

**PART 1 General****1.1 RELATED SECTIONS**

- .1 Section 01 35 29.06 - Health and Safety;
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements;
- .3 The followings documents, submit by the Departmental Representative, are an integral part of the specifications:
  - .1 Mechanical & Electrical drawing ME-1.
  - .2 Mechanical & Electrical drawing ME-2.
- .4 Where appropriate or contradictions between the documents issued by the Departmental Representative and the specifications, the documents of the Departmental Representative will take precedence.
- .5 Where appropriate or contradictions between the English and French documents, the information contained in the English version will take precedence.

**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 2015 and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

**1.3 TAXES**

- .1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

**1.4 FEES, PERMITS AND CERTIFICATES**

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.
- .2 Coordinate and comply with all rules to any local service utilities or authority that has jurisdiction.
- .3 The work must be carried out by contractors who hold valid refrigeration permits for the nature of the work.

**1.5 FIRE SAFETY REQUIREMENTS**

- .1 Comply with the current edition in force of the National Building Code of Canada 2015 for fire safety in construction and the National Fire Code of Canada 2015 (NFC) for fire prevention, fire fighting and life safety.
- .2 Welding, cutting and grinding:

- .1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative. No hot work will be undertaken unless authorized by the Departmental Representative:
  - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass;
  - .2 Completed welding permit as defined in NFC 2015 and NBCC 2015;
  - .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
  - .4 Store flammable liquids in approved CSA containers.
- .3 A firewatcher as described in NFC 2015 and NBCC 2015 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.
- .4 Where the work requires interruption or could cause activation of fire alarms or fire suppression, extinguishing or protection systems:
  - .1 Notify the Departmental Representative at least 72 hrs in advance.
  - .2 The Fire Alarm bypass will be completed by Departmental Representative's, Certificated Fire Alarm Technicians.
  - .3 Provide "Watchman Service" as described in NFC; In general, watchman service is defined as an individual conversant with "Fire Emergency Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
  - .4 Immediately upon completion of work, advise the Departmental Representative so the fire protection systems can be re-activated
  - .5 Re-activation to be completed by Departmental Representative's.

## **1.6 HAZARDOUS MATERIALS**

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and the provision of Material Safety Data Sheets (MSDS).
- .2 For work in occupied buildings give the Departmental Representative 48 hours notice for work involving hazardous substances, and before painting, caulking, installing carpet or using adhesives.

## **1.7 TEMPORARY UTILITIES**

- .1 Existing services required for the work, excluding power required for space heating, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
- .2 Notify the Departmental Representative and utility companies of intended interruption of services, obtain requisite permission.
- .3 Give the Departmental Representative 2 weeks notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

**1.8 REMOVED MATERIALS**

- .1 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

**1.9 PROTECTION**

- .1 Protect finished work against damage until take-over.
- .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .3 Protect personal and other users of site from all hazards.

**1.10 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to the normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Sanitary facilities will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean.
- .5 Furniture moving and protection: To execute the work, move any furniture that needs to be moved with great precautions and re-place the furniture after the work has been completed. Also, protect furniture in vicinity of work from dust as described in article 1.23 and protect from any risk of damage.
- .6 Contractor is responsible to arrange and pay for parking for vehicles. No parking is available at the NRC Plant for contractors.

**1.11 SITE STORAGE**

- .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
- .2 Do not unreasonably encumber site with materials or equipment.

**1.12 SLEEVES, HANGERS AND INSERTS**

- .1 Co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.

**1.13 EXAMINATION**

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

**1.14 SIGNS**

- .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices etc., in both official languages or by the use of commonly understood graphic symbols to the Departmental Representative's approval.
- .2 No advertising will be permitted on this project.

**1.15 ACCESS AND EGRESS**

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

**1.16 SCAFFOLDS AND WORK PLATFORMS**

- .1 Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.

**1.17 WASTE MANAGEMENT**

- .1 Comply with the Environmental Protection Act, R.S.O. 1990, c. E.19, and waste management program on construction and demolition projects.
- .2 Conduct waste audit to determine waste generated during demolition or construction operations, prepare written waste reduction work plan and implement procedures to reduce, reuse and recycle materials to the extent possible.
- .3 Provide a source separation program to disassemble and collect in an orderly fashion the following materials designated for alternative disposal from the general waste stream:
  - .1 Cardboard (corrugated);
  - .2 Steel;
  - .3 Wood (not including treated or laminated wood).
- .4 Submit complete records of all removals from site for both materials designated for alternative disposal and general waste including:
  - .1 Time and date of removal;
  - .2 Description of material and quantities;
  - .3 Proof that materials have been received at an Approved Waste Processing Site or certified Waste Disposal Site as required.

**1.18 GUARANTEES AND WARRANTIES**

- .1 Before completion of work collect all manufacturer's guarantees and warranties and deposit with Departmental Representative.

**1.19 CLEAN UP**

- .1 Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.
- .3 Clean areas under contract to return to original condition to that previously existing or higher and to approval of Departmental Representative.
- .4 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

**1.20 BUILDING SMOKING ENVIRONMENT**

- .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.

**1.21 DUST CONTROL**

- .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.
- .3 Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non- construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

**1.22 SCHEDULING**

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.
- .2 Within 10 days after award of contract, submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .3 Carry out work during "regular working hours", Monday to Friday from 07:00 to 18:00 hours.
- .4 Carry out work in occupied areas during "silent hours", Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
  - .1 House of Commons Sitting Calendar: <https://www.ourcommons.ca/en/sitting-calendar>
- .5 Carry out the following noise generating work during "silent hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays:
  - .1 Drilling and coring.
  - .2 Hot work including welding and cutting.

- .6 Give the Departmental Representative a 48 hours notice for any work to be carried out during "regular hours" and/or "silent hours".

### **1.23 COST BREAKDOWN**

- .1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by Departmental Representative and for the total Contract Amount. After approval by Departmental Representative, cost breakdown will be used as the basis of progress payments.

### **1.24 SECURITY ESCORT**

- .1 All personnel employed on this project shall be escorted when executing work in non-public areas during normal working hours. Personnel shall be escorted in all areas after normal working hours.
- .2 Submit an escort request to Departmental Representative at least 14 days before the service is needed. For requests submitted within the time mentioned above, the Departmental Representative will pay for the costs of the security escort. The cost incurred by a late request will be charged to the Contractor.
- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before the scheduled time of the escort. The cost incurred by a late cancellation will be charged to the Contractor.
- .4 The calculation of costs will be based on the average hourly rate of a security officer for a minimum of 8 hours per day for a late service request and 4 hours for late cancellations.

### **1.25 COMMON PRODUCT REQUIREMENTS**

- .1 Quality of Work:
  - .1 Carry out work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
  - .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licenced workers.
  - .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
- .2 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.
  - .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.
- .3 Manufacturer's Instructions: 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.

### **1.26 CONSTRUCTION FACILITIES**

- .1 Existing elevators and stairwells: to be used by construction personnel and transporting of materials.

- .1 Co-ordinate with Departmental Representative.
- .2 Protect from damage, safety hazards and overloading of existing equipment.
- .3 Do not exceed load indicated by elevator signage.
- .2 Site Storage:
  - .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
  - .2 Do not unreasonably encumber site with materials or equipment.
  - .3 Move stored products or equipment that interferes with operations of Departmental Representative or other contractors.
  - .4 Obtain and pay for use of additional storage or work areas needed for operations.
  - .5 Do not load or permit to load any part of work with weight or force that will endanger work.
- .3 Where security is reduced by work, provide temporary means to maintain security.
- .4 Sanitary facilities: will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean.
- .5 Signage:
  - .1 Provide common-use signs related to information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly understood graphic symbols and to approval of the Departmental Representative.
  - .2 No advertising will be permitted on this project.
  - .3 The Departmental Representative will provide a sign describing the project for the information of building users. Locate sign as directed by Departmental Representative.
  - .4 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as directed by Departmental Representative.

## **1.27 QUALITY CONTROL**

- .1 Testing Laboratory Services:
  - .1 Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.
  - .2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
  - .3 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not used.

**Part 3            Execution****3.1                CUT, PATCH AND MAKE GOOD**

- .1        Cut existing surfaces as required to accommodate new work.
- .2        Remove all items so shown or specified.
- .3        Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.

**3.2                FIRESTOP**

- .1        Firestop and smoke seal systems: in accordance with CAN-ULC-S115-11(R2016) – Fire Tests of Firestop Systems. Install around pipe, ductwork, cables, and other objects penetrating fire separations to provide fire resistance not less than the fire resistance rating of surrounding floor, ceiling, and wall assembly.

**3.3                SLEEVES HANGERS AND INSERTS**

- .1        Co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.

**END OF SECTION**



**PART 1 General****1.1 RELATED SECTIONS**

- .1 Section 01 00 10 – General Instructions;
- .2 Section 01 35 29.06 – Health & Safety.

**1.2 REFERENCES**

- .1 Federal Legislation
  - .1 Canada Labour Code, Part II, section 124 and 125. Canada Occupational Health and Safety Regulations
  - .2 Transportation of Dangerous Goods Act, 1992 (TDGA)
  - .3 Canada Consumer Product Safety Act
    - .1 Surface Coating Materials Regulations SOR/2005-109.
  - .4 Canadian Environmental Protection Act, 1999 (CEPA)
    - .1 PCB Regulations (SOR/2008-273)
    - .2 Federal Halocarbon Regulations, 2003 (SOR/2003-289)
- .2 Provincial Legislation
  - .1 Ontario Occupational Health and Safety Act, R.S.O. 1990, 2010 edition.
    - .1 Ontario Regulation 490/09 – Designated Substances (O.Reg. 490/09).
    - .2 Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations, (O.Reg. 278/05).
    - .3 Ontario Regulation 213/91 for Construction Projects (O.Reg. 213/91)
  - .2 Ontario Environmental Protection Act, R.R.O. 1990,
    - .1 Ontario Regulation 347/90, General – Waste Management (O.Reg. 347/90).
    - .2 Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons (O.Reg. 463/10).
  - .3 Canadian General Standards Board (CGSB).
  - .4 Canadian Standards Association (CSA International). CAN/CSA-Z94.4-11 - Respiratory Protection
  - .5 Underwriters' Laboratories of Canada (ULC).

**1.3 DEFINITIONS**

- .1 Asbestos-Containing Materials (ACMs): means material that contains 0.5 per cent or more asbestos by dry weight as per Ontario Regulation 278/05.
- .2 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

- .3 Time-weighted average exposure limit (TWael): the time-weighted average airborne concentration of a biological or chemical agent to which a worker may be exposed in a work day or work week as prescribed by Ontario Regulation 490/09 Designated Substances, as amended.

#### **1.4 DESIGNATED SUBSTANCES**

- .1 Confirm with the Departmental Representative that no additional designated substances have been brought to the project area prior to beginning work.
- .2 Additional designated substances and hazardous materials may exist outside the accessible survey areas but are beyond the scope of this project.
- .3 Should any additional material, suspected to be a designated substance, be encountered within the project area, any disturbance of such material must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. Do not proceed until written instructions have been received.
- .1 ACRYLONITRILE: Not Identified
  - .2 ARSENIC: Not Identified
  - .3 ASBESTOS: Not Identified
  - .4 BENZENE: Not Identified
  - .5 COKE OVEN EMISSIONS: Not Identified
  - .6 ETHYLENE OXIDE: Not Identified
  - .7 ISOCYANATES: Not Identified
  - .8 LEAD: Not identified
  - .9 MERCURY: Not Identified
  - .10 SILICA: Not Identified
  - .11 VINYL CHLORIDE MONOMER: Not Identified
  - .12 POLYCHLORINATED BIPHENYLS (PCBs): Not Identified
  - .13 MOULD: Not Identified
  - .14 HALOCARBONS: Not Identified
  - .15 OTHER HAZARDOUS MATERIALS: Not Identified

#### **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 35 29.06 - Health and Safety;
- .2 Section 01 74 21 - Construction / Demolition waste management and disposal;
- .3 Section 01 78 00 - Closeout Submittals;
- .4 Section 01 91 13 - General Commissioning (Cx) Requirements;
- .5 Section 23 05 00 - Common Work Results For HVAC;
- .6 Section 23 57 00 - Heat Exchangers for HVAC.

**1.2 ADMINISTRATIVE**

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

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario Province of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.
- .4 Allow seven (7) days for the Departmental Representative's review of each submission. Submit shop drawings in their entirety, only once within ten (10) days after contract is awarded.
- .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 the Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as the Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify the Departmental Representative in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date;
  - .2 Project title and number;
  - .3 Contractor's name and address;
  - .4 Identification and quantity of each shop drawing, product data and sample;
  - .5 Other pertinent data.
- .8 Submissions shall include:
  - .1 Date and revision dates;
  - .2 Project title and number;
  - .3 Name and address of:
    - .1 Subcontractor;
    - .2 Supplier;
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication;
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances;

- .3 Setting or erection details;
- .4 Capacities;
- .5 Performance characteristics;
- .6 Standards;
- .7 Operating weight;
- .8 Wiring diagrams;
- .9 Single line and schematic diagrams;
- .10 Relationship to adjacent work.
- .6 The manufacturer will have to update the chiller shop drawings taking into account the new tubes.
- .9 After the Departmental Representative's review, distribute copies.
- .10 Submit 6 prints of shop drawings for each requirement requested in specification Sections and as the Departmental Representative may reasonably request.
- .11 Submit 6 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by the Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by the Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, and must be performed before fabrication and installation of Work may proceed.
- .15 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 the Departmental Representatives 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 all 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 all sub-trades.

**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 00 10 – General Instructions;
- .2 Section 01 33 00 - Submittal Procedures;
- .3 Section 01 74 11 - Cleaning;
- .4 Section 23 05 00 - Common Work Results For HVAC.

**1.2 REFERENCES**

- .1 CAN/CSA Z460-13 and CAN/CSA Z462-15 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .2 Province of Ontario
  - .1 Occupational Health and Safety Act, R.S.O. 1990 Updated 2005

**1.3 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 10 days after contract awarded and prior to commencement of mobilization. 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.
- .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 Federal, Provincial and Territorial 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 two (2) 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.

#### **1.4 FILING OF NOTICE**

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

#### **1.5 SAFETY ASSESSMENT**

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

#### **1.6 MEETINGS**

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

#### **1.7 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.

#### **1.10 UNFORESEEN HAZARDS**

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



**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 works;
  - .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 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 with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

**1.14 POWDER ACTUATED DEVICES**

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

**1.15 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 RELATED SECTIONS**

- .1 Section 23 05 00 - Common Work Results For HVAC.

**1.2 INSPECTION**

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

**1.3 INDEPENDENT INSPECTION AGENCIES**

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

**1.4 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.

**1.5 PROCEDURES**

- .1 Notify appropriate agency Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made. Cost of such services will be borne by Contractor.
- .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.

**1.6 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.

**1.7 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.

**1.8 TESTS AND MIX DESIGNS**

- .1 Provide 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.

**1.9 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment reports and chiller system performance

**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 45 00 - Quality Control;
- .2 Section 01 78 00 - Closeout Submittals;
- .3 Section 23 57 00 - Heat Exchangers for HVAC.

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

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

#### **1.4 TRANSPORTATION**

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

#### **1.5 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

#### **1.6 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

#### **1.7 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.

#### **1.8 CONCEALMENT**

- .1 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

#### **1.9 REMEDIAL WORK**

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

**1.10 LOCATION OF FIXTURES**

- .1 Consider location of equipments indicated as approximate.
- .2 Inform Departmental Representative of conflicting equipment installation and proceed at install as directed.

**1.11 FASTENINGS**

- .1 Unless indicated otherwise, provide metal fastenings and accessories.
- .2 Prevent electrolytic action between dissimilar metals and materials.

**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. Stake and record location of capped service.

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

- .1 Not Used.

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

- .1 Not Used.

**END OF SECTION**



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

- .1 Section 01 35 29.06 - Health and Safety;
- .2 Section 01 74 21 - Construction / Demolition waste management and disposal;
- .3 Section 23 57 00 - Heat Exchangers for HVAC.

**1.2 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .6 Dispose of waste materials and debris off site.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.3 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by Departmental Representative or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

#### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse 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 RELATED SECTION**

- .1 Section 01 33 00 - Submittal Procedures;
- .2 Section 01 74 11- Cleaning;
- .3 Section 23 05 00 - Common Work Results For HVAC;
- .4 Section 23 57 00 - Heat Exchangers for HVAC.

**1.2 WASTE MANAGEMENT GOALS**

- .1 Prior to start of Work conduct meeting with Department Representative to review and discuss PWGSC's Waste Management Plan and Goals.
- .2 PWGSC's Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide Department Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

**1.3 REFERENCES**

- .1 LEED Canadian Green Building Council (CGBC), Green Building Rating System, For New Construction and Major Renovations LEED Canada-NC, Version 1.0 - December 2004.

**1.4 DEFINITIONS**

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

- .7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .8 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects;
  - .2 Returning reusable items including pallets or unused products to vendors.
- .9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .10 Separate Condition: refers to waste sorted into individual types.
- .11 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .12 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
- .13 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .14 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

## **1.5 DOCUMENTS**

- .1 Maintain at job site, one copy of following documents:
  - .1 Waste Audit;
  - .2 Schedules C and D completed for project.

## **1.6 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
  - .1 Submit two 2 copies of completed Demolition Waste Audit (DWA): Schedule C;
  - .2 Submit two (2) copies of Materials Source Separation Program (MSSP) description.
- .3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
  - .1 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled or disposed of.

- .2 For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
- .3 For each material land filled or incinerated from project, include amount of material and identity of landfill, incinerator or transfer station.

### **1.7 DEMOLITION WASTE AUDIT (DWA)**

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA: Schedule C.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

### **1.8 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended.
  - .2 Remove co-mingled materials to off-site processing facility for separation.
  - .3 Provide waybills for separated materials.

### **1.9 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
  - .1 Number and size of bins;
  - .2 Waste type of each bin;

- .3 Total tonnage generated;
- .4 Tonnage reused or recycled;
- .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.
- 1.10 USE OF SITE AND FACILITIES**
  - .1 Execute work with least possible interference or disturbance to normal use of premises.
  - .2 Maintain security measures established by existing facility.
- 1.11 SCHEDULING**
  - .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.
- Part 2 Products**
- 2.1 NOT USED**
  - .1 Not used.
- Part 3 Execution**
- 3.1 APPLICATION**
  - .1 Do Work in compliance with DWA.
  - .2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
- 3.2 CLEANING**
  - .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
  - .2 Clean-up work area as work progresses.
  - .3 Source separate materials to be reused/recycled into specified sort areas.
- 3.3 DIVERSION OF MATERIALS**
  - .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
    - .1 Mark containers or stockpile areas.

- .2 Provide instruction on disposal practices.
- .2 On-site sale of reusable is not permitted.
- .3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Metals	100	90

- .4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	100
Plastic Packaging	100	100
Steel	100	100
Wood (uncontaminated)	100	100

### 3.4 DEMOLITION WASTE AUDIT (DWA)

- .1 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description	(2) Quantity	(3) Unit	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks and Assumptions
Wood						
Cardboard						
Metals						
Slab Regular						
Wood Laminate						
Glazing						

### 3.5 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Schedule E - Government Chief Responsibility for the Environment:

Province	Address	General Inquires	Fax
Ontario	Ministry of Environment and Energy, 135 St. Clair Avenue West Toronto ON M4V 1P5	416-323-4321 800-565-4923	416-323-4682
	Environment Canada Toronto ON	416-734-4494	

**END OF SECTION**

**PART 1      General****1.1      RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures;
- .2      Section 01 45 00 - Quality Control;
- .3      Section 01 61 00 - Common Product Requirements;
- .4      Section 01 91 13 - General Commissioning (Cx) Requirements;
- .5      Section 23 05 00 - Common Work Results For HVAC;
- .6      Section 23 57 00 - Heat Exchangers for HVAC.

**1.2      REFERENCES**

- .1      Canadian Environmental Protection Act (CEPA)
- .2      Federal Halocarbon Regulations 2003 CSA B52-13 Mechanical Refrigeration Act

**1.3      ADMINISTRATIVE REQUIREMENTS**

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

**1.4      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Two (2) weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, two (2) final copies and one (1) electronic copy on an USB key of operating and maintenance manuals in English and French.



- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

## **1.5 FORMAT**

- .1 Organize data as instructional manual assembled in two - 3 ring binders, 1" or greater, and one electronic copy provided on USB key (or appropriate electronic media).
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Binder Cover and Binder Edge and Title Page:
  - .1 Project Name, Building Name, address, project number (GOC#), Project Completion Date.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents as follow:
  - .1 Table of Contents:
    - .1 Project Name, Building Name, address, project number (GOC#), Project Completion Date and table of contents.
  - .2 Tab A - Contact information:
    - .1 Include contact information for Departmental Representative, General Contractor and all Sub-Contractors. Contractor Information: name, address, telephone number of manufacturer, installing contractor, 24-hour number for emergency service for all equipment in this section identified by equipment.
  - .3 Tab B - Signed letter of Warranty:
    - .1 Signed and dated letter of Warranty to include: project name, project number (GOC#), location, warranty start date (to be the date of Substantial Completion as declared by Departmental Representative), and all manufacturer and extended warranties.
  - .4 Tab C- Shop Drawings:
    - .1 A copy of all Shop Drawings reviewed by the Departmental Representative and or Third Party Commissioning Agent.
  - .5 Tab D - All Reports:
    - .1 Copies of all TAB reports, pre-functional tests, start up reports, completed performance verification forms and permits or certifications from Authorities Having Jurisdictions.
  - .6 Tab E – Sequences of Operation:
    - .1 Provide Designers and / or the Manufactures operating instructions and sequence of operations.
  - .7 Tab F - Maintenance and Service Procedures:
    - .1 Specific service and maintenance manuals, preventative and corrective maintenance, with service procedures and schedules.

- .8 Tab G - As Build Drawings:
  - .1 Incorporate any changes on the drawings and re-issue as "As-Built".
- .9 Tab H – CMMS Data Sheets:
  - .1 A copy of all completed CMMS Data Sheets for all equipment which was deleted, removed, added or replaced.
- .10 Tab I – Letter, signed by the Departmental Representative or Commissioning Provider
  - .1 Indicating whether the Project included a system or modification to system susceptible to Legionella and whether the Facility Legionella Binder as per MD-15161 was updated in particular the Facility Checklist LBCMP-1, Contact List LBCMP-2 and Schematic Drawings, and whether the update was completed.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in DWG 2014 minimum version format on USB key.

## **1.6 CONTENTS - PROJECT RECORD DOCUMENTS**

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

## **1.7 AS -BUILT DOCUMENTS 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 Addendum;
  - .4 Change Orders and other modifications to Contract;
  - .5 Reviewed shop drawings, product data, and samples;
  - .6 Field test records;
  - .7 Inspection certificates;
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
- .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
- .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
- .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

## **1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Changes made by change orders;
  - .2 Details not on original Contract Drawings;
  - .3 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, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

**1.9 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 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.
- .4 Additional requirements: as specified in individual specifications sections.

**1.10 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 No spare parts required.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections;
  - .2 Provide items of same manufacture and quality as items in Work;
  - .3 Deliver to location as directed; place and store;
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section;
  - .2 Provide items with tags identifying their associated function and equipment;
  - .3 Deliver to location as directed; place and store;
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

**1.11 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.

- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

## **1.12 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing;
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal;
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (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.
- .7 Except for items put into use with Departmental Representative permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved;
  - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item;
    - .2 Model and serial numbers;
    - .3 Location where installed;
    - .4 Name and phone numbers of manufacturers or suppliers;
    - .5 Names, addresses and telephone numbers of sources of spare parts;

- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates;
- .7 Cross-reference to warranty certificates as applicable;
- .8 Starting point and duration of warranty period;
- .9 Summary of maintenance procedures required to continue warranty in force;
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals;
- .11 Organization, names and phone numbers of persons to call for warranty service;
- .12 Typical response time and repair time expected for various warranted equipment.
- .3 Procedure and status of tagging of equipment covered by extended warranties.
- .4 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in 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 RELATED SECTIONS**

- .1 Section 01 00 10 - General Instruction, installation Check Lists and Product Information;
- .2 Section 01 33 00 - Submittal Procedures;
- .3 Section 01 78 00 - Closeout Submittals;
- .4 Section 01 91 31 - Commissioning (Cx) Plan;
- .5 Section 01 91 33 - Commissioning Forms.

**1.2 ACRONYMS:**

- .1 AFD - Alternate Forms of Delivery, service provider;
- .2 BMM - Building Management Manual;
- .3 Cx – Commissioning;
- .4 EMCS - Energy Monitoring and Control Systems;
- .5 O&M - Operation and Maintenance;
- .6 PI - Product Information;
- .7 PV - Performance Verification;
- .8 TAB - Testing, Adjusting and Balancing.

**1.3 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent;
  - .2 Ensure appropriate documentation is compiled into the BMM;
  - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .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 Departmental Representative requirements or determined by Departmental Representative. To meet Project functional and operational requirements.

**1.4 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 includes 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

**1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

**1.6 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative;
  - .2 Adequacy of provisions for Cx;
  - .3 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 up-to-date;
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete;
  - .3 Fully understand Cx requirements and procedures;
  - .4 Have Cx documentation shelf-ready;
  - .5 Understand completely design criteria and intent and special features;
  - .6 Submit complete start-up documentation to 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.

### **1.7 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.

### **1.8 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than two (2) 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 four (4) weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least four (4) weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

### **1.9 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 00 10 – General Instruction, installation Check Lists and Product Information.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

### **1.10 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.

#### **1.11 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage, 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 60% and subsequent Cx meetings and as required.

#### **1.12 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.
- .2 The Contractor shall coordinate and collaborate with the existing service provider of the chiller service contract for final inspection and start-up.

#### **1.13 WITNESSING OF STARTING AND TESTING**

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

#### **1.14 MANUFACTURER'S INVOLVEMENT**

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

- .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .2 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty;
  - .2 Verify with manufacturer that testing as specified will not void warranties.

### **1.15 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms;
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures;
  - .3 Operational testing: document equipment performance;
  - .4 System PV: include repetition of tests after correcting deficiencies;
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Documents require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative;
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative;
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

### **1.16 START-UP DOCUMENTATION**

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

**1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit 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.

**1.18 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

**1.19 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of installation of tubes affecting start-up and performance verification of chillers #1 and #3 have been completed.

**1.20 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.

**1.21 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:

- .1 Under actual operating conditions, over entire operating range, in all modes.
- .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

## **1.22 WITNESSING COMMISSIONING**

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

## **1.23 AUTHORITIES HAVING JURISDICTION**

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

## **1.24 COMMISSIONING CONSTRAINTS**

- .1 It is necessary to complete Cx, weather, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

## **1.25 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

## **1.26 EXTENT OF VERIFICATION**

- .1 Number and location to be at discretion of Departmental Representative.
- .2 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .3 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .4 Perform additional commissioning until results are acceptable to Departmental Representative.

**1.27 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's approval;
  - .2 Repetition of second verification again fails to receive approval;
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

**1.28 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.

**1.29 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 Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

**1.30 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.

**1.31 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.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

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

**1.33 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications;
  - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.34 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/-10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

**1.35 DEPARTMENTAL REPRESENTATIVE 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 RELATED SECTIONS:**

- .1 Section 01 91 13 – General Commissioning (CX) Requirements
- .2 Section 01 91 33 – Commissioning Forms

**1.2 REFERENCES**

- .1 Public Works and Government Services Canada (PWGSC)
  - .1 PWGSC - Commissioning Guidelines CP.1 - 4th edition.
- .2 Underwriters' Laboratories of Canada (ULC)

**1.3 GENERAL**

- .1 Provide a fully functional chillers #1 and #3:
  - .1 Systems, equipment and components meet Departmental Representative functional requirements before date of acceptance, and operate consistently at peak efficiencies;
  - .2 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 design requirements;
  - .5 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.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation;

.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

.1 Cx Plan to be 100% completed within two (2) weeks after 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 Departmental Representative program modifications;

.2 Approved design and construction changes.

.2 Revise, refine and update every two (2) weeks during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 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 sole point of contact between members of commissioning team.

.2 Departmental Representative will select Cx Team consisting of following members:

.1 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.
- .2 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 Departmental for administrative and coordination purposes.
- .3 Contractor's Cx agent implements specified Cx activities including:
  - .1 Demonstrations;
  - .2 Testing;
  - .3 Preparation, submission of test reports.

## **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 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
  - .4 Ensure that Cx participant:
    - .1 Could complete work within scheduled time frame;
    - .2 Available for emergency and troubleshooting service during first year of for adjustments and modifications outside responsibility of O&M operation.
  - .5 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx three (3) weeks prior to starting date of Cx for review and approval.

## **1.8 EXTENT OF CX**

- .1 Commission of the glycol loop systems:
  - .1 Heat exchanger;
  - .2 Pump;
  - .3 Glycol fill system;
  - .4 Cooling coils of AHU-1 to 4.

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

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

**1.10 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 General:
  - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
  - .1 Cx as used in this section includes:
    - .1 Cx of components, equipment, systems, subsystems, and integrated systems;
    - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
  - .1 Cx Specifications;
  - .2 Startup, pre-Cx activities and documentation for systems, and equipment;
  - .3 Completed installation checklists (ICL);
  - .4 Completed product information (PI) report forms;
  - .5 Completed performance verification (PV) report forms;
  - .6 Results of Performance Verification Tests and Inspections;
  - .7 Description of Cx activities and documentation;
  - .8 Description of Cx of integrated systems and documentation;
  - .9 Tests of following witnessed by Departement Representative:
  - .10 Tests performed by the Contractor;
  - .11 Cx Reports;
  - .12 Prescribed activities during warranty period.
- .4 Departement 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 Departement Representative prior to permission to start up and rectification of deficiencies to Departmental Representative satisfaction;
  - .2 Departement Representative to use approved check lists;
  - .3 Departement Representative will monitor all of these pre-start-up inspections;
  - .4 Include completed documentation with Cx report.

**1.12 START-UP**

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, all new equipment, covered under these specifications.
- .3 Departmental Representative to monitor some of these start-up activities.
  - .1 Rectify start-up deficiencies to satisfaction of Departement Representative.
- .4 Performance Verification (PV):
  - .1 Approved Cx Agent to perform;
    - .1 Repeat when necessary until results are acceptable to Departmental Representative.
  - .2 Use procedures modified generic procedures to suit project requirements;
  - .3 Departement Representative to witness and certify reported results using approved PI and PV forms;
  - .4 Departement Representative to approve completed PV reports and provide to Departmental Representative;
  - .5 Departmental Representative reserves right to verify up to 30% of reported results at random;
  - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

**1.13 CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Perform Cx by specified Cx agency using procedures developed by Departement Representative and approved by Departmental Representative.
- .2 Departement Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Departement Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

**1.14 PERFORMANCE VERIFICATION (PV) REPORT**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

**1.15 CX SCHEDULES**

- .1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation Cx activities of components, equipment, subsystems, systems and integrated systems.
  - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Department Representative.
  - .3 Six (6) months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Department Representative, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

**1.16 CX REPORTS**

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

**1.17 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period.

**1.18 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.

**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 91 13 – General Commissioning (Cx) Requirements;
- .2 Section 01 91 31 - Commissioning (Cx) Plan.

**1.2 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 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 to Department 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.

**1.3 PRODUCT INFORMATION (PI) REPORT FORMS**

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

**1.4 PERFORMANCE VERIFICATION (PV) FORMS**

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative approval.

## **1.5 SAMPLES OF COMMISSIONING FORMS**

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

## **1.6 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 approval prior to use.
  - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

## **1.7 COMMISSIONING FORMS**

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

## **1.8 LANGUAGE**

- .1 To suit the French and English language.



**Part 2            Products**

**2.1            NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1            NOT USED**

.1            Not Used.

**END OF SECTION**