

**PART 1 GENERAL****1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 56 00 - Temporary Barriers and Enclosures.

**1.2 MINIMUM STANDARDS**

- .1 Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2010 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

**1.3 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises of fit-up of the third floor office space, located at the Blackburn Building at 85 Sparks Street, Ottawa, Ontario; and further identified as Blackburn Building Third Floor Workplace 2.0 Fit-Up.

**1.4 WORK BY OTHERS**

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

**1.5 WORK RESTRICTIONS**

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Provide in form acceptable to Departmental Representative, within 5 working days of contract award, schedule showing dates:
  - .1 Commencement and completion of work of each section of specifications.
  - .2 Final Completion date within time period required by Contract Documents.
- .3 Carry out work:
  - .1 Interior Building works: After hours, co-ordinate with Departmental Representative if after hours or weekend work will be required, such as any work that involves excessive noise, vibration, and/or strong odours,
  - .2 All Contractor personnel must have valid PWGSC 'Secret' level security status in place prior to commencing work. Coordinate any additional security requirements with Departmental Representative. Departmental Representative to bear cost of security escorts if required,
  - .3 Coordinate with Departmental Representative for all security and fire alarm bypasses required to facilitate work,
  - .4 Coordinate with Departmental Representative if scheduled work affects the Tenant's use of the entrance to Tenant office areas. Schedule work to minimize disruption to the Tenants. Do not proceed with any work that affects the Tenant's use of space without approval from Departmental Representative.

**1.6 CONTRACTOR USE OF PREMISES**

- .1 Restricted use of site.
- .2 Limit use of premises for Work, for storage and for access, to allow:
  - .1 Owner occupancy.
  - .2 Partial owner occupancy.
  - .3 Work by other contractors.
- .3 Co-ordinate use of premises under direction of Departmental Representative.

- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
  - .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
  - .6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
  - .7 At completion of operations condition of existing work: equal to or better than that which existed before new work started.
- 1.7 OWNER OCCUPANCY**
- .1 Owner will occupy building during entire construction period for execution of normal operations.
  - .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.
- 1.8 WORK SEQUENCE**
- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
  - .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
  - .3 Maintain fire access/control.
  - .4 Maintain elevator access.
- 1.9 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**
- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
  - .2 Use only elevators existing in building for moving workers and material.
    - .1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.
    - .2 Accept liability for damage, safety of equipment and overloading of existing equipment.
  - .3 Provide temporary dust screens, barriers, warning signs and drop cloths in locations where renovation and alteration work is adjacent to areas used by public or Tenant.
  - .4 Where elevators and conveyors exist in building, only those assigned for Contractor's use may be used for moving personnel and materials with the building. Protect walls of passenger elevators, to approval of Departmental Representative before use. Accept liability for damage, safety to equipment and overloading of existing equipment.
- 1.10 EXISTING SERVICES**
- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
  - .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
  - .3 Provide alternative routes for personnel.
  - .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
  - .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
  - .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
  - .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
  - .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

#### **1.11 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .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 Other documents as specified.

#### **1.12 SECURITY CLEARANCES**

- .1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.
- .2 Personnel will be checked daily at start of work shift and given a pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

#### **1.13 CAMERAS**

- .1 Do not use camera or photographic equipment unless approved by the Departmental Representative.

### **PART 2 PRODUCTS**

#### **2.1 NOT USED**

- .1 Not used.

### **PART 3 EXECUTION**

#### **3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 REGULATORY REQUIREMENTS**

- .1 An investigation into the presence of designated substances for the 2<sup>nd</sup> and the 3<sup>rd</sup> Floors Fit-Up Project at Blackburn Building, 85 Sparks Street, Ottawa, Ontario, was performed in order to meet the requirements of the *Canada Labour Code* (CLC) under Part II, Section 124 that every employer shall ensure that the health and safety at work of every person employed by the employer is protected. Furthermore, Section 125(1) (z.14) of the *Canada Labour Code* stipulates that the employer, to the extent that he controls the activity, will take all reasonable care to ensure that all persons granted access to the work place, other than the employer's employees, are informed of every known or foreseeable health and safety hazard to which they are likely to be exposed in the work place. In addition, it was performed to meet the requirements of Section 30 of the *Ontario Occupational Health and Safety Act, Revised Statutes of Ontario, 1990, Chapter 0.1*. By having a Designated Substances Report (DSR) conducted, the PWGSC Departmental Representative will be able to inform his or her employees, contractors, and tenants of any designated substances that may be present and possibly disturbed throughout the duration of the project. The informed Departmental Representative will then be able to impose appropriate health and safety precautions for all applicable personnel as required.
- .2 The designated substances identified in the *Occupational Health and Safety Act* and its corresponding regulations are:
  - .1 **Acrylonitrile:** “Designated Substances”  
O. Reg 490/09 (as amended)
  - .2 **Arsenic:** “Designated Substances”  
O. Reg 490/09 (as amended)
  - .3 **Asbestos:**
    - .1 “Designated Substances”  
O. Reg 490/09 (as amended)
    - .2 “General – Waste Management”  
O. Reg 347/90 (as amended)
    - .3 “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations”  
O.Reg 278/05 (as amended)
    - .4 PWGSC Departmental Policy  
DP 057 – “Asbestos Management”
  - .4 **Benzene:** “Designated Substances”  
O. Reg 490/09 (as amended)
  - .5 **Coke Oven Emissions:** “Designated Substances” O. Reg 490/09 (as amended)

- .6 **Ethylene Oxide:** *"Designated Substances"*  
O. Reg 490/09 (as amended)
  - .7 **Isocyanates:** *"Designated Substances"*  
O. Reg 490/09 (as amended)
  - .8 **Lead:**
    - .1 *"Designated Substances"*  
O. Reg 490/09 (as amended)
    - .2 *"General – Waste Management"*  
O. Reg 347/90 (as amended)
    - .3 *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109 (as amended)*
  - .9 **Mercury:**
    - .1 *"Designated Substances"*  
O. Reg 490/09 (as amended)
    - .2 *"General – Waste Management"*  
O. Reg 347/90 (as amended)
  - .10 **Silica:** *"Designated Substances"*  
O. Reg 490/09 (as amended)
  - .11 **Vinyl Chloride:** *"Designated Substances"*  
O. Reg 490/09 (as amended)
- .3 All contractors requesting tenders from subcontractors shall furnish this report to subcontractors. **This report must be read in its entirety, including text and tables.**

## 1.2 VALIDITY DATE

- .1 Cyprien Amani, Environmental Analyst of the Environmental Services Directorate of the Real Property Branch, PWGSC, conducted the on-site survey for this report on 2014/08/14.
- .2 The work area is located on the 2<sup>nd</sup> and the 3<sup>rd</sup> floors of the Blackburn Building, 85 Sparks Street, Ottawa, Ontario and with sampling locations described as:
  - Corridor floor close to room 305;
  - Corridor ceiling close to room 313; and
  - Corridor wall close to room 313.

The scope of the work for the project consists of fitting up the 2<sup>nd</sup> and the 3<sup>rd</sup> floors of the Blackburn Building.

  - .1 The scope of work for this report involved a visual inspection of building materials and contents for the presence of suspected designated substances in the project area on 2014/08/14.

- .2 From the visual inspection suspect materials were sampled and analyzed, where appropriate, for the above substances. On the basis of the visual inspection, a total of nine (9) bulk samples of suspected asbestos-containing materials (ACMs), and two (2) bulk samples of suspected lead-containing paint were collected. Bulk ACM samples were collected in order to satisfy the requirements of *O. Reg. 278/05* (as amended).

The samples were then submitted for analysis to the EXOVA Laboratory (accredited by the Canadian Association for Laboratory Accreditation (CALA) and the National Voluntary Laboratory Accreditation Program (NAVLAB)) located at 146 Colonnade Road, Unit 8, Ottawa, Ontario, K2E 7Y1.

The bulk asbestos samples were analyzed using Polarized Light Microscopy (PLM). This analytical method complies with the United States Environmental Protection Agency (U.S. EPA) Method 600/R-93/116.

The lead analysis of the paint samples was completed using Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) in accordance with U.S. EPA Method 6010-C.

- .3 The visual inspection and sampling were limited to readily accessible areas. Destructive testing was not included in the investigation, but is recommended prior to any major demolition. Due to the nature of building construction, some inherent limitations exist as to the possible thoroughness of the designated substance survey. No confined space was accessed for the purpose of this report.
- .4 It is possible that the designated substances aforementioned are present in non-accessible areas and concealed spaces (i.e., wall and ceiling cavities), or confined spaces. No other areas outside the defined work boundaries have been assessed.
- .5 Prior to beginning work, it must be confirmed with the Departmental Representative that no additional designated substances have been brought to the project area.
- .6 In addition, the survey refers to polychlorinated biphenyls (PCBs) and halocarbons; however, it does not refer to other substances that may be present in the day-to-day usage for specialized equipment or areas in buildings (i.e. lead shields, fume hoods, etc.).

- .7 There is a possibility that materials which could not be reasonably identified within the scope of this assessment or which were not apparent during previous site visits may exist. Should any designated substance be encountered in the course of demolition, work must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. **Do not proceed until written instructions have been received.**

## **PART 2 - DESIGNATED SUBSTANCES**

### **2.1 SURVEY RESULTS**

- .1 **ACRYLONITRILE:** Not Identified  
.2 **ARSENIC:** Not Identified  
.3 **ASBESTOS:** Not Identified

Asbestos is a naturally occurring material. In general, it has historically been intentionally added to many building materials in the construction industry to increase thermal or chemical resistance properties. More common uses are thermal insulation for pipes and boilers, structural steelwork fireproofing, floor tiles and in-wall and ceiling plasters. There are two classes of asbestos-containing materials: friable and non-friable. Friable asbestos-containing materials are loose in composition or can be easily crumbled using hand pressure. Non-friable asbestos-containing materials are more durable and are held together by a binder such as cement, vinyl or asphalt.

Representative bulk samples, collected on 2014/08/14 from materials located within the project area have been analyzed for asbestos. Analytical results indicate that the mastic, the plaster and ceiling plaster in the project area do not contain asbestos. The results are shown in Table 1 below.

**Table 1: Asbestos Sample Results by Polarized Light Microscopy (PLM)**

Sample ID	Material	Location	Asbestos Type	Asbestos content (%)
BLB3F-AS-1A	Floor Mastic	Corridor Floor, close to Room 305	n/a	n/d
BLB3F-AS-1B			n/a	n/d
BLB3F-AS-1C			n/a	n/d
BLB3F-AS-2A	Ceiling Plaster	Corridor Ceiling, close to Room 313	n/a	n/d
BLB3F-AS-2B			n/a	n/d
BLB3F-AS-2C			n/a	n/d
BLB3F-AS-3A	Wall Plaster	Corridor Wall close to Room 313	n/a	n/d
BLB3F-AS-3B			n/a	n/d
BLB3F-AS-3C			n/a	n/d

n/d = none detected, n/a = not applicable

- .4 **BENZENE:** Not Identified
- .5 **COKE OVEN EMISSIONS:** Not Identified
- .6 **ETHYLENE OXIDE:** Not Identified
- .7 **ISOCYANATES:** Not Identified
- .8 **LEAD: Traces Amounts Identified**

Lead is a naturally occurring metal. It was used primarily in paint prior to the 1980's to speed up drying, increase durability, maintain a fresh appearance, and resist moisture that causes corrosion. Lead in paint becomes a danger when it is old or damaged, as it creates lead dust and chips. Lead can also be found in soldered joints installed on piping up to the mid 1990s and in older cast iron bell and spigot joints.

- .1 According to the *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended) allowable concentration of lead in surface coatings is 90mg/kg which is equivalent to 90 parts per million (ppm).
- .2 Even at very low concentrations, there may be potential for exposure to very high levels of lead depending on the activities performed that disturb the lead-containing materials. At low lead concentrations, conducting a risk assessment to assess the potential for exposure is required to determine the need to follow precautionary measures.
- .3 Representative white paint sample (BLB3F-Pb-1) collected from the corridor ceiling close to room 313 and the gold paint (BLB3F-Pb-2) sample collected from the corridor wall close to



room 313, taken on 2014/08/14 from the project area, have been analyzed for lead content. Analytical results indicate that the white and the gold paints in the project area have lead traces amounts content below the 90ppm threshold outlined in the *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended). The results are shown in Table 2 below.

**Table 2: Lead Sample Results by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)**

Sample ID	Description	Location	Lead Content (ppm)
BLB3F-Pb-1	White Paint	Corridor Ceiling, close to room 313	<30
BLB3F-Pb-2	Gold Paint	Corridor Wall, close to room 313	50

**.9 MERCURY: Identified**

During the site investigation several fluorescent light tubes which contain mercury were observed in the project area.

**.10 SILICA: Identified**

Free crystalline silica is present in concrete and plaster within the project area.

**.11 VINYL CHLORIDE MONOMER: Not Identified**

**.12 POLYCHLORINATED BIPHENYLS (PCBs): Suspected**

During the site investigation several fluorescent light fixtures were observed within the project area. PCBs may be present in the fluorescent light ballasts.

**.13 HALOCARBONS: Not Identified**

**2.2 RECOMMENDATIONS**

**1. LEAD**

- .1 If lead-containing materials are disturbed (i.e. during dry sanding, grinding, polishing and sawing operations), then proper precautions, as outlined under *Regulation 490/09* (as amended) of the *Ontario Occupational Health and Safety Act*, must be followed.
- .2 Under *Regulation 490/09* (as amended), regulatory limits have been established for occupational exposure limits to airborne lead that may be present in a workplace. The Time Weighted Average Exposure Values (TWAEV) to airborne lead dust or fumes should not

exceed the Ministry of Labour's 0.05 milligram per cubic metre ( $\text{mg/m}^3$ ) limit during the removal of paints and products containing any concentration of lead. The TWAEV represents the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects.

- .3 Contractors performing work that requires disturbance of lead-containing materials are responsible to ensure that the workers are not exposed to airborne lead dust levels in excess of the time-weighted average Exposure Concentration for lead-containing paints. It should be noted that the use of mechanically-powered tools or torches on lead-containing materials increases the concentration of airborne lead dust or fumes and thereby requiring more stringent respiratory protection and controlled work procedures.
- .4 Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Lead on Construction Projects*". This document classifies all disturbances of lead-containing materials as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, based on presumed airborne concentrations of lead generated during the work each of which will have defined work practices. Although this document is not a regulation, Ministry of Labour Inspectors use it as guidance during site inspections.
- .5 The disposal of construction waste containing lead is controlled by "General – Waste Management" O.Reg 347/90 (as amended) under the *Ontario Environmental Protection Act*. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as "hazardous", "non-hazardous" or "registerable solid waste", depending on the results of the leachate test.

Before the disposition, the lead concentration in the leachate must be determined for waste with high lead concentration by following the procedure detailed in the document entitled "Toxicity Characteristic Leaching Procedure" (TCLP).

## 2. MERCURY

- .1 Mercury is governed by the *Regulation 490/09* (as amended) under the *Ontario Occupational Health and Safety Act*. The regulation provides requirements for allowable exposure levels.
- .2 Should the disturbance or removal of fluorescent light tubes be required, the Ontario Ministry of Labour (MoL) publication '*The Safe Handling of Mercury: A Guide for the Construction Industry*', should be followed.
- .3 Mercury waste is considered a hazardous waste under "*General – Waste Management*" O.Reg 347/90 (as amended) of the *Ontario Environmental Protection Act*. Fluorescent light tubes are considered hazardous material and should be recycled if removed from service. For more information, please contact the Departmental Representative.

### 3. SILICA

- .1 Silica is governed by the *Regulation 490/09* (as amended) under the *Ontario Occupational Health and Safety Act*. The regulation provides requirements for allowable exposure levels.
- .2 Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in concrete and plaster within the project area, appropriate respiratory protection and ventilation must be done during the demolition and modifications of these structures.
- .3 The Occupational Health and Safety Branch of the Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Silica on Construction Projects*". This document classifies the disturbance of materials containing silica as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

### 4. POLYCHLORINATED BIPHENYLS (PCBs) (NOT RECOGNIZED AS A DESIGNATED SUBSTANCE)

- .1 PCBs are not recognized as Designated Substances. However, a survey of the project area was completed for this substance due to its risks to both human health and environment. It was not feasible during the survey to determine whether light fixtures in the project area were free of PCBs. Therefore, if any fluorescent light fixtures are removed during

this project, please refer to the Environmental Canada, *Identification of Lamp Ballasts Containing PCBs, August 1991* report in order to identify the ballast type. Ballasts for a typical 1.2 metre fluorescent light fixture made with PCBs contain approximately 23.6 grams of PCB.

- .2 If any fluorescent light ballasts are removed during any future works, they must be sorted by a competent person.

PCB-containing equipment must be disposed of in accordance with:

- Canadian Environmental Protection Act's (CEPA) *PCB Regulations*
- Canadian Council of Ministers of the Environment's "Guidelines for the Management of Wastes Containing Polychlorinated Biphenyls" - Ontario Environmental Protection Act's O. Reg 362/90 "Waste Management – PCB's" as amended (O. Reg 33/07).

- .3 Any PCB-containing equipment that is removed from the site or placed into storage shall be appropriately reported in accordance with the requirements of the CEPA *PCB Regulations*.

## 5. CONTRACTORS DUTIES

The contractor must review the designated substance report and take the necessary precautions to protect the health and safety of the workers and the environment. As per Section 30(4) of the *Ontario Occupational Health and Safety Act*, the party hiring the contractor (i.e. Departmental Representative) shall ensure that the contractor and subcontractor (if any) for the project has received a copy of the designated substance report prior to entering a binding contract for the supply of work on the project. As per Section 27(2) (a, b, and c) of the *Ontario Occupational Health and Safety Act*, while onsite, the contractor supervisor shall exercise every reasonable precaution for the protection of a worker. If you have any questions about the designated substance report, please contact the Departmental Representative.

## END OF SECTION

**Part 1 GENERAL****1.1 COORDINATION**

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of others.
  - .1 Liaise between all subcontractors and consultant regarding the work. Follow up all verbal communication in writing; receive, review, clarify and acknowledge all communication, including; requests for information, shop drawings, etc., prior to forwarding to Departmental Representative.

**1.2 PROJECT MEETINGS**

- .1 Schedule and administer bi-weekly project meetings throughout progress of Work as determined by Departmental Representative.
  - .1 Project meetings shall not be used as a forum for detailed construction coordination relating to means, methods, techniques sequences, procedures, etc. between contractors and sub contractors, which are to be dealt with during the course of the work and covered at Construction Progress Meetings between contractor and sub contractors.
  - .2 Typically attendees shall include the project representatives for the contractor, major subcontractors, client, consultant and major sub consultants; schedule representatives for other subcontractors, sub consultants, companies or authorities where required.
- .2 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.
- .3 Prepare agenda for meetings and distribute written notice of each meeting in advance of meeting date to Departmental Representative.
- .4 Departmental Representative shall provide physical space and make arrangements for meetings.
- .5 Preside at meetings and record minutes. Include significant proceedings and decisions. Identify action by parties.
- .6 Produce and distribute copies of minutes within three (3) days after each meeting and transmit to all meeting participants, affected parties not in attendance.

**1.3 CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within five (5) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Establish time and location of meeting and notify parties concerned minimum three (3) days before meeting.
- .3 Agenda to include following:
  - .1 Appointment of official representative of participants in Work.
  - .2 Schedule of Work and progress scheduling.
  - .3 Schedule of submission of shop drawings, samples, colour chips, etc.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, etc.
  - .5 Delivery schedule of specified equipment.
  - .6 Site safety and security.
  - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
  - .8 Owner-furnished Products.
  - .9 Record drawings and a process for maintaining them current during the Work.
  - .10 Maintenance material and data.

- .11 Take-over procedures, acceptance, and warranties.
- .12 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances and transcript of policies.
- .4 During construction, coordinate use of site and facilities.
- .5 Activate procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

#### 1.4 SCHEDULES

- .1 Submit preliminary construction progress schedule to Departmental Representative.
- .2 After review, revise and resubmit schedule to comply with revised project schedule.
- .3 During progress of Work revise and resubmit as directed by Departmental Representative.

#### 1.5 CONSTRUCTION PROGRESS MEETINGS

- .1 During course of Work schedule bi-weekly progress meetings.
- .2 Notify affected parties minimum five (5) days prior to meetings.
- .3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three (3) days after meeting.
- .4 Agenda to include 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 Review site safety and security issues.
  - .13 Other business.

#### 1.6 SCHEDULES

- .1 Submit schedules as follows:
  - .1 Submittal schedule for shop drawings, product data, samples, timeliness of Owner-furnished Products and delivery schedule.
  - .2 Shut down or closure activity.
  - .3 Prepare schedule in form of a horizontal Gantt bar chart.
- .2 Schedule Submission
  - .1 Submit initial format of schedules within ten (10) working days after award of Contract.
  - .2 Submit schedules in electronic format, forward by e-mail.
  - .3 Departmental Representative will review schedule and return review copy within five (5) days after receipt.
  - .4 Submit revised progress schedule with each application for payment.

**1.7 CONSTRUCTION PROGRESS SCHEDULING**

- .1 Submit initial schedule in duplicate within ten (10) days after date of Owner-Contractor Agreement or established in Notice to Proceed.
- .2 Revise and resubmit as required.
- .3 Submit revised schedules with each Application for Payment, identifying changes since previous version.

**1.8 WASTE MANAGEMENT PLAN**

- .1 Departmental Representative requires waste to be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
- .2 Draft a waste management plan within ten (10) days after receipt of notice of award of bid, or prior to any waste removal, whichever occurs sooner; to the Departmental Representative for review.
- .3 Subcontractors and others on site to cooperate fully with Contractor to implement the plan.
- .4 Failure to cooperate may result in Contractor being assessed penalties by a local regulatory jurisdiction.

**1.9 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Protect, stockpile, store salvaged items.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .4 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

**1.10 DISPOSAL OF WASTE**

- .1 Burying rubbish and waste materials is prohibited.
- .2 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, sanitary sewers, or on site is prohibited.

**1.11 CLEANING**

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

**1.12 PERSONNEL SMOKING**

- .1 Comply with regulatory imposed tobacco smoking restrictions during execution of the Work.

**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, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable. Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work is co-ordinated.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
- .9 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 Where applicable submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Ontario.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow seven (7) working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in PDF Format, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.



- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic files, in PDF format, of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic files, in PDF format, of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative, where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic files, in PDF format, 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 accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic files, in PDF format, of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic files, in PDF format, of manufacturers' instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic files, in PDF format, copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit four (4) hard 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 electronic 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 Departmental Representative is for sole purpose of ascertaining conformance with general concept.
- .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.
- .21 Arrange and pay for all deliveries and pick-up, to and from, the Departmental Representative's offices.

### **1.3 SAMPLES**

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

### **1.4 MOCK-UPS**

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

### **1.5 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 Execution**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS): Material Safety Data Sheets (MSDS).
- .3 Province of Ontario: Occupational Health and Safety Act, R.S.O. 1990 Updated 2007.

**1.2 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within five (5) 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 two (2) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within five (5) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five (5) days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.3 FILING OF NOTICE**

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

**1.4 SAFETY ASSESSMENT**

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

**1.5 MEETINGS**

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

**1.6 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

**1.7 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

**1.8 RESPONSIBILITY**

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

**1.9 COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Health and Safety Act, R.S.O.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.
- .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.10 UNFORSEEN HAZARDS**

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

**1.11 HEALTH AND SAFETY CO-ORDINATOR**

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

**1.12 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

**1.13 CORRECTION OF NON-COMPLIANCE**

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

**1.14 BLASTING**

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

**1.15 POWDER ACTUATED DEVICES**

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

**1.16 WORK STOPPAGE**

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

**Part 2 Products****2.1 NOT USED**

- .1 Not used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 General****1.1 DEFINITIONS**

- .1 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 humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

**1.2 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan: include:
  - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan, where applicable.
  - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site, where applicable.
  - .3 Name and qualifications of person responsible for training site personnel, where applicable.
  - .4 Descriptions of environmental protection personnel training program, where applicable.
  - .5 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
  - .6 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  - .7 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  - .8 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
  - .9 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
  - .10 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

**1.3 FIRES**

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

**1.4 DISPOSAL OF WASTES**

- .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**1.5 POLLUTION CONTROL**

- .1 Control emissions from equipment and plant to local authorities' emission requirements.
- .2 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

**1.6 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. Contractor, after receipt of such notice, shall inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
- .2 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .3 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 REFERENCES AND CODES**

- .1 Perform Work in accordance with the National Building Code of Canada (NBC 2010) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

**1.2 HAZARDOUS MATERIAL DISCOVERY**

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

**1.3 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions and municipal by-laws.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



**Part 1 General****1.1 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative's 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. If such Work is found in accordance with Contract Documents, project shall pay cost of examination and replacement.

**1.2 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the project.
- .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 the project. Pay costs for retesting and re-inspection.

**1.3 ACCESS TO WORK**

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

**1.4 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in 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 four (4) copies of inspection and test reports to Departmental Representative.

- .2 Provide copies to subcontractor of work being inspected or tested and/or manufacturer or fabricator of material being inspected or tested.

#### **1.7 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

#### **1.8 MILL TESTS**

- .1 Submit mill test certificates as requested or required of specification Sections.

#### **1.9 EQUIPMENT AND SYSTEMS**

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

#### **Part 2 Products**

##### **2.1 NOT USED**

- .1 Not Used.

#### **Part 3 Execution**

##### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUBMITTALS**

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

**1.2 INSTALLATION AND REMOVAL**

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

**1.3 WATER SUPPLY**

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

**1.4 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
  - .1 Facilitate progress of Work. Protect Work and products against dampness and cold.
  - .2 Prevent moisture condensation on surface.
  - .3 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .4 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, not to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform to applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.5 TEMPORARY POWER AND LIGHT**

- .1 The Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply to be confirmed by Departmental Representative.

- .2 Arrange for connection with the existing building personnel. Pay costs for installation, maintenance and removal.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of the Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Connect to existing power supply in accordance with Canadian Electrical Code.

#### **1.6 TEMPORARY COMMUNICATION FACILITIES**

- .1 Provide and pay for temporary telephone, fax and data hook up, and equipment necessary for use.

#### **1.7 FIRE PROTECTION**

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

#### **Part 2 Products**

##### **2.1 NOT USED**

- .1 Not Used.

#### **Part 3 Execution**

##### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CSA-0121-M1978(R2003), Douglas Fir Plywood.
  - .2 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
  - .3 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

**1.3 SUBMITTALS**

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

**1.4 SCAFFOLDING**

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

**1.5 ELEVATORS**

- .1 Designated existing elevator to be used by construction personnel and transporting of materials. Co-ordinate use with Departmental Representative.
- .2 Provide protective coverings for finish surfaces of cars and entrances.

**1.6 SITE STORAGE/LOADING**

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

**1.7 CONSTRUCTION PARKING**

- .1 Parking will not be permitted on site.
- .2 Provide and maintain adequate access to project site.

**1.8 OFFICES**

- .1 On site office will not be provided.

**1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Site storage of equipment, tools and materials will not be provided.

**1.10 SANITARY FACILITIES**

- .1 Existing building facilities may be used as directed by Departmental Representative.

**1.11 CONSTRUCTION SIGNAGE**

- .1 Construction signage will not be permitted on site.

**1.12 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2            Products****2.1                Not Used**

.1                Not Used.

**Part 3            Execution****3.1                Not Used**

.1                Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUBMITTALS**

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

**1.2 INSTALLATION AND REMOVAL**

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

**1.3 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.

**1.4 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 five (5) days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by the project in event of conformance with Contract Documents or by Contractor in event of non-conformance.

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

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



**1.4 TRANSPORTATION**

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

**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 the 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.
- .4 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.
- .5 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .6 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

**1.6 CO-ORDINATION**

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

**1.7 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.

**1.8 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate 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.

**1.9 LOCATION OF FIXTURES**

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

**1.10 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.

#### **1.11 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use rivets and washers, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

#### **1.12 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.

#### **1.13 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Record location of capped service.

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

### **Part 3 Execution**

#### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 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 Owner or separate contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Effect on Work of Owner or separate contractor.
  - .7 Written permission of affected separate contractor.
  - .8 Date and time work will be executed.

**1.2 MATERIALS**

- .1 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.

**1.4 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 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 appropriate fire stopping material in accordance with Section 07 84 00 - Firestopping, 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 pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by building tenants.
- .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 Provide on-site containers for collection of waste materials and debris.
- .4 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .5 Dispose of waste materials and debris off site.
- .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 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by building tenants.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Clean and polish glass, hardware, stainless steel, chrome, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2            Products****2.1                NOT USED**

.1            Not Used.

**Part 3            Execution****3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUBMITTALS**

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

**1.2 O&M MANUAL**

- .1 O&M Manuals are to be assembled in a 1" or greater 3 ring binder labelled on the front cover and on the binder edge with the:
  - .1 Building Name and address
  - .2 Project Name
  - .3 Project Number
  - .4 Project Completion Date
- .2 O&M manuals are to include a Title Page with: building name, address, date, general contractor information: name address & phone numbers, consultant: name address & phone numbers.
- .3 O&M Manuals are to be indexed and sectioned as follows
  - .1 Signed Letter of warranty: dated; identifying project by name; project number; location and warranty period. Any extended equipment warranty must also be identified.
  - .2 Contact information for all sub-contractors & suppliers.
  - .3 Reports:
    - .1 Copy of all TAB reports for HVAC systems.
    - .2 Pre-functional tests and/or start-up reports.
    - .3 Functional test reports.
    - .4 Completed performance verification forms.
    - .5 Cabling verifications.
    - .6 ESA certification - Certificate of Inspection & Requested.
    - .7 Inspection Outcome Summary Report.
    - .8 TSSA certification.
    - .9 Fire alarm certifications.
    - .10 NFPA 13 certifications.
    - .11 Seismic Reports.
    - .12 Other required certifications required by National Building Code.
- .4 Sequence of operation: outline how the system is designed to operate.
- .5 CMMS Data Sheets:
  - .1 All equipment which is to be deleted, removed, added or replaced from site is to have a CMMS inventory sheet completed and included in the O&M manual.
  - .2 If this equipment is a pressure vessel and is included in the annual inspection with TSSA the orange tag that is attached to the equipment must be removed prior to demolition and forwarded to the commissioning manager.
- .6 Copy of approved shop drawings.
- .7 Copy of the specific service and maintenance manual for new equipment.

**1.3 AS-BUILTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative 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. Field test records.

- .6 Inspection certificates.
- .7 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

**1.4****RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, provided by Departmental Representative, and one copy within Project Operation and Maintenance Manual.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Field changes of dimension and detail.
  - .4 Changes made by change orders.
  - .5 Details not on original Contract Drawings.
  - .6 References 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 records, required by individual specifications sections.

**1.5****EQUIPMENT AND SYSTEMS**

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



- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

## **1.6 MATERIALS AND FINISHES**

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

## **1.7 STORAGE, HANDLING AND PROTECTION**

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

## **1.8 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .3 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .4 Assemble approved information in binder and submit upon acceptance of work. 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 (10) 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.
- .5 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.
- .6 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 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, and commissioned systems such as alarm systems and lightning protection systems.
- .3 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.
- .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.
- .7 Respond in a timely manner to oral or written notification of required construction warranty repair work.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Sections:
  - .1 Sections of Division 01.
  - .2 Sections of Division 10.
  - .3 Sections of Division 23.
  - .4 Sections of Division 25.
  - .5 Sections of Division 26.
  - .6 Sections of Division 28.
- .3 Acronyms:
  - .1 BMM - Building Management Manual.
  - .2 Cx - Commissioning.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 O&M - Operation and Maintenance.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.

**1.2 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.
  - .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 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.

**1.3 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's cost breakdown.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .3 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 include transfer of critical knowledge to facility operational personnel.
- .4 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

#### 1.4 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 non-functional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional testing, inspections, acceptability and proper performance of such items to be borne by the Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

#### 1.5 PRE-CX REVIEW

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan with all updates.
  - .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 Departmental Representative.
  - .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
  - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

#### 1.6 CONFLICTS

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

**1.7 SUBMITTALS**

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

**1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 31 - Commissioning (Cx) Plan: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

**1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule.
- .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.

**1.10 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 80 % construction completion stage. Departmental Representative 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 Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 100 % and subsequent Cx meetings and as required.

**1.11 STARTING AND TESTING**

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

**1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days' notice prior to commencement.
- .2 Departmental representative to witness the start-up and testing of all new and existing equipment's installed.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

**1.13 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 Perform a visual inspection of the quality of the installation.
  - .2 Start-up: to 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 Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document required to be used for testing, are the approved PV forms only.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by 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 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be removed from site and replaced with new one.
    - .2 Subject all new equipment to specified start-up procedures.

**1.14 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative 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 completed start-up procedures, to permit Departmental Representative to repeat start-up at any time.

**1.15 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 Departmental Representative 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.

**1.16 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.

**1.17 START OF COMMISSIONING**

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

**1.18 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative 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.

**1.19 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under accepted simulated 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 manufacturer's instructions for the start-up of the equipment and for operation under normal condition.

**1.20 WITNESSING COMMISSIONING**

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

**1.21 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate the verifications 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 regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

#### **1.22 EXTENT OF VERIFICATION**

- .1 Refer to Section 25 05 01 – EMCS: General Requirements.

#### **1.23 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

#### **1.24 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.

#### **1.25 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to the Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

#### **1.26 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 Departmental Representative.

#### **1.27 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.

#### **1.28 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

#### **1.29 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 Departmental Representative.



**1.30 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, tolerance 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.

**1.31 DEPARTMENTAL REPRESENTATIVE PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution****3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 General****1.1 SUMMARY**

- .1 Section Includes:
  - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.
- .2 Related Sections:
  - .1 Section 01 11 00 – Summary of Work
  - .2 Section 01 33 00 – Submittal Requirements
  - .3 Section 01 45 00 – Quality Control
  - .4 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
  - .5 Section 23 36 00 – Air Terminal Units
  - .6 Section 25 01 11 – EMCS: Start-up and Check-out
  - .7 Section 25 30 02 – EMCS: Field Control Devices
  - .8 Section 25 90 01 – EMCS: Site Requirements Applications and Systems Sequences of Operation

**1.2 REFERENCES**

- .1 Public Works and Government Services Canada (PWGSC)
  - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition.
- .2 Department of Justice Canada.
  - .1 CEPA (1999), Canadian Environmental Protection Act.
- .3 National Research Council Canada (NRC)
  - .1 NFCC 2010, National fire Code of Canada.
- .4 Ontario Building Code 2010 (OBC).
  - .1 CSA C-282-09, Emergency electrical power supply for buildings.

**1.3 GENERAL**

- .1 Provide a fully functional installation:
  - .1 Systems, equipment and components meet user's functional requirements before date of acceptance and according to applicable regulatory requirements.
  - .2 Facility user and O&M personnel have been fully trained in aspects of installed equipment systems.
  - .3 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 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 Departmental Representative and design requirements.
  - .5 A complete and functional system is to be produced 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.
- .4 Acronyms:
  - .1 Cx - Commissioning.
  - .2 BMM - Building Management Manual.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 MSDS - Material Safety Data Sheets.
  - .5 PI - Product Information.
  - .6 PV - Performance Verification.
  - .7 TAB - Testing, Adjusting and Balancing.
  - .8 WHMIS - Workplace Hazardous Materials Information System.

#### 1.4 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 100% completed within 8 weeks of award of contract 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.
- .2 Submit completed Cx Plan to Departmental Representative and obtain written approval.

#### 1.5 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.
- .2 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

#### 1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is the only point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 Departmental Representative Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
  - .2 Departmental Representative Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
    - .1 During construction, periodic site verifications are to be made in order to see the progress of the construction.
    - .2 Review of Cx documentation from operational perspective.
    - .3 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
    - .4 Protection of health, safety and comfort of the occupants including O&M personnel.
    - .5 Monitoring of Cx activities, training, development of Cx documentation.
    - .6 Work closely with members of Cx Team.

- .3 Departmental Representative is responsible for:
  - .1 Organizing Cx.
  - .2 Monitoring operations Cx activities.
  - .3 Witnessing, certifying accuracy of reported results.
  - .4 Witnessing and certifying TAB and other tests.
  - .5 Developing BMM.
  - .6 Ensuring implementation of final Cx Plan.
  - .7 Performing verification of performance of installed systems and equipment.
  - .8 Implementation of Training Plan.
- .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
  - .1 Testing.
  - .2 TAB.
  - .3 Performance of Cx activities.
  - .4 Delivery of training and Cx documentation.
  - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
  - .1 Demonstrations.
  - .2 Training.
  - .3 Testing.
  - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Receiving facility.
  - .2 Day-To-Day operation and maintenance of facility.

**1.7****CX PARTICIPANTS**

- .1 Employ the following Cx participants to verify performance of equipment and systems:
  - .1 Installation contractor/subcontractor:
    - .1 Equipment and systems except as noted.
- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
  - .1 To include performance verification.
- .3 Ensure that Cx participant:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications that are outside of the responsibility of the O&M personnel, including:
    - .1 Changes to control strategies and systems.
- .4 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 weeks prior to starting date of Cx for review and approval.

**1.8 EXTENT OF CX**

- .1 Commission mechanical /electrical systems and associated equipment:
  - .1 Terminal units:
    - .1 Pneumatic actuator.
    - .2 Pneumatic heating baseboards control valves.
    - .3 Pneumatic thermostats.
  - .2 Drainage pumping basin on/off automatic pump operation.
  - .3 Lighting control system.
  - .4 Fire alarm system.

**1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES**

- .1 General requirements:
  - .1 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
  - .1 Pressure testing forms.
  - .2 Equipment identification forms (SIGE / CMMS).
  - .3 Equipment manufacturer's installation, operation and maintenance manuals (IOM).
  - .4 Documentation for Energy Monitoring and Control Systems (ECMS).
  - .5 Inventory of spare parts, special tools and maintenance materials.
  - .6 WHMIS information.
  - .7 MSDS data sheets.
  - .8 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

**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.
- .3 Deliverables: provide:
  - .1 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .2 Completed installation checklists (ICL).
  - .3 Completed performance verification (PV) report forms.
  - .4 Results of Performance Verification Tests and Inspections.
  - .5 Description of Cx activities and documentation.
  - .6 Description of Cx of integrated systems and documentation.
  - .7 Tests of following witnessed by Departmental Representative:
    - .1 Performance verification of integrated systems including:
      - .1 Terminal units;
      - .2 Temperature/control devices;
      - .3 Ventilation.
  - .8 Training Plans.
  - .9 Cx Reports.

- .4 Departmental Representative to witness and certify tests and reports of results provided to 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 Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative satisfaction.
  - .2 Departmental Representative will monitor some of these pre-start-up inspections.
  - .3 Include completed documentation with Cx report.
  - .4 Conduct pre-start-up tests: as specified in technical sections.
  - .5 Include completed documentation in Cx report.
- .2 Pre-Cx activities:
  - .1 Submit each item of equipment to a start-up test in standalone mode.
  - .2 Complete controls prior to start-up and fill out relevant documentation.
  - .3 After the commissioning of equipment and systems, perform automatic operation testing of related systems one after the other, at the same time as those of command / control systems.
  - .4 Use the graphics and trends reports from the ECMS as a criteria for performance control.
  - .5 Demonstrate equipment and system performances in the presence of SNC Lavalin O&M Representative.

#### 1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities. Results to recorded on approved forms.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms and submitted to Departmental Representative for verification and certification.
- .4 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.
- .5 Identification:
  - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Contractor, and Cx Manager to co-operate to complete inventory data sheets and provide assistance to Departmental Representative in full implementation of MMS identification system of components, equipment, sub-systems, systems.

#### 1.13 INSTALLATION/START-UP CHECK LISTS

- .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, supplemental or additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists Departmental Representative. Check lists will be required

during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

#### **1.14 PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Departmental Representative to prepare in electronic form and shall provide them to the Contractor along with the commissioning specifications.
  - .1 Integrated system performance control form.
- .2 Usage strategy
  - .1 Departmental Representative will provide the Contractor with Cx report forms developed for this particular project along with the commissioning specifications.
  - .2 Provide the required data from the shop drawings and check if components, equipment and systems listed on the forms are correctly installed and are operating properly.
  - .3 Confirm that components, equipment and systems operate according to design criteria and according to the designer's intent.
  - .4 Identify the differences between the calculated values and actual values as well as the reasons for such differences.
  - .5 Check the operation of components, equipment and systems in normal and emergency operation and under specified load conditions.
  - .6 The forms must be signed by the technician who performed the data recording.
  - .7 Submit reports immediately after completing testing.

#### **1.15 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for review and approval prior to being used.

#### **1.16 CX SCHEDULES**

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval 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 Cx procedures:
    - .2 Discussion of testing loads for Cx.
    - .3 Submission of list of instrumentation with relevant certificates.
    - .4 Notification of intention to start Cx of integrated systems.
    - .5 Performance control testing of integrated systems.
    - .6 Implementation of training plans.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.

#### **1.17 FINAL SETTINGS**

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

**1.18 PMSS Numerical System**

- .1 Contractor to provide tags on equipment and components based on the numbering identification system provided by Departmental Representative.
- .2 Identification
  - .1 PWGSC has established a numbering convention for the identification of all equipment and systems requiring regular maintenance. No other numbering system will be acceptable. These number are to appear on all design and as built drawings. Final approval of all PMSS (Preventive Maintenance supporting Service) numbering shall be done by the PWGSC Commissioning Authority.
- .3 The numbering convention consists of three elements of identification.
  - .1 System Code: A two-digit code used to identify the type of "system" that an inventory item is employed under (see attached list) (e.g. 30 = Ventilation, 20=Heating).
  - .2 Equipment Code: A three-digit numerical code used to identify a particular type of equipment within a system (see attached list) (e.g. 050 = Air Handling Unit, 239 = Electric Motor).
  - .3 Unit Counter: A numerical code from two to four numbers (01 to 999) used to identify individual pieces of equipment within the building.
  - .4 The system codes list will be provided by Departmental Representative.
- .4 The system/Equipment/Unit Counter designations will be separated by hyphen (e.g. 30-050-01 = Ventilation (30) – Air Handling Unit (50) – Unit number (01)).
- .5 In the case of an item of electrical equipment which is or has the capability of being, on uninterrupted power supply or emergency generator, the System Code 05 is replaced by the number "10" (e.g. 10-210-01).
- .6 In circumstances where an inventory item may expose an individual to hazardous substance, the letter "H" will appear as the last character of the unit counter designation. The place colours for hazardous substance shall be white on blue (e.g. 30-260-01H).
- .7 Each section will define the System Code, Equipment Code and the starting Unit Counter to be used in the listing of items to be includes in the PMSS.
- .8 Labels
  - .1 Labels will consist of a lamacoid plate, white on colour with black lettering, unless otherwise specified.
  - .2 Lamacoid plates will be fastened with #6 self-taping screws wherever possible, otherwise a chain hanger or heat, weather, solvent resistant glue may be used on an exception basis.
  - .3 All lettering to be no less than 10 mm in height. Lettering to be easy identifiable from reasonable distance in lighting levels pertaining to particular location.
  - .4 The size of labels to be dependent on equipment size, ease of installation and visibility.
  - .5 Mount plates in highly visible location as approved by the Commissioning Agent. In high circulation areas, (e.g. offices, hallways, etc.) less conspicuous locations will be acceptable. Location of plates in some occasions such as an electric motor would be preferable on the base. Otherwise install plate directly on equipment.

**Part 2 Products****2.1 NOT USED**

- .1 Not Used.



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**Part 3                      Execution**

**3.1                      STEPS PRIOR TO COMMISSIONING**

- .1      Review and complete the planning and preparations of the installations, instrumentation and activities required for the performance verification of the integrated systems, such as, but not limited to:
  - .1      Air balancing and balancing report issued.
  - .2      Air readjustments on pneumatic controls.
  - .3      Electrical pretest.
  - .4      Fire alarm testing (including sound test) A-D certificate issued.
  - .5      ESA report.
  - .6      Emergency lights test c/w reports.

**END OF SECTION**