

**Part 1 General****1.1 TIME OF EXECUTION**

- .1 Commence work in accordance with notification of acceptance and complete work within approved schedule from date of such notification.
- .2 Furnish all necessary work, materials, tools and equipment and carry out in a careful and workmanlike manner and to the satisfaction of the Departmental Representative.

**1.2 FIELD QUALITY CONTROL**

- .1 Carry out work using only qualified licensed certified workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
- .2 Permit employees registered in Provincial, Territorial apprentices' program to perform specific tasks only in under direct supervision of qualified licensed workers.
- .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

**1.3 MEASUREMENTS**

- .1 Measurements, sizes, exact counts and dimensions are the responsibility of the Contractor to verify. Verify all drawings, measurements and deletions or omissions before commencing work.
- .2 Verify all conditions and dimensions prior to fabrication and construction.
- .3 Notify the Departmental Representative of any discrepancies or divergences in the drawings before proceeding.

**1.4 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 2015 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

**1.5 FEES CERTIFICATES & BYLAWS**

- .1 Departmental Representative to apply and pay for Permit.

- .2 Contractor to pick-up permits. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

## **1.6 TAXES**

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

## **1.7 FIRE SAFETY REQUIREMENTS**

- .1 Comply with both the National Building Code 2015 (NBC) and the National Fire Code of Canada 2015 (NFC) for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire as follows:
  - .1 The NBC for fire safety and the fire protection features that are required to be incorporated in a building during construction.
  - .2 The NFC:
    - .1 The ongoing maintenance and use of the fires safety and fire protection features incorporated in buildings.
    - .2 Limitations on hazardous contents in and around buildings
    - .3 The establishment of fire safety plans
    - .4 Fire safety at construction and demolition sites
- .2 Fire Protection Services
  - .1 Retain services of manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:
    - .1 Modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
    - .2 Cutting, welding, soldering or other construction activities that might activate fire protection systems.
    - .3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
    - .4 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.
- .3 Watchmen Services - Firewatch

- .1 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems: Provide "Watchman Services" 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 as frequently as determined by regulation.

## **1.8 HAZARDOUS MATERIALS**

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage and disposal of hazardous materials and regarding labeling and the provision of Safety Data Sheets (SDS).
- .2 For work in occupied buildings give the Departmental Representative 1 week notice for work involving designated substances (O.Reg. 490/09); and before painting, caulking.
- .3 In the event that Hazardous Materials are brought on site, the Contractor will provide the Departmental Representative a SDS. These SDS sheets will be put into a 3 ring binder located on site.

## **1.9 TEMPORARY UTILITIES**

- .1 Notify the Departmental Representative and utility companies of intended utilities interruptions of services; obtain requisite permission.
- .2 Existing services required for the work, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expenses and responsibility.
- .3 Connect to existing power supply in accordance with Provincial Electrical Code.
- .4 Give the Departmental Representative 14 days notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. The requests may be refused or rescheduled to off-hours/weekend if it affects occupied spaces outside the project limits. Keep duration of these interruptions to a minimum. Requests to be dealt with independently.

## **1.10 PROTECTION**

- .1 All work is being carried out in occupied areas. Protect existing work surfaces, equipment, floors, walls, partitions from damage during construction.
- .2 Protect finished work against damage until take-over.

- .3 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .4 Protect operatives and other users of the site from all hazards.

**1.11****SITE STORAGE**

- .1 Storage space shall be equipped and maintained by the Contractor.
- .2 Do not unreasonably encumber site with materials or equipment.
- .3 Move stored products or equipment which interfere with building operations.
- .4 Obtain and pay for use of additional storage or work areas needed for operations.
- .5 No onsite storage available other than 9th floor.

**1.12****REMOVED MATERIAL**

- .1 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from the site. Existing furniture & equipment to be removed & disposed of by Contractor.
- .2 Submit complete records of all removals from site including:
  - .1 Time and Date of removal
  - .2 Description of material and quantity
  - .3 Proof that materials have been received at an approved Waste Processing Site or Certified Waste Disposal Site as required.

**1.13****USE OF SITE FACILITIES**

- .1 Execute work with least possible interference or disturbance to the normal use of premises. Make arrangements with the Departmental Representative to facilitate work as states.
- .2 Where elevators, dumbwaiters, conveyors or escalators exist, the Contractor may use these at the Departmental Representative's discretion. Protect them from damage, safety hazards and overloading of existing equipment.
- .3 Freight elevator hours are 0600 to 1800 hours, Monday-Friday. Must be accompanied by a Departmental Representative and use is 30 min. maximum. Outside of these hours, the Departmental Representative must operate/control the elevator. Elevator bookings must be made through the Departmental Representative. The freight elevator door is 97.5 cm wide by 213.5 cm high. The dimensions of the elevator car are 140cm wide by 190.5 cm long by 363 cm high. The lift capacity is 1361 kg.

- .4 Available loading docks are at 50 Victoria (accepts a cube van vehicle) and 165 Hotel de Ville dock (will accommodate a 49-foot truck). A request must be made to the Departmental Representative 48 hours in advance for access to the dock(s). Loading dock operational hours are 0700 hours to 1800 hours.
- .5 Sanitary facilities will be assigned for Contractor personnel. Washroom usage on 9<sup>th</sup> floor to be under contractor responsibility to clean and maintain during construction. Any damage will be at contractor's responsibility.
- .6 Building operational hours are 0600 to 1800 hours, Monday-Friday
- .7 Support work performed in areas outside of the contract limits will require a commissioner escort to be booked through the Departmental Representative. Failure to cancel an un-needed commissioner 24 hours prior to event will result in a 4 hour back charge to the contractor.
- .8 Contractor Health and Safety Plan to be provided in soft format and approved by Departmental Representative as a deliverable prior to mobilization.
- .9 Construction Contractor office to be located within 9th floor.
- .10 The Electrical and HVAC systems supporting Room E906B (See Interior Design drawings) must not be disrupted. Any work affecting these systems must be fully coordinated between Contractor and Departmental Representative.
- .11 Equipment racks and garbage to be removed & disposed of by Contractor throughout.

#### **1.14 CUT, PATCH and MAKE GOOD**

- .1 Cut existing surface as required to accommodate new work.
- .2 Remove all items so shown or specific.
- .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval.
- .4 Install fire stops and smoke seals in accordance with ULC-S115-11 (R2016), 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.

#### **1.15 EXAMINATION**

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.

- .2 Provide the Departmental Representative with photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

#### **1.16 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 for approval.
- .2 No advertising will be permitted on this project.

#### **1.17 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.

#### **1.18 RECORDS, PRINTS & AS-BUILT DRAWINGS**

- .1 As work progresses, maintain accurate records to show deviations from contract drawings.
- .2 Supply to the Departmental Representative one set of black & white as-built drawings with all deviations neatly inked in.
- .3 Contractor to pay for all reproductions.

#### **1.19 GUARANTEES & WARRANTIES**

- .1 Conduct an inspection of work, identify deficiencies and defects, and repair as required to conform to Specifications and Drawings.
- .2 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection of work to identify obvious defects or deficiencies.
- .3 The Departmental Representative and Contractor will perform inspection of work to identify obvious defects and deficiencies. Contractor will correct work accordingly.
- .4 Submit written certificate that the following have been performed:
  - .1 Work has been completed and inspected for compliance with contract documents
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, and are fully operational.
  - .4 Operation of systems have been demonstrated to the Departmental Representative.

- .5 Work is completed and ready for final inspection.
- .5 Request final inspection of work from Departmental Representative when items noted above are completed. If work is deemed incomplete, complete outstanding items and request re-inspection.
- .6 Before completion of work, collect all manufacturers guarantees and warranties and deposit with Departmental Representative as described in Submittals Section.

#### **1.20 CLEAN-UP**

- .1 Clean-up work area per Occupational Health & Safety Act and Construction Regulations 213/91 or as ordered by the Departmental Representative. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack materials 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 a condition to meet Departmental Representative's approval.

#### **1.21 PRIOR TO COMMENCEMENT**

- .1 Contractor shall be responsible and assume the "Principal Contractor" role for 50 Victoria, 9<sup>th</sup> Floor. Contractor shall provide a written acknowledgement of this responsibility within three (3) weeks of contract award. Written acknowledgement shall be submitted to CNESST along with the "Ouverture De Chantier" Notice.
- .2 Work zone locations include: 50 Victoria, 9<sup>th</sup> Floor.
- .3 The contractor shall agree to install proper site separation and identification in order to maintain "Time and Space" at all times throughout the life of the project.
- .4 Submit to Departmental Representative the names and dates of birth of all personnel accessing the site on the project. Personnel must report to the commissionaire's desk prior to accessing site for a pass and return the access pass at the end of each workday.
- .5 Minimum security requirement for contractor personnel is Reliability status.
- .6 Submit all health and safety documents within two weeks after contract award.

#### **1.22 BUILDING SMOKING ENVIRONMENT**

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

**1.23 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. Dust control barriers must meet NFC Code requirements.
- .2 Maintain and relocate protection until such work is complete.
- .3 Protect all furnishing within work area with 10 mil thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

**1.24 SCHEDULING**

- .1 Within two weeks of award of contract, submit bar chart identification schedule for work, indicating anticipated progress stages within time of completion and according to contract duration. When schedule has been reviewed and approved by the Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without notifying the Departmental Representative.
- .2 No delay claim will be entertained. Overall contract duration to be maintained from date of award.
- .3 Carry out work during "normal hours" Monday to Friday, with exceptions to shutdowns, noisy work and smelly work.
- .4 Construction work to be performed in one phase only.

**1.25 PARKING**

- .1 Contractor is responsible for their own/employees parking. There is no contractor on-site parking available.

**1.26 SHOP DRAWINGS & SAMPLE SUBMITTALS**

- .1 Submit for the Departmental Representative's review, copies of each shop drawing, copies of guarantees and warranties from suppliers.
- .2 The Term "shop drawing" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of work.
- .3 The review is for the sole purpose of ascertaining conformance with the general design concept and does not mean approval of design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings requirements of the contract documents.
- .4 Accompany submission with transmittal letter containing:



- .1 Date:
- .2 Project Title & Number:
- .3 Contractor's Name & Address:
- .4 Identification and quantity of each shop drawing, product data and sample
- .5 Other pertinent data
- .5 Do not commence manufacture or order materials before shop drawings and samples are reviewed and approved.

**1.27 SAMPLES**

- .1 Where colour, pattern or texture is criterion, submit full range of samples.
- .2 Reviewed and accepted samples will become standard or workmanship and material against which installed will be verified.

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

- .1 Not Used.

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

- .1 Not Used.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 REFERENCES**

#### *1. Federal Legislation*

1. *Canada Labour Code, Part II, section 124 and 125. Canada Occupational Health and Safety Regulations*
2. *PSPC Asbestos Management Standard*
3. *Transportation of Dangerous Goods Act, 1992 (TDGA)*
4. *Canada Consumer Product Safety Act*
  1. *Surface Coating Materials Regulations SOR/2005-109.*
5. *Canadian Environmental Protection Act, 1999 (CEPA)*
  1. *PCB Regulations (SOR/2008-273)*
  2. *Federal Halocarbon Regulations, 2003 (SOR/2003-289)*

#### *2. Provincial Legislation*

1. *Act Respecting Occupational Health And Safety (as amended)*
    1. *Québec R.S.Q., Chapter S-2.1*
  2. *Province of Québec's Safety Code for the Construction Industry*
    1. *Work Liable to Produce Asbestos Dust Emissions. Québec R.S.Q., Chapter S-2.1, r.4, Section 3.23*
  3. *Regulation Respecting Occupational Health and Safety*
    1. *Québec R.S.Q., Chapter S-2.1, r.13*
  4. *Regulation Respecting the Quality of the Work Environment*
    1. *Québec R.S.Q., Chapter S-2.1, r. 11*
  5. *Regulation Respecting Hazardous Materials (O.C. 1310-97), under the Environmental Quality Act*
    1. *R.S.Q., c. Q-2 - (21)*
  6. *Quebec Transportation of Dangerous Substances Regulation*
  7. *Canadian General Standards Board (CGSB).*
3. *Canadian Standards Association (CSA International). CAN/CSA-Z94.4-11 - Respiratory Protection*
  4. *Underwriters' Laboratories of Canada (ULC).*

### **1.2 DEFINITIONS**

Asbestos-Containing Materials (ACMs): means material that contains 0.1 per cent or more asbestos by dry weight as per Quebec Regulation Respecting Occupational Health and Safety (Québec R.S.Q., Chapter S-2.1, r.13).

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.

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 outlined in the Québec R.S.Q Chapter S-2.1, r. 13.

### 1.3 DESIGNATED SUBSTANCES

Confirm with the Departmental Representative that no additional designated substances have been brought to the project area prior to beginning work.

Additional designated substances and hazardous materials may exist outside the accessible survey area but are beyond the scope of this project.

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: **Identified**

Based on bulk sampling, laboratory analysis, or visual observations, the following building materials contain regulated amounts of asbestos:

- Approximately five-hundred (500) square metres of non-friable floor leveling compound, was confirmed to contain 1% Chrysotile asbestos. The material was observed throughout the north, east and south office blocks often concealed under carpeting. The material was not observed under raised flooring of the north/south-west computer rooms,
- Approximately sixty (60) linear metres of non-friable, rigid, brown joint caulking, observed at the joint between windows and the concrete bulkhead was confirmed to contain 1% Chrysotile asbestos. The material was observed throughout the north, east and south office blocks. The location of the material was concealed by drywall

bulkheads in the south-west and north-west computer and therefore assumed to be present in those areas,

- Less than one (1) square metre of friable, drain pipe joint caulking (oakum), observed on a black, cast iron drain pipe above the dropped ceiling in men's washroom of the elevator lobby was confirmed to contain 75% Amosite asbestos.
- Approximately forty-five (45) square metres of non-friable 30 cm x 30 cm vinyl floor tiles, beige with black streaks, observed in the conveyor room and narrow corridor around the south and north-west computer rooms were confirmed to contain 3% Chrysotile asbestos; and
- Less than one (1) square metre of non-friable cementitious material, intermixed with peach (painted grey) coloured, soft caulking, observed in the conveyor room - north end, floor level pipe penetrations was confirmed to contain 1% Chrysotile asbestos.

The following materials are assumed to contain asbestos:

- One (1) pipe fitting with grey cement compound (GCC) insulation was observed in the pipe chase adjacent the men's washroom in the elevator lobby. The material was inaccessible for sampling and laboratory analysis but is assumed to contain asbestos based on visual appearance.

Bulk sampling and subsequent laboratory analysis has determined that the following building materials do not contain regulated amounts of asbestos:

#### Surfacing Materials

- Drywall joint compound, observed throughout the floor, and
- Drywall joint compound observed at pipe penetrations in the north office block, above ceiling tiles, on the west wall.

#### Mastics, Caulking, Tars and Adhesives:

- Baseboard mastic, observed throughout the floor.
- Brown and grey duct mastic, observed on air handling units (AHUs) throughout the floor.
- Black joint caulking, observed in the north office block, joint on concrete bulkhead.
- Black window caulking, observed on windows throughout the floor.

- Yellow tile adhesive affixing ceramic tiles in women's and men's washrooms.
- Soft brown caulking, observed on wall joints on the south side of the elevator lobby.
- Black tar, observed around the bases supporting the raised floors in the north/south-west computer rooms.
- Remnant black mastic, observed on concrete floors under raised tile floors in the north-west and south-west computer rooms.
- Golden yellow caulking observed at a pipe penetration in the men's washroom, above ceiling tile.
- Off-white caulking, observed in the south-west computer room-conveyor room north end, floor level pipe penetrations, and
- Grey soft caulking observed in the south-west computer rooms electrical room, pipe penetration on west wall

*Ceiling Tiles:*

- 60 cm x 120 cm ceiling tiles, random fissures, observed throughout the north, east and south office blocks,
- 60 cm x 120 cm ceiling tiles, deep random fissures, observed in women's washroom,
- 60 cm x 120 cm ceiling tiles, horizontal fissures, observed in barrier-free washroom, and
- 60 cm x 120 cm ceiling tiles, white with light pinhole, observed in the north-west and south-west computer rooms.

*Cementitious Materials, Mortars and Grouts:*

- Cementitious firestop/parging observed at pipe penetrations on the exterior concrete bulkhead above ceiling tiles throughout the floor,
- Brown concrete block mortar observed above ceiling tile in the north office block, east photocopy room,
- Brown brick mortar, observed throughout the elevator lobby,
- Ceramic tile grout observed beneath tiles on the elevator lobby floor and disabled person's washroom walls,

- Grey concrete block mortar observed in the elevator lobby- wall hatch adjacent the women's washroom and assumed concealed throughout the elevator lobby.
- Grey mortar, affixing decorative vertical bricks in the elevator lobby, and
- Textured parging (glossy coating) observed at a pipe penetration in the men's washroom, above ceiling tile.

Flooring and Associated Mastics:

- 30 cm x 30 cm vinyl Floor Tiles, Off-White and blue patterns and associated mastics, observed in photocopy rooms of the north office block and lunch room of the east office block, and
- 45 cm x 45 cm white and beige raised tile flooring, observed in the north-west and south-west computer rooms.

4. BENZENE: Not identified

5. COKE OVEN EMISSIONS: Not identified

6. ETHYLENE OXIDE: Not Identified

7. ISOCYANATES: Not Identified

8. LEAD: **Assumed**

The following paints contain concentrations of lead less than the Federal Canada Consumer Product Safety Act's limit of 90 ppm:

- White paint, sampled from wall of the south-west computer room; and
- Black paint observed on doors leading to the north-west computer room.

Other painted surface coatings were in good condition at the time of the site survey. As such, sampling without matrix interference (i.e. removing the paint without the substrate material) would have proved exceedingly difficult. Other paint applications are assumed to contain detectable concentrations of lead.

Lead is also assumed to be present in the following materials:

- Solder on the joints of copper piping,
- Ceramic tile glazing,
- Emergency light batteries.

9. MERCURY: **Identified**

Mercury is assumed to be present in the following:

- Fluorescent light fixtures containing fluorescent light tubes were observed throughout the project area. Fluorescent light tubes contain mercury in a vapour form and in the phosphor coating on the lamp tube.

10. SILICA: **Identified**

Free crystalline silica is assumed to be present in the following materials:

- Concrete and cement,
- Cementitious parging materials,
- Interior masonry building materials,
- Ceramic tiles, grouts, mortar,
- Drywall building elements,
- Ceiling tiles,
- Floor leveling compounds and mastics,
- Vinyl flooring products.

11. VINYL CHLORIDE MONOMER: Not Identified

12. POLYCHLORINATED BIPHENYLS (PCBs): Not identified

13. MOULD: Not Identified

14. HALOCARBONS: **Assumed**

Halocarbons are suspected to be present as a coolant in water fountains observed in the elevator lobby

15. OTHER HAZARDOUS MATERIALS: Not Identified

## 1.4 RECOMMENDATIONS

### 1. ASBESTOS

1. All work must be done in accordance with *Canada Occupational Health and Safety Regulations*, PSPS Asbestos Management Standard and the Québec *Safety Code for the Construction Industry*. In the event of conflict between the federal and provincial regulations, the most stringent one applies.
2. As per section 3.23 of the Québec Safety Code for the Construction Industry, the employer shall determine the types of asbestos present in the materials before undertaking work liable to generate asbestos dust. In the case of asbestos removal work or demolition work involving asbestos, it is required to use the methods and procedures, as well as to attest to the existence of a training and information program that complies with section 3.23 of the Québec Safety Code for the Construction Industry. Section 3.23 stipulates that in a work environment where asbestos dust is present or expected to be produced, workers shall wear respirators suitable for such asbestos work in accordance with *CSA Standard Z94.4-93* "Selection, Use, and Care of Respirators".
3. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition or renovation. The Québec Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) must be notified of any project involving the removal of asbestos-containing materials.
4. Appropriate asbestos abatement practices should be followed, including the use of proper respiratory protection and ventilation as per the Canada Occupational Health and Safety Regulations, PSPC Asbestos Management Directive, and in the province of Québec, R.S.Q., Chapter S2.1, r.4, Section 3.23, as amended, if asbestos-containing materials are disturbed. Appropriate work practices, including adequate ventilation and respiratory protection must be utilized during work operations to ensure that allowable asbestos exposure concentrations, as outlined in Québec's Regulation Respecting Occupational Health and Safety (Québec R.S.Q., Chapter S-2.1, r.13) are not exceeded.



5. The disturbance of asbestos-containing materials on construction and demolition projects in the province of Québec is governed by Québec R.S.Q., Chapter S2.1, r.4, Section 3.23. This regulation classifies all asbestos disturbances as either Low Risk, Moderate Risk, or High Risk, each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition or renovation. The Québec Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST) must be notified of any project involving removal of asbestos-containing materials
6. Low Risk asbestos work procedures can be used for the removal or disturbance of non-friable ACMs (e.g. caulking, cementitious material, levelling compound, vinyl floor tiles), provided the materials remain in a non-friable condition and are removed by non-destructive means (without breaking, cutting, drilling, abrading). The destructive removal (breaking, cutting, drilling, abrading) of non-friable ACMs can also be completed using Low Risk procedures, provided only non-powered hand tools are used, and the material is wetted. Should these conditions not be met, then more stringent work procedures (e.g. Moderate or High Risk) are required.
7. If required to accommodate the project, the handling or removal of small quantities of friable material containing asbestos having a volume of debris not exceeding 0.03 m<sup>3</sup> (or an area less than 1m<sup>2</sup>) must be completed using a minimum Moderate-Risk Work Procedures. The handling or removal friable material containing asbestos having a volume of debris exceeding 0.03 m<sup>3</sup> (or an area greater than 1m<sup>2</sup>) must be completed using High-Risk Work Procedures. The removal of good condition pipe fitting insulation can be completed using Moderate-Risk glove-bag work procedures.
8. The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of non-friable asbestos-containing materials if the work is done by means of a power tool that is attached to a dust-collecting device equipped with HEPA filters, must be performed using Moderate Risk asbestos work procedures. The breaking,

cutting, drilling, abrading, grinding, sanding, or vibrating of non-friable asbestos-containing materials, if the work is done by means of a power tool that is not attached to a dust-collecting device equipped with HEPA filters, requires High-Risk asbestos work procedures.

9. The handling and packaging of asbestos waste must comply with the requirements of Québec R.S.Q., Chapter S2.1, r.4, Section 3.23.10 and the Regulation Respecting Occupational Health and Safety (Québec R.S.Q., Chapter S-2.1, r.13). The *Federal Transportation of Dangerous Goods Act and Provincial Transportation of Dangerous Substances Regulation* controls the transport of the waste to a disposal site. Although there is no specific legislation on the disposal of asbestos waste in Québec, it is recommended in terms of best management practices, to inform the waste transporter and waste disposal site of the nature of the asbestos waste before transport.

## 2. LEAD

1. Follow recommendations provided in the CNESST document entitled *Guide de Prévention – L'exposition au plomb* and the Ontario Ministry of Labour's (MoL) Guideline "Lead on Construction Projects", September, 2004. The Ontario guideline classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification.
2. Regulatory limits have been established under the Quebec's *Regulation respecting the quality of the work environment* for occupational exposure to airborne lead that may be present in a workplace. The Time Weighted Average Exposure Values (TWAEV) to airborne lead dust or fumes should not exceed 0.05 milligram per cubic metre (mg/m<sup>3</sup>) limit during the removal of paints and products containing any concentration of lead.
3. The use of mechanically-powered tools or torches on lead-containing materials increases the concentration of airborne lead

dust or fumes requiring more stringent respiratory protection and controlled work procedures.

4. Even at low concentrations, there may be a potential for exposure to high concentrations of lead depending on the activities performed that disturb the lead-containing materials (e.g. by aggressive means such as sandblasting, grinding, etc.). At low lead concentrations, conducting a risk assessment to assess the potential for exposure is required to determine the need to follow precautionary measures.
5. The disposal of construction waste containing lead is controlled by the *Regulation Respecting Hazardous Materials (O.C. 1310-97)*, under the *Environmental Quality Act, R.S.Q., c. Q-2 - (21)*. Any material that produces a leachate containing lead in a concentration higher than 5 mg/L is considered as a hazardous material and should be handled accordingly.
6. Prior to or during renovation work, the following procedures should be performed for lead-containing materials that are anticipated to be disturbed:
  - Copper piping solder can be cut a small distance (e.g. 50 mm) from the joints to avoid direct disturbance of the lead material,
  - Ceramic tiles, can be removed using Type 1 work procedures and respiratory protection provided that only non-powered hand tools are used,
  - Emergency light batteries and other batteries should be removed when decommissioned and disposed of as lead-containing waste.

### 3. MERCURY

1. The exposure of workers to mercury should be reduced to a minimum as defined under Schedule 1 of the Québec *Regulation Respecting Occupational Health and Safety*.
2. Follow recommendations provided in the CNESST published worker respiratory and clothing protective measures based on presumed airborne concentrations of mercury generated during

the work, as well as clean-up procedures for minor and major disturbances of mercury containing products. This information should be followed during the disturbance of materials or products containing mercury. In the event of conflict, the more stringent procedures should be applied.

3. The Québec *Regulation respecting Hazardous Materials* (O.C. 1310-97), under the *Environmental Quality Act*, R.S.Q., c. Q-2 - (21) stipulates that fluorescent light tubes, in quantities where it is anticipated that a leachable extract could have a concentration higher than 0.1 mg/L or ppm, is considered hazardous waste and should be treated as such.
4. Fluorescent lamp tubes are considered hazardous material in the Province of Québec and shall be recycled if removed from service. For information regarding the collection of fluorescent lamp tubes, please consult the Departmental Representative.

#### 4. SILICA

1. The Québec *Regulation Respecting Occupational Health and Safety* defines crystalline silica in the form of respirable dust as a suspected carcinogen.
2. Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is presumed present select materials within the project areas, appropriate respiratory protection and ventilation must be donned during the demolition and modifications of these structures, as per the "*Guide des appareils de protection respiratoire utilisés au Québec*", published by the *Institut de recherche Robert-Sauvé en santé et en sécurité du travail*. Personal protective equipment shall be selected, adjusted, used and cared for in accordance with the *CSA Standard Z94.4-93* entitled "*Selection, Use and Care of Respirators*".
3. The exposure of workers to silica should be reduced to a minimum as defined under Schedule 1 of the Québec *Regulation Respecting Occupational Health and Safety*. Follow recommendations provided in the MoL Guideline entitled

“Guideline: Silica on Construction Projects”. This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. Also follow recommendations in : *Prévention de l'exposition des travailleurs à la silice* by CNESST. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

## 5. HALOCARBONS

1. The handling, transport and disposal of halocarbons is governed by the following:
  - Federal Halocarbon Regulations (FHR), 2003,
  - Ozone-depleting Substances and Halocarbon Alternatives Regulations, 2016,
  - Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, 2015, and
  - Provincial Transport of Dangerous Substances Regulation and Federal Transport of Dangerous Goods Act.
2. When suspected halocarbon-containing equipment is taken out of service, the halocarbons must be captured and reclaimed by a certified service technician using methods and containers that are designed to contain the halocarbon. The service technician must provide written acknowledgement of the requirements of the FHR. Appropriate records of service technician certification and records of equipment decommissioning must be provided and maintained in accordance with requirements of the FHR.

**END OF SECTION**

**Part 1        General****1.1        ADMINISTRATIVE**

- .1        Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Project Time and no claim for extension by reason of such default will be allowed.
- .2        Do not proceed with Work affected by submittal until review is complete.
- .3        Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4        Where items or information is not produced in SI Metric units converted values are acceptable.
- .5        Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Specifications and Drawings. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6        Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Specifications and Drawings stating reasons for deviations.
- .7        Verify field measurements and affected adjacent work are coordinated.
- .8        Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9        Contractor's responsibility for deviations in submission from requirements of Specifications and Drawings is not relieved by Departmental Representative review.
- .10       Contractor is to complete the CMMS form for all equipment removals and for new installed equipment as part of this project. Refer to Appendices.
- .11       Contractor is to complete and provide Departmental Representative a completed work permit no later than Tuesday by 1800 of the week before the planned work. Permits are from Mondays to Sundays. Refer to Appendices.
- .12       Keep one reviewed copy of each submission on site.

- .13 Life Safety Shutdowns- Any bypass required to life safety systems will require a 72 hour notice to Departmental Representative. All life safety systems tests and work requiring system bypass must take place after normal working hours.
- .14 Notice for Disruption- Any disruption to tenant building occupant must be notified two weeks in advance to Departmental Representative.
- .15 Shutdown- Any Mechanical and Electrical shutdowns are to be done after normal business hours or on weekends. They will require a 72 hour notice to Departmental Representative.
- .16 Operational Hours- 0600 to 1800 Monday to Friday.
- .17 Operations & Maintenance Manual to be submitted in both French and English, one hardcopy each. One softcopy with both French and English versions to be submitted on a USB stick to the Departmental Representative.
- .18 Loading Dock Access- This building has two loading docks. One at 50 Victoria Street and the other located at 165 Hotel de Ville.
- .19 Loading Dock Size- 50 Victoria Street has a limited capacity of a Cube van size only. 165 Hotel de Ville has a limited capacity of truck size at 49 feet maximum.
- .20 Freight elevator hours 0600 to 1800, inside operating hours the freight can be used for 30 minutes maximum at a time and is manned by the Commissionaire. Outside of these hours, a request must be made to the Departmental Representative 72 hours in advance and the freight elevator will have to be operated by the Commissionaire.
- .21 Freight elevator size to be confirmed by Departmental Representative upon request.
- .22 Contractor Parking- No parking will be made available (day or night) for contractor as part of this project. However, the Contractor can make arrangements at their cost for street parking or nearby exterior parking locations.
- .23 Base Building Service Providers- The Contractor is expected to engage the services of the base building for the tie-ins to the base building equipment. Suppliers are:
  - .1 Regulvar: BAS, VAV boxes, control and calibrate devices
  - .2 Ainsworth: AC Unit and leak tests.
  - .3 Tyco Integrated Fire & Security: Fire Alarm, sprinklers dry & wet, fire extinguishers, backflow preventer, fire pump, fire hose and cabinet, emergency lights, suppression and pre-action.

- .24 Security Requirements- The minimum security requirement for Contractor personnel is Reliability Level. The Contractor must provide names and DOB for all personnel accessing the site under their contract(s) for validation. Personnel must report to the Commissionaires desk prior to accessing site for a pass and return the access pass at the end of each work day.
- .25 Work outside of the project area on the 9<sup>th</sup> floor- Support work performed in area outside of the contract limits will require a Commissionaire escort to be booked through the Departmental Representative in advance. Failure to cancel an un-needed Commissionaire 24 hour prior to event will result in a 4 hour back-charge to the Contractor.
- .26 Contractor Health and Safety Plan to be provided as per requirements outlined in Section 01 35 29.06 Health and Safety Requirements.

## **1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by Departmental Representative registered or licensed in the Province of Quebec.
- .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 5 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Value of Work. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Specifications and Drawings. When resubmitting, notify Departmental Representative in writing of 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 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 Specifications and Drawings.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each of the requirements requested in specification Sections and as requested by Departmental Representative.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Cross reference product data information to applicable portions on Specifications and Drawings.

- .13 Submit 1 electronic copy of reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit 2 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that the Departmental Representative approves the detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 SAMPLES**

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

### **1.4 MOCK-UPS**

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

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 Execution**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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

- .1 Province of Quebec
  - .1 Occupational Health and Safety Act and Regulations - Updated 2019.

**1.2 DEFINITIONS**

- .1 Competent Person:
  - .1 Person with the knowledge, training and expertise in organizing the work and its performance.
  - .2 Person familiar with the acts and the regulations that apply to the work.
  - .3 Person with the knowledge of any potential or actual danger to Health and Safety in the workplace.
  - .4 "Working alone" means the performance of any function by an employee who:
    - .1 Is the only employee in the workplace at any given time.
    - .2 Is not within the range of sight, or within the hearing distance of another employee for more than five minutes.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 –Submittal Procedures.
- .2 Submit to the Departmental Representative within 10 days after date of notice to proceed and prior to commencement of work:
  - .1 Registration of constructors and employers engaged in construction --Form to be completed and signed.
  - .2 Proof of record of training to work at heights per Occupational Health and Safety Act and Construction Regulation 213/91.
  - .3 Employees WHMIS / WHMIS Certificates as applicable.
- .3 Submit site-specific Health and Safety Plan: Within 10 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
  - .3 Company Health and Safety Policy.

- .4 Be provided in softcopy format as a deliverable prior to mobilization.
- .5 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.
- .4 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .5 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .6 Submit copies of incident and accident reports to Departmental Representative.
- .7 Submit WHMIS 2015 SDS - Safety Data Sheets.
- .8 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .9 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.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .11 Personnel training requirements including as follows:
  - .1 Submit names of personnel and alternates responsible for site health and safety hazards on site, and use of personal protective equipment (PPE).
- .12 Submit to the Departmental Representative for review, one complete Hazard Assessment Site Specific Health and Safety Plan (HASSSP) in an indexed format, and in a three ring binder and electronic copy. Once the Departmental Representative has reviewed and accepts the HASSSP binder the Departmental Representative will return to contractor for site use"
- .13 The Contractor shall advise the Departmental Representative of any accident, injury, near-miss incident, fire, explosion or chemical spill, occurring at the Work site and any visit to the site by a governmental enforcement official.
- .14 The Principal Contractor shall provide a written report within 24 hours of any accident, injury, near-miss incident, fire, explosion or chemical spill.

**1.4 SUBMITTALS PRIOR TO CONSTRUCTION**

- .1 Submit copies of all workers:
  - .1 Proof of liability insurance. Insurance must be site specific with Departmental Representative indicated.
  - .2 Registration of constructors and employers engaged in construction form completed and signed.
  - .3 Proof of record of training to work at heights as set out in O.Reg.297/13:Occupational Health and Safety Awareness Training and under Construction Regulation 213/91 Construction Projects.
  - .4 Employees WHMIS / WHMIS 2015 Certificates.

**1.5 FILING OF NOTICE**

- .1 File Notice of Project (Ouverture De Chantier) with Provincial Authorities (CSST) prior to beginning of Work.
- .2 Contractor shall file a written "Principal Contractor" acknowledgement letter within three (3) weeks of contract award. This letter will acknowledge that the contractor will be responsible and assume the "Principal Contractor" role for this project and not the entire complex. Written acknowledgement shall be submitted to CSST along with the "Ouverture De Chantier" Notice.
- .3 Contractor shall be the "Principal Contractor" as described in the Quebec Act and Code for only their scope and areas of work as defined and described within this project specification. Refer to Section 01 00 10 General Instructions.
- .4 File Notice of Project with Provincial authorities prior to beginning of Work; leave a copy on site, if applicable.
- .5 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

**1.6 SAFETY ASSESSMENT**

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

**1.7 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- .2 All project meetings to open with a standard "Health and Safety" update.
- .3 Project construction meeting to be held biweekly from contract award to completion.

**1.8 REGULATORY REQUIREMENTS**

- .1 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.

**1.9 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. Do not allow any person to work alone in isolated/remote areas or work of high risk.
- .2 Contractor will be responsible and assume the role Constructor as described in the Quebec Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Specifications and Drawings, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .4 Do not allow any person to work alone in isolated/remote areas or work of high risk.
- .5 The Contractor shall ensure their site supervisor is present and available at all-time throughout the life of the project and is an employee of the Contractor.

**1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Quebec CNESST.
- .2 Comply with the Health and Safety requirements of CSA Z462 Workplace Electrical Safety.
- .3 Comply with the Health and Safety requirements of CSA Z460 Control of Hazardous Energy.

**1.11 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .2 Do not proceed until written instructions have been received from Departmental Representative.

**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 from Departmental Representative.

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

- .1 Not used.

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

- .1 Not used.

**END OF SECTION**



**Part 1        General****1.1        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 Specifications and Drawings. If, upon examination such work is found not in accordance with Specifications and Drawings, correct such Work and pay cost of examination and correction.

**1.2        PROCEDURES**

- .1    Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2    Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3    Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.3        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 Specifications and Drawings. Replace or re-execute in accordance with Specifications and Drawings.
- .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 Specifications and Drawings, Departmental Representative will deduct from Value of Work difference in value between Work performed and that called for by Specifications and Drawings, amount of which will be determined by Departmental Representative.

#### **1.4 REPORTS**

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

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

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

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

### **Part 3 Execution**

#### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**PART 1 General****1.1 PRECEDENCE**

- .1 For Federal Government Projects, Division 01 Sections take precedence over technical specifications in other Divisions of this Project Manual.

**1.2 RELATED REQUIREMENTS**

- .1 Overview of sustainable requirements (including indoor air quality management and product/material selection) requirements and procedures.

**1.3 RELATED SECTIONS**

- .1 Divisions 1 through 49 – Sustainable requirements specific to the Work of each of those Sections. These requirements may or may not include reference to sustainable requirements.

**1.4 REFERENCE STANDARDS**

- .1 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE 52.2-[12], Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).
  - .2 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-92.1-[1989], Sound Absorptive Prefabricated Acoustical Units.
  - .3 Carpet and Rug Institute (CRI)
    - .1 Green Label Program.
    - .2 Green Label Plus Program.
  - .4 CSA Group
    - .1 AAMA/WDMA/CSA 101/I.S.2/A440-[11], NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
    - .2 CAN/CSA-B45.0 Series-[02 (R2008)], Plumbing Fixtures.
    - .3 CAN/CSA-Z809-[08], Sustainable Forest Management.
  - .5 Environmental Choice Program
    - .1 CCD-016-[97 (R2005)], Thermal Insulation Materials.
    - .2 CCD-020-[95 (R2007)], Gypsum Wallboard.
    - .3 CCD-029-[96], Water Conserving Products.

- .4 CCD-045-[95], Sealant and Caulking Compounds.
- .5 CCD-046-[95], Adhesives.
- .6 CCD-047-[98 (R2005)], Architectural Surface Coatings.
- .7 CCD-048-[95 (R2006)], Surface Coatings - Recycled Water-Borne.
- .8 CCD-127-[95], Recycled Plastic Products.
- .9 CCD-144-[2003], Naturally-Derived Phenol Substitutes.
- .10 CCD-150-[2004], Steel for Use in Construction Products.
- .11 CCD-152-[2001 (R2005)], Flooring Products.
- .12 CCD-167-[2007], Mosaic Tiles.
- .6 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.
- .7 Green Seal Environmental Standards (GS)
  - .1 GS-03-[97], Environmental Criteria for Anti-Corrosive Paints.
  - .2 GS-11-[11], Standard for Paints and Coatings.
  - .3 GC-03-[97], Anti-Corrosive Paints.
  - .4 GS-36-[00], Aerosol Adhesives.
- .8 National Air Duct Cleaners Association (NADCA)
  - .1 NADCA ACR-[2006], Assessment Cleaning and Restoration.
  - .2 NADCA Standard 05-[1997], Requirements for the Installation of Service Openings in HVAC Systems.
- .9 National Research Council Canada (NRC)
  - .1 National Energy Code of Canada for Buildings [2015] (NECB).
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-[A2016], Architectural Coatings.
  - .2 SCAQMD Rule 1168-[A2017], Adhesives and Sealants Applications.
- .11 Scientific Certification Systems (SCS)
  - .1 FloorScore Program [2017].
- .12 Sheet Metal and Air Conditioning National Contractors Association (SMACNA)
  - .1 IAQ Guideline for Occupied Buildings Under Construction, 2007.
- .13 Sustainable Forestry Initiative (SFI)
  - .1 SFI-[2010-2014] Standard.

- .14 EPA
  - .1 EPA Protocol for Environmental Requirements, Testing for Indoor Air Quality Baseline IAQ.
- .15 Canadian Construction Association (CCA) Mould Guidelines for the Canadian Construction industry (CCA 82-2004), January 2004.

## **1.5 SUSTAINABILITY COORDINATION MEETING**

- .1 Prior to start of construction, the Contractor (in conjunction with the Departmental Representative) shall hold a coordination meeting with the construction team to explain the sustainable and indoor air quality management requirements to the Sub-Contractors. This meeting shall include a review of:
  - .1 Sustainable objectives including indoor air quality and waste management
  - .2 Sustainable requirements and procedures
  - .3 Indoor air quality and waste management documentation and submittals
- .2 The Contractor shall ensure that the appropriate Sub-Contractors attend the Sustainability Coordination Meeting. If Sub-Contractors are unable to attend this meeting, the Contractor shall make arrangements to host additional Sustainability Coordination Meetings to suit if needed.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submittals required:
  - .1 Submit name and experience of Consultant for approval.
  - .2 Compliance Report indicating requirement to purchase energy efficient and environmentally benign products.
  - .3 Use Report indicating understanding of requirement to use materials and methods of construction, which improve energy and water efficiency, reduce hazardous by-products, and use recycled materials, or materials, which can be reused.
- .3 Collect supporting documentation (SDS's, product data sheets, letter from manufacturers, etc.) to document:
  - .1 VOC emission rates for all adhesives, sealants, lubricants, paints and coatings that are applied onsite and fall within the building weather barrier.
  - .2 VOC emission rates for carpets comply with the Carpet and Rug Institute's Green Label Indoor Air Quality Test program

- .3 All composite wood and agrifibre products used in the building
- .4 Construction Schedule:
  - .1 Submit schedule of construction prior to start of work, in coordination with scheduling requirements, including:
    - .1 Sequence of finish applications and allowances for curing times.
    - .2 Identification of finish types. See Table A
    - .3 Schedule and duration of proposed temporary ventilation.
    - .4 Delivery schedules of manufactured materials which are anticipated to off-gas in timely manner, which will allow for airing of those materials prior to their scheduled installation.
    - .5 Indicate and schedule commissioning procedures and temporary usages of building mechanical systems, identifying types of filtration and schedule for filter replacement.
- .5 IAQ Management Plan:
  - .1 Submit Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy phases of building as per 1.8 – Indoor Air Quality Management.
    - .1 The plan must document the control measures to be taken onsite during the construction period.
    - .2 All 5 types of control measures described in the SMACNA Guidelines must be included in the plan.
- .6 IAQ Management Inspection Log & Photo Documentation
  - .1 Complete an IAQ inspection log on a weekly basis. The log shall commence when the building is enclosed and carry through to building turnover.
  - .2 The inspection log shall be completed for each weekly inspection and must document:
    - .1 Indoor air quality management measures implemented onsite
    - .2 Deficiencies related to those measures and,
    - .3 Corrective actions taken to remedy the deficiencies
    - .4 Each deficiency must be initialed and each log signed after all corrective measures have been completed and documented.

- .5 Submit an up-to-date copy of the IAQ Management Inspection Log to the Departmental Representative monthly.
- .3 Include photographs demonstrating implementation of all the indoor air quality control measures described in the SMACNA standard "IAQ Guideline for Occupied Buildings under Construction, Chapter 3."
  - .1 Photographs must be accompanied by the date taken and a description of the indoor air quality management measure depicted.
- .4 Submit a compilation of the completed inspection logs and accompanying photos to the Departmental Representative after construction and prior to Contractor demobilization.

**1.7****HAZARDOUS MATERIALS**

- .1 Follow methods and procedures in accordance with environmental laws and authorities having jurisdiction.
- .2 Take measures to ensure chemical spills do not enter drains.
- .3 Provide proper storage and containment of herbicides and indoor pesticides.
  - .1 Design and construction of storage spaces for hazardous materials in accordance with authorities having jurisdiction.
  - .2 Include ventilation of areas, which contain potential sources of air contamination.
    - .1 Comply with standards for storage of flammable, combustible and hazardous materials, explosives, compressed gas cylinders, and reactive, corrosive and oxidizing materials.
- .4 Storage conditions, ventilation requirements, construction materials storage areas, containers, drums and tanks, compatibility issues, and labelling: in accordance with federal and municipal guidelines supplemented as follows:
  - .1 Confine storage of chemicals and hazardous wastes to designated areas with security of access.
  - .2 Ensure access to hose bib and water for mixing concentrated chemicals.
  - .3 Include containment to prevent spills from entering drains.
  - .4 Include venting to exterior.
  - .5 Keep storage areas under negative pressure, where possible.

**1.8 GENERAL BUILDING DESIGN**

- .1 Green design facilitation is used on this project to support green design integration.
- .2 Indicate in writing to Departmental Representative:
  - .1 Compliance Report: indicating requirement to purchase energy efficient and reduced environmental impact products.
  - .2 Use Report: indicate understanding of requirement to use materials and methods of construction, which improve energy and water efficiency, reduce hazardous by-products, and use recycled materials, or materials which can be reused.

**1.9 INDOOR AIR QUALITY**

- .1 The site superintendent (or other person designated by the Contractor) shall be responsible for all aspects of coordination (during construction) related to indoor air quality management.
- .2 The main objective of having proper indoor air quality management during construction is to protect construction workers and future building occupants from indoor air quality problems resulting from construction activities and building materials.
  - .1 Reduce the production and circulation of pollutants during construction.
  - .2 Protect equipment and absorptive materials stored and installed on-site from moisture, dust and dirt accumulation during construction.
  - .3 Meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2007, Chapter 3.
  - .4 Prepare the building for occupancy following construction and prior to occupancy.
- .3 Indoor air quality (IAQ) management activities shall include:
  - .1 Preparing an IAQ Management Plan highlighting management practices implemented during construction, including protection of stored on-site and installed absorptive materials from moisture damage.
  - .2 Identifying, implementing and documenting measures to achieve the indoor air quality management objectives
  - .3 Supervising on-site indoor air quality management activities daily



- .4 Coordinating indoor air quality management tasks with subcontractors to ensure timely and orderly progress of the work
- .5 Conducting indoor air quality management inspections and making necessary repairs
- .6 Maintaining an indoor air quality inspection log to document observations, deficiencies and corrective actions
- .7 Preparing indoor air quality management documentation and submittals as detailed herein
- .8 Selecting products/materials that meet the requirements specified herein
- .9 Providing product and material documentation and submittals to the Departmental Representative as detailed herein
- .10 Reporting indoor air quality management progress to the Departmental Representative
- .11 Coordinate a partial space flush-out after construction ends but before occupancy as detailed herein.
- .12 Conduct IAQ testing prior to occupancy and after partial flush-out as detailed herein.
- .4 Environmental Tobacco Smoke (ETS) Control
  - .1 Smoking will not be permitted at site during construction.
- .5 Carbon Dioxide (CO<sub>2</sub>) Monitoring
  - .1 Provide carbon dioxide detectors to assess and monitor air quality and ventilation rates.

**1.10****GENERAL CONSTRUCTION MATERIALS/PRACTICES**

- .1 Materials and Resources
  - .1 Incorporate reused building materials as indicated.
  - .2 Use products and services that meet criteria of EcoLogo guidelines.
  - .3 Provide list of non-endorsed products and services, provided the green labelled product or services are capable of meeting specified performance requirements.
  - .4 Recycled Content
    - .1 Select products/materials such that  $\geq 30\%$  (by cost) of all products/materials used for the project contain recycled content.
    - .2 Suggested products/materials to target and include in calculations include, but not limited to:

Material: Subcontractors are encouraged to include other

Target Recycled Content Values\*

products and materials with recycled content in addition to the products listed below.	(by mass)	
	Min. Post-Consumer	Min. Pre-Consumer
Composite Wood (MDF, Particle Board)	0%	90%
Fiberglass Insulation	60%	0%
Mineral Wool / Rigid Insulation	0%	40%
Gypsum	5%	80%
Carpet	5%	30%
Acoustic Ceiling Tiles & Grid	15%	10%

\*Target recycled content values are suggestions of recycled content values commonly available on the market today.

.5 Local/Regional Materials

- .1 Use systems and materials having 30 %, by cost, of total products or materials manufactured within 800 kilometres if transported by truck or 2400 kilometres if transported by rail or water of project site.
- .2 Suggested products/materials to target and include in calculations include, but not limited to:
  - Light Steel Framing (Steel Studs)
  - Light Steel Framing
  - Fiberglass Insulation
  - Mineral Wool Insulation
  - Gypsum
  - Carpet
  - Wood
  - Furniture

.6 Wood

- .1 Use lumber sourced from independently certified well-managed forests in accordance with CAN/CSA-Z809 or FSC or SFI for at least 50% (by cost) of all wood-based products/material used for the project.
- .2 Materials made from composite wood materials or agricultural products: must not contain urea-formaldehyde resins.

.7 Insulation

- .1 Utilize insulation materials meeting following requirements:
  - .1 Board-type thermal insulation materials must contain, when calculated on 12-month rolling basis:

- .1 Over 35% recycled material by weight of finished product if made from glass fibre.
    - .2 Over 45% recycled material by weight of finished product if made from mineral composition.
  - .2 Loose-fill and spray-on thermal insulation materials must contain, when calculated on 12-month rolling basis:
    - .1 Over 75% recycled material by weight of finished product, if made from cellulose fibre.
    - .2 Over 35% recycled material by weight of finished product if made from glass fibre.
    - .3 Over 50% recycled material by weight of finished product, if made from mineral wool.
  - .3 Use insulation materials manufactured or installed that do not include CFC's.
- .2 Construction Waste Management
  - .1 Follow recommendations and requirements of this projects construction, renovation and demolition (CRD) waste management plan in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

### 1.11 HVAC EQUIPMENT

- .1 Identify sources of external contamination in writing to Departmental Representative.
- .2 Air filter MERV (minimum efficiency reporting value) ratings shall be determined by ASHRAE 52.2-1999.
- .3 HVAC systems operated during construction must use minimum MERV-8 rating
- .4 After all construction and final cleaning work is complete, install new MERV-13 filters in all HVAC systems prior to building flush-out, IAQ testing or occupancy.

### 1.12 LIGHTING

- .1 Integrate lighting controls as specified related to room occupancy, circulation space, day-lighting, and number of work stations (in office

areas) using stepped or dimming day-light controls as per Electrical Drawings and Specifications.

**.2 Lighting Fixtures**

**.1** Include high efficiency lamps and luminaries with electronic ballasts. Lamps and luminaries to have following requirements:

- .1** Fit electronic ballasts to luminaries
- .2** Include task lighting as indicated.
- .3** Include personal controls as indicated.

**1.13 PLUMBING FIXTURES**

**.1 Water Efficiency**

**.1** Include showerheads, kitchen and bathroom faucets with low flow models aerators.

**.2 Water Use Reduction**

- .1** Use low-flow lavatory faucet with 1.9 Litres/minute flow rate if applicable.
- .2** Use low flow urinals to CAN/CSA-B45.0 with 1.9 Litres/minute or less flush rate if applicable.
- .3** Include low flow toilets to CAN/CSA-B45.0, maximum 4.8 Litres/flush for single flush models, or 4.2 Litres/flush and 6 Litres/flush for dual-flush toilet models if applicable.
- .4** Include water saving showerheads: flow rates 5.7 l/min @ 5.5 kg/cm<sup>2</sup> l/min if applicable.

**PART 2 Products**

**2.1 CEILINGS**

**.1 Utilize ceiling tiles (panels) that:**

- .1** Comply with CAN/CGSB-92.1.
- .2** Have noise reduction coefficient (NRC) of at least [0.50] when tested on E400 mounting in accordance with CAN/CGSB-92.1.
- .3** Contain, when calculated on 12-month rolling average:
  - .1** Over 75 % recycled material by weight of finished product, if made from cellulose fibre.
  - .2** Over 35 % recycled material by weight of finished product if made from glass fibre or mineral composition.

**2.2 PAINTS, STAINS, AND VARNISHES**

- .1 All paints and coatings that are applied onsite and fall within the building weather barrier must have a VOC content less than the limits of Green Seal Standards GS-11 and GC-03 and the State of California's South Coast Air Quality Management District (SCAQMD) Rule 1113.

- .15 The VOC content limits of Green Seal Standard GS-11 are as follows:

Paints	
Category	VOC Limit (grams/litre)
Interior Coatings, Non-Flat	150
Interior Coatings, Flat	50

- .16 The VOC content limits of Green Seal Standard GC-03 are as follows:

Anti-Corrosive Paints	
Category	VOC Limit (grams/litre)
Anti-Corrosive Paint, Gloss	250
Anti-Corrosive Paint, Semi-Gloss	250
Anti-Corrosive Paint, Flat	250

- .17 The VOC content limits of SCAQMD Rule 1113 are as follows:

Coatings	
Category	VOC Limit (grams/litre)
Bond Breaker/Concrete Curing Compound	350
Clear Wood Finish, Varnish	350
Clear Wood Finish, Sanding Sealer	350
Clear Wood Finish, Lacquer	550
Clear Brushing Lacquer	275
Concrete-Curing Compound	100
Dry-Fog	150
Fire-Proofing Exterior Coating	350
Fire-Retardant Coating, Clear	650
Fire-Retardant Coating, Pigmented	350
Flat Coating	50
Floor Coating	100
Graphic Arts (sign) Coating	500
Industrial Maintenance Coating	100
High Temperature Industrial Maintenance Coating	420

Coatings	
Category	VOC Limit (grams/litre)
Zinc-Rich Industrial Maintenance Coating	100
Japans/Faux Finishing Coating	350
Magnetite Cement Coating	450
Mastic Coating	300
Metallic Pigmented Coating	500
Multi-Colour Coating	250
Non-Flat Coating	50
Pigmented Lacquer	550
Pre-Treatment Wash Primers	420
Sealer and Undercoating	200
Quick-Dry Enamel	50
Quick-Dry Primer, Sealer and Undercoating	100
Recycled Coating	250
Roof Coating	50
Roof Coating, Aluminum	100
Roof Primer, Bituminous	350
Rust Preventative Coating	100
Shellac, Clear	730
Shellac, Pigmented	550
Specialty Primer	100
Stains	250
Waterproofing Sealer	250
Waterproofing Concrete/Masonry Sealer	400
Wood Preservative	350
Low-Solids Coating	120

- .2 Submit supporting documentation for all paints and coatings that are applied onsite and fall within the building weather barrier.

## 2.3

### SEALANTS, ADHESIVES AND COMPOUNDS

- .1 All adhesives and sealants that are applied onsite and fall within the building weather barrier must have a VOC content less than the limits of the State of California's South Coast Air Quality Management District (SCAQMD) Rule 1168 A2017.
- .1 The VOC content limits of SCAQMD Rule 1168 are as follows:

Architectural Adhesives	
Category	VOC Limit (grams/litre)

Indoor Carpet Adhesive	50
Carpet Pad Adhesive	50
Wood Flooring Adhesive	100
Rubber Floor Adhesive	60
Subfloor Adhesive	50
Ceramic Tile Adhesive	65
Grout and mortar	250
VCT and Asphalt Tile Adhesive	50
Drywall and Panel Adhesive	50
Cove Base Adhesive	50
Multipurpose Construction Adhesive	70
Structural Glazing Adhesive	100

## Specialty Adhesives

Category	VOC Limit (grams/litre)
PVC Welding	510
CPVC Welding	490
ABS Welding	325
Plastic Cement Welding Adhesive	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Top and Trim Adhesive	250

## Substrate Specific Adhesives

Category	VOC Limit (grams/litre)
Metal to Metal Adhesive	30
Plastic Foam Adhesive	50
Porous Material (except wood) Adhesive	50
Wood Adhesive	30
Fiberglass Adhesive	80

## Sealants

Category	VOC Limit (grams/litre)
Architectural Sealant	250
Non-membrane Roof Sealant	300
Roadway Sealant	250
Single-Ply Roof Membrane Sealant	450
Other Sealant	420

**Sealant Primers**

Category	VOC Limit (grams/litre)
Architectural, Non-Porous Sealant Primer	250
Architectural, Porous Sealant Primer	775
Other Sealant Primer	750

**Aerosol Adhesives**

Category	VOC Limit by weight (grams/litre minus water)
General Purpose Mist Spray Adhesive	65%
General Purpose Web Spray Adhesive	55%
Special Purpose Aerosol Adhesives (all types)	70%

- .1 Provide supporting documentation for all adhesives and sealants that are applied onsite and fall within the building weather barrier.

**2.4****FLOORING**

- .1 All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.

- .15 The maximum allowable carpet emissions of the CRI Green Label Plus program are as follows:

Emissions	Maximum Emission Factor (measured in mg/m <sup>2</sup> *h)
Total Volatile Organic Compounds (TVOC's)	0.5
4-PC (4-Phenylcyclohexene)	0.05
Formaldehyde (to prove that none is used)	0.05
Styrene	0.4

- .3 All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.

- .1 The maximum allowable carpet cushion emissions of the CRI Green Label Plus program are as follows:

Emissions	Maximum Emission Factor (measured in mg/m <sup>2</sup> *h)
Total Volatile Organic Compounds (TVOC's)	1.00
BHT (butylated hydroxytoluene)	0.30
Formaldehyde	0.05
4-PC (4-Phenylcyclohexene)	0.05



- .4 All carpet adhesive shall have a volatile organic compound (VOC) limit of 50 g/L.
- .5 All hard surface flooring covered by the FloorScore standard must be certified as compliant with the standard (current as of the date of this rating system, or more stringent version) by an independent third-party. Flooring products covered by FloorScore include vinyl, linoleum, laminate flooring, engineered wood flooring, ceramic flooring, rubber flooring and wall base.
- .6 Concrete, wood, bamboo, and cork floor finishes such as sealers, stains, and finishes, must meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
- .7 Tile setting adhesives and grout must meet South Coast Air Quality Management District (SCAQMD) Rule 1168.
  - .1 VOC limits are listed below and correspond to the most currently amended date.  
  
Ceramic tile adhesive: 65 g/L  
Grout and mortar: 250 g/L
- .8 Submit supporting documentation for all flooring systems used in the building.

## **2.5 COMPOSITE WOOD AND AGRIFIBRE**

- .1 All composite wood and/or agrifibre products (including core materials) used in the building must not contain added urea-formaldehyde.
- .2 Adhesives used to fabricate laminated assemblies used in the building that contain composite wood and/or agrifibre products must not contain added urea-formaldehyde resins.
- .3 These requirements apply to all products/materials used in the building regardless of whether they are manufactured on or off site.
- .4 Submit supporting documentation for all composite wood and agrifibre products used in the building.

## **PART 3 Execution**

### **3.1 Pollutant Source Identification**

- .1 Identify potential sources of indoor air pollutants on the construction site.

- .2 Any construction activity or material that produces odour and/or dust is considered a source of air pollutants. Pollutant sources include, but are not limited to:
  - .1 Materials that produce detectable odour:
 

Paints	Coatings	Grouts
Stains	Adhesives	Epoxy flooring
Sealants	Caulking	Solvents
Pesticides	Fuels	Cleaning products
  - .2 Materials that create dust:
 

Concrete products	Drywall	Wood products
Acoustic ceiling tile	Insulation	Ceramic tile
  - .3 Equipment that emit products of combustion or create odour and/or dust:
 

Generators	Compressors	Cutting tools/saws
Torches/welders	Vehicles	Portable heaters
  - .4 Construction activities that disrupt pollutants:
 

Demolition	Repair	renovation
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  - .5 Other
 

Exterior site work	Standing water	Tobacco smoke
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### 3.2

#### MINIMIZE POLLUTANTS

- .1 Minimize pollutants generated inside the building from the sources identified under article 3.1 using the following measures:
  - .1 Prohibiting smoking inside the building at all times during construction
  - .2 Fuelling up equipment outside the building
  - .3 Storing gasoline or solvents outside the building
  - .4 Restricting outdoor vehicular/equipment traffic and operation where emissions can enter the building
  - .5 Reducing on-site emissions by using equipment that burns propane/natural gas or is powered by electricity
  - .6 Exhausting pollutant sources directly outside using temporary or permanent ventilation equipment. Where exhaust is not feasible, locally re-circulate air through a portable air cleaner.
  - .7 Collecting and bagging sawdust from woodworking tools
  - .8 Covering and/or sealing all indoor sources of odour and dust
  - .9 Using painting techniques that minimize odour (e.g. roller instead of spraying)
  - .10 Using cleaning practices that minimize dust (e.g. vacuum instead of sweeping)

- .11 Using cleaning products that minimize pollution, fumes, VOC's, etc.
- .12 Prohibiting the burning of garbage
- .2 All sub-contractors must abide by the measures listed above.

### 3.3 Pollutant Containment Measures

- .1 Prevent the movement of pollutants from the sources identified under article 3.1 to other areas in the building using the following measures:
  - .1 When possible, perform pollutant generating activities outside the building.
  - .2 Move equipment, work and other pollutant sources to locations where they will have the minimum impact on indoor air quality.
  - .3 Setup small, contained, designated work areas to contain pollutants:
    - .1 Avoid open areas and areas with high drafts
    - .2 Erect dust curtains and barriers
    - .3 Depressurize areas using temporary or permanent ventilation equipment
    - .4 Use portable fans to exhaust pollutants (e.g. gas engine exhaust) to the exterior through windows, doors, etc. Ensure that adjacent windows, doors, etc. will not allow pollutants to re-enter the building.
    - .5 Close windows and doors adjacent to pollutant sources (e.g. dust, vehicle emissions, etc.) outside of the building. If windows and doors have not been installed, temporarily seal exterior openings with plastic, wood, etc.
    - .6 Pressurize occupied or completed areas of the building using temporary or permanent ventilation equipment.
- .2 All sub-contractors must abide by the measures listed above.

### 3.4 Housekeeping Measures

- .1 Prevent the accumulation of moisture, dust and dirt in the building from the sources identified under article 3.1 using the following measures:
  - .1 Frequently cleaning interior surfaces to minimize dust and dirt accumulation by:
    - .1 Dusting with damp rags
    - .2 Wet mopping

- .3 Sweeping using wetting agents and sweeping compounds
- .4 Vacuuming with equipment that contains HEPA filtration and/or a wet scrubber
- Note:** Localized cleaning should occur immediately after a construction activity is completed and/or at the end of each day. A full project clean-up must be performed at least once a week.
- .2 Close exterior windows and doors or create temporary enclosures using plastic or wood to prevent moisture accumulation indoors.
- .3 Immediately remove any water accumulated indoors to protect interior surfaces and materials.
- .4 Cover, seal and protect materials stored and installed on-site from moisture, dust and dirt accumulation.
- .5 Elevate materials stored on-site off the ground to protect from moisture and dirt accumulation.
- .6 Do not install materials with evidence of moisture damage or excessive moisture accumulation.
- .7 If necessary, use ventilation/dehumidification to control humidity levels within the building.
- .8 Promptly clean all spills (fuels, lubricants, paints, adhesives, etc.).
- .9 Clean or remove excess application of solvent-containing products.
- .2 All sub-contractors must abide by the measures listed above.

### 3.5

#### HVAC Protection Measures

- .1 Protect all HVAC equipment from collecting not only dust and air pollutants but also odors by using the following measures:
  - .1 Do not use mechanical rooms to store or collect construction waste materials.
  - .2 Avoid using building HVAC systems during the construction period. Instead use portable or temporary ventilation or air conditioning when ever possible.
  - .3 During/Before Installation
    - .1 Cover (with plastic) and elevate (off ground) all ductwork, fittings, insulation, acoustic lining and equipment stored on site during construction.
    - .2 Seal all supply, return and exhaust openings as well as all temporary ductwork openings not under immediate work (e.g. open ends in ductwork runs) with plastic. Openings must be sealed immediately

- after installation in areas that will no longer be under work.
- .3 Close/cover all hatches and access doors in HVAC equipment that will not be under work.
- .4 Seal all HVAC equipment openings (e.g. inlets/outlets of air handlers, fans, VAV boxes, etc.) with plastic until ductwork is connected.
- .5 Do not use mechanical rooms to store or collect construction waste materials.
- .6 Install ceiling tiles and seal all openings into the plenum with plastic prior to final cleaning.
- .4 After Installation (select Option 1 or Option 2 for each HVAC system)
  - .1 Option 1: HVAC Equipment Not Used During Construction (Recommended)
    - .1 Do not operate any permanent HVAC equipment or systems during construction.
    - .2 Seal all openings in HVAC systems, ductwork and plenums as described in paragraph 3.5.3 above.
    - .3 If HVAC system protection measures are not implemented, or if the system is operated during construction, the Mechanical Contractor must provide duct cleaning services, plus all necessary access doors, at no extra cost to the contract.
    - .4 After all construction and final cleaning work is complete the Mechanical Contractor shall:
      - .1 Remove all HVAC protection measures
      - .2 Install new filters in all air handling equipment as per paragraph 2.5
      - .3 Prepare systems for Testing, Adjusting and Balancing Contractor and Commissioning Agent.
  - .2 Option 2: HVAC Equipment Used During Construction
    - .1 Install new filters in all air handling equipment as per paragraph 2.5 before any HVAC system is operated. Provide a duct-mounted filter (external to equipment) if necessary.

- .2 Install new filters with a MERV = 8 (or higher) as per 2.5 at all return/exhaust grilles/inlets before any HVAC system is operated.
    - .3 Temporarily shut down the return/exhaust side of HVAC systems during heavy construction/demolition.
  - .3 Permanently close off the return/exhaust side of HVAC systems in areas with high dust levels. Cover duct openings with plastic in these areas.
    - .1 If an HVAC system is operated without the above protection measures in place, the Mechanical Contractor must provide duct cleaning services, plus all necessary access doors, at no extra cost to the contract.
  - .4 After all construction and final cleaning work is complete the Contractor shall:
    - .1 Remove all temporary filters installed on return all grilles.
    - .2 Install new filters (MERV 13) in all air handling equipment as per paragraph 2.5
    - .3 Prepare systems for Testing, Adjusting and Balancing Contractor and Commissioning Agent.
- .2 All sub-contractors, especially the mechanical contractor, must abide by the measures listed above.

### 3.6

#### Scheduling

- .1 Schedule construction activities to minimize the amount of VOC's, odours and fumes absorbed by porous materials (e.g. ceiling tiles, carpet, etc.).
- .2 Complete applications of wet and odorous materials such as paints, sealants, and coatings before installing absorbent "sink" materials such as ceiling tiles, carpets, and fabric-covered furnishings.
- .3 Allow for Testing, Adjusting and Balancing to be carried out following construction and before occupancy (refer to HVAC Protection Measures).
- .4 Allow for corrective work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning to be carried out following construction and before occupancy.
- .5 Allow for Building Flush-Out procedures or IAQ Testing to be carried out following construction and before occupancy.

- .6 Allow for corrective work related to general IAQ Testing to be carried out following construction and before occupancy.

### 3.7 FLUSH-OUT

- .1 Conduct a partial building (space) flush-out after construction ends (and furniture has been installed) before IAQ testing prior to occupancy.

### 3.8 IAQ Testing Prior to Occupancy

- .1 After all construction, final cleaning, and Testing, Adjusting, Balancing, and the flush-out prior to occupancy work is complete, and prior to building occupancy, have a qualified IAQ Testing Departmental Representative conduct an indoor air quality test.
- .2 Indoor air quality testing will be carried out by a qualified IAQ Testing Consultant under the supervision of either a Certified Industrial Hygienist (CIH) or a Professional Engineer (PE) and at the expense of the Contractor.
  - .1 Indoor air quality testing will be carried out using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- .3 The Contractor shall allow five (5) days after all construction and final cleaning work is complete and prior to building occupancy for the Departmental Representative to conduct indoor air quality testing.
- .4 The Contractor shall perform all corrective work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning prior to indoor air quality testing.
- .5 Testing shall be completed over the course of one normal operating day (additional days may be required due to sampling equipment limitations)
- .6 All HVAC systems shall be fully operational during the testing period.
- .7 Sampling locations shall be not be less than 6 (5 indoors and 1 exterior) and shall be representative of the various room types found in the building.
- .8 Indoor air quality parameters to be tested include the following as a minimum:
  - .1 Carbon dioxide
  - .2 Air temperature and relative humidity

- .3 Carbon monoxide
- .4 Respirable suspended particulate (PM10)
- .5 Formaldehyde
- .6 Total volatile organic compounds (TVOC's)
- .9 All sampling will be conducted in accordance with established sampling and analytical methodologies. Sampling is to be conducted for a minimum of four (4) hours following the completion of all construction and prior to occupancy of the building.
- .10 The maximum concentrations for the above listed indoor air quality parameters as listed below shall be met:

Contaminant	Maximum Concentration
Formaldehyde	27 parts per billion
Particulates (PM10)	50 Micrograms per m3
Total Volatile Organic Compounds (TVOC)	500 micrograms per m3
Carbon Monoxide (CO)	9 parts per million and no greater than 2 parts per million above outside levels
4-Phenylcyclohexene (4-PCH)*	micrograms per m3

\* This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing material are installed as part of the base building systems.

- .11 The Contractor shall perform all corrective or remedial work identified by the Departmental Representative, at no extra cost to the contract, and conduct partial building flush-out as directed by the Departmental Representative, as needed.
- .12 Testing and corrective or remedial work shall be performed until the appropriate maximum concentration levels as listed in 3.8.10 above are achieved.
- .13 The general-contractor will assume all the costs associated with the indoor air quality testing.

### 3.9 Inspections and Maintenance

- .1 The Contractor shall inspect all indoor air quality management measures and remedy any deficiencies on a weekly basis.
  - .1 Inspections shall be recorded in the IAQ Management Inspection Log (see article 1.8.3) and shall denote the measures implemented at the time of inspection, any deficiencies as well as corrective actions taken.



- .2 Provide photos as specified by article 1.8.4 at various occasions during construction to prove continuous compliance.
- .2 All Pollutant Containment, Housekeeping and HVAC protection measures will be reviewed by the Departmental Representative during each site visit.
  - .1 All deficiencies identified by the Departmental Representative must be remedied and documented in the IAQ Management Inspection Log within 48 hours of notification.
  - .2 The Contractor shall clean or replace any equipment or materials that is incorrectly stored or improperly protected at no extra cost to the contract.

### **3.10 Removal of Protection Measures**

- .1 All products/materials installed as a part of indoor air quality management measures shall be removed prior to building turnover. Any remedial work required as a result of removing the measures is the responsibility of the sub-contractor who initially installed them.

**END OF SECTION**

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

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative.
- .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, unless approved by Departmental Representative.
- .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 Dispose of waste materials and debris off site after hours.
- .6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.2 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .7 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .10 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

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

- .1 Not Used.

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

- .1 Not Used.

**END OF SECTION**

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**Part 1      General****1.1      RELATED REQUIREMENTS**

- .1      Overview of construction & demolition waste management and disposal requirements and procedures.

**1.2      RELATED SECTIONS**

- .1      01 47 15 – Sustainable Requirements: Construction
- .2      Divisions 1 through 49 – Waste management requirements specific to the Work of each of those Sections. These requirements may or may not include reference to waste management

**1.3      DEFINITIONS**

- .1      Solid Waste: Any waste materials (including land-clearing debris) that is sent from the project site to another location for disposal.
- .2      Land-Clearing Debris: Waste materials resulting from land-clearing that include pre-existing development materials and plant matter, but do not include soil.
- .3      Reused Waste: Waste materials that are sent to a location off-site (e.g. another construction project or product supplier) where they are used in their original form (i.e. without additional processing).
- .4      Recycled Waste: Waste materials that are sent off-site to a recycling facility where they are used to displace virgin materials as feedstock for manufacturing processes that create new products. Recycling does not include burning, incinerating, or thermally destroying waste.
- .5      Landfill Waste: Waste materials that are sent to a landfill site for disposal.
- .6      Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos, PCBs, CFCs, HCFCs, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or well-being or environment if handled improperly.
- .7      Salvage: Careful removal of materials for the purpose of reuse.

**1.4      REFERENCES**

- .1      Canadian Construction Association. Standard Construction Document CCA 27-1997: A Guide on Construction Environmental Management Planning.
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- .2 Canadian Construction Association. Standard Construction Document CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
- .3 Canada. Public Works and Government Services Canada. 2002 National Construction Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.

## 1.5 OBJECTIVES

- .1 Minimize the amount of solid waste (including land-clearing debris) generated by construction, renovation and demolition (CRD) activities.
- .2 Of the inevitable solid waste that is generated by CRD activities, divert 80% or more from landfill (through reuse and recycling) to achieve the project's waste diversion goal. Provide documentation certifying that waste management and recycling goals have been met.
- .3 Comply with all applicable provincial environmental regulations relating to construction waste management.
- .4 Comply with Canadian Construction Association's "Code of Practice" outlined in Standard Construction Document CCA 27-1997 to encourage improved waste management practices.

## 1.6 DESCRIPTION OF WORK

- .1 The site superintendent (or other person designated by the Contractor) shall be responsible for all aspects Waste Management and Disposal.
- .2 Identify, implement and document measures to achieve the waste management objectives listed above.
- .3 Follow a strategy based on the 3R's hierarchy: Reduce the generation of waste materials at the project site, Reuse waste materials on other construction sites (when feasible) and Recycle waste materials as feedstock for manufacturing processes that create new products.
- .4 Waste Management and Disposal activities shall include:
  - Arranging waste management service agreements with waste haulers and waste receiving facilities
  - Supervising on-site waste management activities on a daily basis
  - Coordinating waste management tasks with subcontractors to ensure timely and orderly progress of the work
  - Preparing waste management documentation and submittals to summarize all shipments of waste materials from the project site

**1.7 SUSTAINABILITY COORDINATION MEETING**

- .1 Prior to start of demolition or construction, the Contractor (in conjunction with the Departmental Representative) shall hold a coordination meeting with the construction team to explain the Waste Management and Disposal requirements to the Sub-Contractors. This meeting shall include a review of:
  - .1 Waste Management and Disposal objectives
  - .2 Waste Management and Disposal requirements and procedures
  - .3 Waste Management and Disposal documentation and submittals

**1.8 SUBMITTALS**

- .1 Construction Waste Management Plan (CWMP)
  - .1 The Contractor shall prepare and submit a CWMP containing the following information prior to the start of demolition:
    - .1 Projected waste to be generated during demolition and construction
    - .2 Projected Sorting (sorted onsite or sorted offsite by waste contractor), Disposal and Handling strategies
    - .3 List of proposed receiving facilities for all the recyclable waste with supporting letters on the end use of the materials
    - .4 Communication strategy to ensure CWMP is followed by workers onsite
- .2 Schedule W1 – Subcontractor Job-Site Waste Production Form (SJWP)
  - .1 In order to provide the Contractor notice of the expected job-site waste, subcontractors shall submit a completed SJWP form to the Contractor for review prior to commencement of their work on site.
    - .1 Itemize waste estimates by material type and provide projections for the total amount of waste generated for each item (in metric tonnes).
  - .2 Obtain approval of the SJWP from the Contractor prior to the start of construction.
  - .3 Update the SJWP as required to reflect the most recent information available
- .3 Schedule W2 - Waste Tracking Worksheet

- .1 The Contractor shall obtain waybills, invoices, letters and other documentation that clearly indicates the receiving facility, end use (reused, recycled or landfill) and quantity of waste for each shipment of waste generated on the project site from demolition and construction activities.
- .2 Record each shipment using the Waste Tracking Worksheet (or equivalent).
- .3 The Contractor shall submit an updated Waste Tracking Worksheet with supporting documentation on a biweekly basis during the demolition stage and then on a monthly basis during the construction phase.
- .4 Final Waste Diversion Report
  - .1 Submit a final report to the Departmental Representative (after substantial completion and prior to demobilization) that contains the final versions of the following:
    - .1 Waste Tracking Worksheet
    - .2 Waybills, invoices, letters and other documentation supporting each shipment listed in the Waste Tracking Worksheet clearly indicating quantities, end uses and receiving facilities.

**PART 2** Products

- .1 Not used.

**PART 3** Execution**3.1 PROCEDURES**

- .1 Waste Reduction
  - .1 Encourage suppliers and subcontractors to retrieve/retain packaging (e.g. skids, plastic wrap, etc.) for reuse.
    - .1 Suppliers and sub-contractors must provide a letter stating the item(s) will be reuse and documenting the item(s) and quantity removed from the site.
    - .2 Prevent damage of materials due to mishandling, improper storage, and contamination.
    - .3 Where possible, use prefabricated assemblies built at a central facility to avoid waste generation at the site.
- .2 Waste Diversion

- .1 Contact local salvaging/recycling facilities and arrange for recycling/reuse services. At a minimum, the proposed facilities must recycle/reuse the following waste materials that will be generated throughout construction:

- .1 Land clearing debris
- .2 Asphalt
- .3 Concrete / masonry / stone
- .4 Steel and other metals
- .5 Wood (see note below)
- .6 Gypsum
- .7 Cardboard
- .8 Plastic
- .9 "Blue Box" and "Black Box" waste

**Note:** Incineration of wood waste for power generation is not considered as recycling or reuse. Recommended measures for recycling/reusing wood include encouraging suppliers to reuse wood pallets, sending wood pallets to pallet recycling companies and converting waste wood into landscaping mulch.

- .2 Designate a central Waste Collection Area onsite that is dedicated to the separation and storage of all waste generated during the demolition or construction in a location which facilitates removal from site and examination by potential end markets , and which does not impede disassembly, processing, or hauling.
- .3 Provide containers in the Waste Collection Area that are sized to accommodate the separation and storage of expected waste types and quantities. Provide separate containers for each of the following material types:
  - .1 Concrete / masonry / stone
  - .2 Steel and other metals
  - .3 Wood
  - .4 Gypsum
  - .5 Cardboard
  - .6 Plastic
  - .7 "Blue Box" and "Black Box" waste
  - .8 Mixed waste
  - .9 Other types (as required by salvaging/ recycling facilities)
- .4 Clearly indicate the material type being stored in each container using appropriate signage.
- .5 All subcontractors shall use the containers provided in Waste Collection Area.



- .6 In the event that a sub-contractor is unable to use these containers, or wishes to use a waste material on future projects (e.g. rubble for road base), the subcontractor must provide waybills, invoices, letters and other documentation that clearly indicates the receiving facility, end use (reused, recycled or landfill) and quantity of waste in each shipment.
- .7 Follow the salvaging/recycling facilities' material acceptance requirements to ensure materials are properly sorted, grouped, and packaged for collection.
- .8 Provide "Blue/Black Box" recycling bins near the construction trailer for recycling waste generated by site workers and visitors. Waste deposited in these bins shall include the following, or adhere to the local recycling program:
  - .1 Aluminum food or beverage cans
  - .2 Glass bottles and jars for food or beverage
  - .3 PET bottles for food or beverages
  - .4 Steel food or beverage cans
  - .5 Cardboard and paper products
- .3 Waste Tracking
  - .1 Coordinate delivery of separated materials to approved salvage or recycling facilities.
  - .2 Track and keep a summary log of all construction and demolition waste generated by type, the quantities of each type that were diverted and landfilled, and the total percentage of waste diverted from landfill disposal.
  - .3 Track waste management firms or receivers and collect supporting letters, waybills, invoices, and other documentation on the end use of materials for inclusion in Final Waste Diversion Report.

### 3.2 INSPECTION AND MAINTENANCE

- .1 Conduct daily inspections of containers to check for and remedy cross-contamination.
- .2 Promptly transport containers to receiving facilities when containers are full.
- .3 Ensure the material type is clearly labeled on each container.
- .4 Take pictures on a weekly basis to document ongoing waste management and recycling efforts.

**SCHEDULE W1 - SUBCONTRACTOR JOB-SITE WASTE PROTECTION FORM**

(Submit completed form per each subcontractor working on the job-site)

<hr/>	
Trade Division no.	
<hr/>	
<hr/>	
Name of Company	Contact
<hr/>	
<hr/>	
Signature	Date

Analysis of Expected Job-Site Hazardous Waste	
<u>Hazardous Waste</u>	<u>Amount (tonnes)</u>
Estimated total amount (in tones) of material produced through our activities on site:	

Analysis of Expected Job-Site Waste/Debris	
<u>Waste/Debris</u>	<u>Amount (tonnes)</u>
Estimated total amount (in tones) of material produced through our activities on site:	

**Comments / Notes:**

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**SCHEDULE W2- WASTE TRACKING WORKSHEET**

(Submit most recent copy to the Departmental Representative on a biweekly basis during demolition and on a monthly basis during the construction phase.)

<b>Project Name:</b>		<b>Completed By:</b>	
<b>Project Location:</b>		<b>Company:</b>	

Material Type Legend		
Land Clearing Debris	Asphalt	Concrete /Masonry / Stone
Steel and Other Materials	Wood	Gypsum
Cardboard	Plastic	"Blue Box" Waste
Mixed Waste	Other (specify)	

#	Shipment Date	Material Type	Amount of Materials (metric tons)		Receiving Facility name	Waybill number	Waybill attached (Y/N)
			Reused or Recycled	Landfill			
Ex	2008.02.03	Gypsum	4.0	0.0	Acme Recycling Inc.	03-1234	Y

I hereby certify that the information provided is complete and correct:

\_\_\_\_\_  
Signature of Authorized Official

\_\_\_\_\_  
Position

\_\_\_\_\_  
Date

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 07 21 16 Blanket Insulation.
- .2 Section 07 84 00 Fire Stopping.
- .3 Section 07 92 00 Joint Sealants.
- .4 Section 09 21 99 Partitions for Minor Works.
- .5 Section 09 65 16 Resilient sheet flooring.
- .6 Section 09 91 23 Interior Painting

**1.2 ADMINISTRATIVE REQUIREMENTS**

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

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, one final hard copy and final electronic copy of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools provided are new, undamaged or defective and are of same quality and manufacture as products provided in Work.

- .4 Provide evidence, if requested, for type, source and quality of products supplied.
- .5 Defective products will be rejected, regardless of previous inspections. Replace products as own expense.
- .6 Pay costs of transportation.

#### **1.4 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by process flow, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD or USB.

#### **1.5 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.

## **1.6 AS -BUILT DOCUMENTS AND SAMPLES**

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

## **1.7 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 Field changes of dimension and detail.
  - .2 Changes made by change orders.
  - .3 Details not on original Contract Drawings.
  - .4 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, required by individual specifications sections.
- .7 Provide digital photos on CD or other media, if requested, for site records.

## **1.8 MATERIALS AND FINISHES**

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

## **1.9 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.

**1.10 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 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 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .4 Procedure and status of tagging of equipment covered by warranties.
- .5 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.
- .10 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

#### **1.11 WARRANTY TAGS**

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
  - .1 Type of product/material.
  - .2 Model number.
  - .3 Serial number.

- .4 Contract number.
- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
  - .1 Section 019113.13 – “Commissioning Plan”
  - .2 Section 019141 – “Commissioning: Training”
  - .3 Section 019113.16 – “Commissioning Forms”
- .3 Acronyms:
  - .1 AFD - Alternate Forms of Delivery, service provider.
  - .2 SM - Systems 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.
  - .9 CC – Construction Checklists.
  - .10 A/E – Architect / Design Engineers. (Departmental Representative)
  - .11 CxA – Commissioning Agent.
  - .12 BO – Building Owner (Departmental Representative)

**1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on equipment and integrated systems and 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. While not being formally submitted for LEED accreditation, this project shall follow the commissioning requirements of LEED V4 CI “Fundamental Commissioning & Verification” and “Enhanced Commissioning”. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent (ie. Owner's Project Requirements (OPR) & Basis of Design (BOD)).
  - .2 Ensure appropriate documentation is compiled into the Commissioning Manual & Systems Manual.
  - .3 Effectively train Departmental Representative.
- .2 Contractor assists in Cx process, providing equipment data, ensuring equipment & systems are installed as per the contract documents/installation instructions,

demonstrates equipment/system operation as directed by the Cx Agent or Departmental Representative to provide satisfactory results across all operating conditions the systems are expected to run while 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 Representatives criteria. To meet Project functional and operational requirements.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Cx to be a line item of Contractor's & Sub-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 The Cx process shall be applied to M&E building systems modified or provided as new within the scope of the project. For each system, each component shall be tested individually and then the complete system shall be commissioned. The detailed list of equipment and systems to be commissioned is to be developed by the Commissioning Agent (CxA).
- .5 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.
  - .4 Cx scope has been completed to the satisfaction of the CxA and recommended for acceptance.

### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by the CxA to ensure effective performance.

- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

## **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review Contract Documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Ensure Cx Plan is current and reviewed by all parties.
  - .2 Ensure installation of related components, equipment, sub-systems, systems are complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation (ie. construction checklists completed) shelf-ready.
  - .5 Understand completely design criteria and intent and special features.
  - .6 Submit complete start-up documentation to CxA.
  - .7 Have Cx schedules up-to-date.
  - .8 Ensure systems have been cleaned thoroughly.
  - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative & CxA for review and approval.
  - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative & CxA in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

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

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx personnel assigned to represent the Cx process.
    - .2 Draft Cx documentation requested by the specifications.
    - .3 Preliminary Cx schedule.
- .2 Request in writing to Departmental Representative for changes to submittals and

- obtain written approval at least 8 weeks prior to start of Cx.
- .3 Submit proposed Cx procedures to Departmental Representative & CxA where not specified and obtain written approval at least 8 weeks prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by Departmental Representative & CxA.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 13.16 - Commissioning (Cx) Forms: Construction Checklists (CC) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 CxA to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to CxA.

## **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

## **1.10 COMMISSIONING MEETINGS**

- .1 Attendance at Cx meetings is mandatory for the Contractor and all M&E sub-contractors. Cx Meetings shall be scheduled regularly and following project meetings or may be held during the construction meetings. Appropriate personnel (leaders of the Contractor's and Sub-Contractor's) shall be allocated for attendance during the construction meetings or for separately held Cx meetings to address Cx issues. If separate Cx meetings are to be held, the CxA will chair the meetings, take minutes, and distribute minutes.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Cx meetings will continue on a regular basis until commissioning deliverables have been addressed.

## **1.11 STARTING AND TESTING**

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

**1.12 WITNESSING OF STARTING AND TESTING**

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

**1.13 MANUFACTURER'S INVOLVEMENT**

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

**1.14 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 CxA after distinct phases have been completed and before commencing next phase.
- .4 Document 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 the Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by 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.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to CxA for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

#### **1.16 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 & CxA for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.



**1.17 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.

**1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative & CxA at least 7 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

**1.19 INSTRUMENTS / EQUIPMENT**

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

**1.20 COMMISSIONING PERFORMANCE VERIFICATION**

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

**1.21 WITNESSING COMMISSIONING**

- .1 CxA to witness activities and verify results. Departmental Representative may be present if so desired.

**1.22 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 CxA within 3 days of test and with Cx report.

#### **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas may be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

#### **1.24 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 CxA & Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

#### **1.25 EXTENT OF VERIFICATION**

- .1 Provide manpower and instrumentation to verify up to 100% of reported results.
- .2 Number and location to be at discretion of Departmental Representative & CxA.
- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .4 Perform additional commissioning until results are acceptable to CxA.

#### **1.26 REPEAT VERIFICATIONS**

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

#### **1.27 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.

**1.28 DEFICIENCIES, FAULTS, DEFECTS**

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

**1.29 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 CxA.

**1.30 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.

**1.31 TRAINING**

- .1 In accordance with Section 01 91 41.

**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 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

**1.34 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 CxA.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 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.

**1.36 DEPARTMENTAL REPRESENTATIVE PERFORMANCE TESTING**

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

**1.37 DEPARTMENTAL REPRESENTATIVE**

- .1 Scope of work for Departmental Representative:
  - .1 Act as the point of contact for the commission agent and relay pertinent information to other Departmental Representatives.
  - .2 Attend Cx meetings to be aware of the status of the Commissioning process.
  - .3 Witness testing, system verification and Departmental Representative training as required.
  - .4 Confirm acceptance of the final testing and system verification results with the Cx Agent and other Departmental Representatives.
  - .5 At completion of the project, coordinate the transfer of the operation of the building systems to the other Departmental Representatives.

**1.38 PROJECT DESIGNATED COMMISSIONING AGENT**

- .1 Scope of work for Cx Agent:
  - .1 Review Consultant's documents at various stages of the design and provide comments that will assist or ensure success of the commissioning process. This review is not an engineering peer review of the design but merely a review to identify any items that will affect the commissioning process or the owner's operation and maintenance of the building systems.
  - .2 Review of the OPR, BOD, and shop drawings for the systems to be commissioned.
  - .3 Develop and implement the Cx Plan.
  - .4 Develop Cx specifications and ensure they are incorporated into the Construction Documents.

- .5 Schedule and chair the commissioning meetings with minutes provided.
- .6 Assist in the development of the commissioning schedule and list of systems to be commissioned.
- .7 Develop the Cx Construction Checklists. The checklists are to be developed by the Cx Agent and completed/returned by the respective contractor associated with the supply and installation of the commissioned equipment/system.
- .8 Develop the Cx Performance Verification (PV) Forms. The PV forms are to be developed by the Cx Agent outlining the general procedures for testing and filled in by the Cx Agent for incorporation into the Cx Manual.
- .9 Witness all equipment start-ups (performed by the manufacturer) and all system testing performed by the contractor, including balancing.
- .10 Review all testing reports from the contractor, such as: balancing reports, equipment startup reports, pressure tests, etc.
- .11 Coordinate and lead the building systems functional performance verification testing. Review results and provide comments or recommendations for any supplemental work or system modifications. This shall also include seasonal testing as required.
- .12 Maintain a Cx Status Log and Issues Log identifying milestones achieved, remaining items left at intervals during the course of construction and any issues causing a delay to the commissioning process with the party responsible for the proposed course of action to correct the issue.
- .13 Review O & M manuals
- .14 Coordinate and lead the Departmental Representative training sessions.
- .15 Review building operations 10 months after substantial completion.
- .16 Develop and ongoing commissioning plan.
- .17 Submit a final commissioning report with all Cx forms, test results and comments/recommendations.
- .18 Develop a systems manual.
- .19 Perform seasonal testing as required.

### **1.39 GENERAL CONTRACTOR/SUB-CONTRACTOR/SUPPLIER**

- .1 Scope of work for Contractor(s):
  - .1 Include Commissioning Process requirements and activities in each purchase order or subcontract written.
  - .2 Obtain cooperation and participation of all subcontractors and manufacturers.
  - .3 Attend all Commissioning Meetings.
  - .4 Include Commissioning Process milestones in the project schedule.
  - .5 Implement the training program as detailed in the Contract Documents.
  - .6 Provide submittals to the owner, design professionals, and the Commissioning Agent as required by the Contract documents and requested by the above noted personnel as they require.
  - .7 Complete the Construction Checklists as the work is accomplished. Provide the completed Construction Checklists to the GC for submission to the Commissioning Agent.
  - .8 Notify the Commissioning Agent when systems and assemblies are ready for

- testing with a minimum of 7 days prior notice to allow for proper scheduling if completed before the scheduled Cx activities.
- .9 Assist as required in the demonstration and the performance of assemblies and/or operation of systems to the Commissioning Agent.
  - .10 Continuously maintain the Record Drawings and submit as detailed in the Contract Documents.
  - .11 Submit O&M manuals.
  - .12 Participate in the Departmental Representative's training by demonstrating proper O&M or having their respective supplier representative provide proper O&M.
  - .13 Provide all information required for the operation and maintenance of the system or assembly as part of the initial submittal.
  - .14 Provide the requirements to maintain the warranty as part of the initial submittal.
  - .15 Coordinate and accomplish factory tests as detailed in the Contract Documents.
  - .16 Attend 10 month a meeting on site to review the building operations 10 months after substantial completion.
  - .17 Provide all required material to be included in the Cx Manual, O&M Manuals, and Systems Manual as required by the specifications.

#### **1.40 System Manual Requirements**

- .1 The Commissioning Agent will be responsible for assembling the Systems Manual at the end of the project and turning it over to the Departmental Representative for their Operations group to maintain and reference on an ongoing basis of operating the systems within the scope of the project. It is required in the LEED V4 CI "Enhanced Commissioning" and the makeup is referenced in ASHRAE Guideline 0-2005 "The Commissioning Process".
- .2 The sections of the Systems Manual will consist of the following:
  - .1 Executive Summary – to be developed by the Cx Agent for inclusion into the manual.
  - .2 Owner's Project Requirements – to be provided by the Departmental Representative for inclusion into the manual.
  - .3 Basis of Design – to be provided by the Departmental Representative for inclusion into the manual.
  - .4 Construction Record Documents – As-builts to be provided by the GC via the respective sub-trades and scanned. A hard copy and electronic copy of the as-builts are to be submitted to the Cx Agent by the GC. Record drawings shall be provided by the Departmental Representative for inclusion into manual.
  - .5 Approved Submittals for Commissioned Systems – to be provided by the construction team and collected by the Cx Agent for inclusion.
  - .6 Facility Operating Procedures – to be developed by the Cx Agent and

Contractor for inclusion into the manual.

- .7 Operational Record Keeping Procedures – to be developed by the Cx Agent for inclusion into the manual.
- .8 Maintenance Procedures – to be developed by the sub-trades or suppliers based on documentation from the suppliers and submitted to the Cx Agent for inclusion into the manual. This is to be provided for all equipment to be commissioned on the project. Refer to the Cx Plan and/or Cx Status Log.
- .9 Ongoing Optimization – to be developed by the Cx Agent for inclusion into the manual.
- .10 Commissioning Documents – to be provided by the Cx Agent for inclusion into the manual.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 Description of overall structure of Plan and roles and responsibilities of commissioning team.
- .2 Related Requirements
  - .1 Section 019113 "General Commissioning Requirements"
  - .2 Section 019113.16 "Commissioning Forms"
  - .3 Section 019141 – "Commissioning: Training"

**1.2 REFERENCE STANDARDS**

- .1 American Water Works Association (AWWA)
- .2 National Fire Protection Association (NFPA)
  - .1 NFPA-13, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA-14, Standard for the Installation of Standpipe & Hose Systems.
- .3 Underwriters' Laboratories of Canada (ULC)

**1.3 GENERAL**

- .1 Provide a fully functional facility:
  - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
  - .2 Departmental Representative have been fully trained in aspects of installed systems.
  - .3 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
  - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
  - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
  - .3 Sets out deliverables relating to O&M, process and administration of Cx.
  - .4 Describes process of verification of how built works meet Departmental Representative requirements.
  - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
  - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:



- .1 Overview of Cx.
- .2 General description of elements that make up Cx Plan.
- .3 Process and methodology for successful Cx.
- .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 developed by the CxA to be 95% completed before the start of Construction.
- .2 Cx Plan developed by the CxA to be 100% completed within 6 weeks of award of contract to take into account:
  - .1 Approved shop drawings and product data.
  - .2 Approved changes to contract.
  - .3 Contractor's project schedule.
  - .4 Cx schedule.
  - .5 Contractor's, sub-contractor's, suppliers' requirements.
  - .6 Departmental Representative and Cx team's requirements.
- .3 The Cx Agent shall prepare the Cx plan for all parties involved in the Cx process to review and comply with during the commissioning of the project.

#### **1.5 REFINEMENT OF CX PLAN**

- .1 During construction phase, the Cx plan shall be revised, refined and updated to include:
  - .1 Changes resulting from Client program modifications.
  - .2 Approved design and construction changes.

#### **1.6 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 Specialist Cx agency:
  - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
- .5 Departmental Representative: responsible for intrusion and access security systems.
- .6 Ensure that Cx participant:
  - .1 Could complete work within scheduled time frame.
  - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of Departmental Representative, including:
    - .1 Modify ventilation rates to meet changes in off-gassing.
    - .2 Changes to heating or cooling loads beyond scope of EMCS.
    - .3 Changes to EMCS control strategies beyond level of training provided to Departmental Representative.
    - .4 Redistribution of electrical services.
    - .5 Modifications of fire alarm systems.
    - .6 Modifications to voice communications systems.

## 1.7 EXTENT OF CX

- .1 Commission mechanical systems and associated equipment:
  - .1 Plumbing systems:
    - .1 Domestic CWS and HWS.
    - .2 Regular sanitary waste systems.
    - .3 Sewage pumps
  - .2 HVAC and exhaust systems:
    - .1 HVAC systems
    - .2 General exhaust systems
    - .3 Fire and life safety systems:
      - .1 Special fire suppression systems identified herein:
      - .2 Wet pipe sprinkler systems.
  - .4 EMCS:
    - .1 Controls as applicable to the HVAC systems

- .2 Commission electrical systems and equipment:
  - .1 Low voltage below 750 V:
    - .1 Low voltage equipment.
    - .2 Low voltage distribution systems.
  - .2 Lighting systems:
    - .1 Lighting equipment.
    - .2 Distribution systems.
    - .3 Emergency lighting systems, including battery packs.
    - .4 Fire exit emergency signage.
  - .3 Fire alarm systems, equipment:

## **1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES**

- .1 General requirements:
  - .1 Compile English documentation.
  - .2 Documentation to be computer-compatible format ready for inputting for data management.
- .2 Provide deliverables:
  - .1 Warranties.
  - .2 Project record documentation.
  - .3 Inventory of spare parts, special tools and maintenance materials.
  - .4 Maintenance Management System (MMS) identification system used.
  - .5 WHMIS information.
  - .6 MSDS data sheets.
  - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

## **1.9 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 construction checklists (CC).
  - .4 Completed performance verification (PV) report forms.

- .5 Results of Performance Verification Tests and Inspections.
  - .6 Description of Cx activities and documentation.
  - .7 Description of Cx of integrated systems and documentation.
  - .8 Training Plans.
  - .9 Cx Reports.
  - .10 Prescribed activities during warranty period.
- .4 Cx Agent to witness tests and reports of results provided to Departmental Representative.
  - .5 Departmental Representative to participate as required.

#### **1.10 START-UP**

- .1 Startup components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, of all new or relocated equipment on the project.
- .3 Cx Agent to monitor most of the start-up activities.
  - .1 Rectify start-up deficiencies to satisfaction of Cx Agent and Departmental Representative.
- .4 Performance Verification (PV):
  - .1 Approved Cx Agent to witness under Contractors demonstration.
    - .1 Repeat when necessary until results are acceptable to Cx Agent and Departmental Representative.
  - .2 Use procedures modified generic procedures to suit project requirements.
  - .3 Cx Agent and/or Departmental Representative reserves right to verify up to 30% of reported results at random.
  - .4 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

#### **1.11 Construction CHECK LISTS (CC)**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Construction Check Lists (CC) / Performance Verification (PV) Forms.

#### **1.12 PERFORMANCE VERIFICATION (PV)**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Construction Check Lists (CC) / Performance Verification (PV) Forms.

#### **1.13 CX SCHEDULES**

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

- .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
  - .1 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
  - .2 Notification of intention to start Cx: 14 days before start of Cx.
  - .3 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
  - .4 Identification of deferred Cx.
  - .5 Implementation of training plans.
  - .6 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to the Departmental Representative.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions as applicable.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Departmental Representative and Cx Agent will monitor progress of Cx against this schedule.

#### **1.14 ACTIVITIES DURING WARRANTY PERIOD**

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

#### **1.15 TESTS TO BE PERFORMED BY DEPARTMENTAL REPRESENTATIVE**

- .1 None are anticipated on this project.

#### **1.16 TRAINING PLANS**

- .1 Refer to Section 01 91 41.

#### **1.17 FINAL SETTINGS**

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

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**Part 2        PRODUCTS**

**2.1            NOT USED**

.1        Not Used.

**Part 3        EXECUTION**

**3.1            NOT USED**

.1        Not Used.

**END OF SECTION**

**Part 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 Commissioning forms to be completed for equipment, system and integrated system.
- .2 Related Requirements
  - .1 Section 019113 "General Commissioning Requirements"
  - .2 Section 019113.13 "Commissioning Plan"
  - .3 Section 019141 "Commissioning: Training"

**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 or Cx Agent 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 Cx Agent. Check lists will be required during Commissioning and will be included in Commissioning Manual at the end of the 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 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 Cx Agent from the contract documents and include records measured data and readings taken during functional testing and Performance Verification procedures.

#### **1.4 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Cx Agent 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 signature(s) of recording representative and may just include the Cx Agent or parties present during the testing.
  - .9 Submit immediately after tests are performed.
  - .10 Cx Agent will keep the forms in the Cx manual and included in hard and electronic copy at the end of the project.

#### **1.5 LANGUAGE**

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

#### **Part 2 PRODUCTS**

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

- .1 Not Used.

#### **Part 3 EXECUTION**

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

- .1 Not Used.

**END OF SECTION**



**Part 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Related Requirements
  - .1 Section 019113 "General Commissioning Requirements".
  - .2 Section 019113.13 "Commissioning Plan"
  - .3 Section 019113.16 "Commissioning Forms"

**1.2 TRAINEES**

- .1 Trainees: personnel selected by Departmental Representative.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

**1.3 INSTRUCTORS**

- .1 The Cx Agent will provide:
  - .1 Descriptions of systems.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
  - .1 Start-Up, operation, shut-down of equipment, components and systems.
  - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
  - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
  - .4 Any emergency startup or shutdown procedures.
  - .5 Any operational procedures that may affect warranty.
- .3 Contractor and equipment manufacturer to provide instruction on:
  - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

**1.4 TRAINING OBJECTIVES**

- .1 Training to be detailed and duration to ensure:
  - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
  - .2 Effective on-going inspection, measurements of system performance.
  - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
  - .4 Ability to update documentation.

- .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

## **1.5 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
  - .1 "As-Built" Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 TAB and PV Reports.
- .3 Training materials to be in a format that permits future training procedures to same degree of detail.
- .4 Supplement training materials:
  - .1 Transparencies for overhead projectors.
  - .2 Multimedia presentations.
  - .3 Manufacturer's training videos.
  - .4 Equipment models.

## **1.6 SCHEDULING**

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions lengths to range from ½ hour to 3 hours in length as agreed by the Cx Agent and Departmental Representative.
- .3 Training to be completed prior to acceptance of facility.

## **1.7 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Cx Agent will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by the Cx Agent.

## **1.8 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:

- .1 Review of facility and occupancy profile.
  - .2 Functional requirements.
  - .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
  - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
  - .7 Maintenance and servicing.
  - .8 Trouble-shooting diagnosis.
  - .9 Inter-Action among systems during integrated operation.
  - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

## **1.9 VIDEO-BASED TRAINING**

- .1 Manufacturer's videos are acceptable as a training tool as long as they are submitted ahead of time (4 weeks) for review and acceptance by the Departmental Representative and Cx Agent.
- .2 On-Site training videos:
  - .1 Video recording of training sessions for use during future training will be done by the Cx Agent. Please ensure all Instructors are acceptable to being video recorded before they are committed to the on site training.
  - .2 To be performed after systems are fully commissioned.
  - .3 Organize into several short modules to permit incorporation of changes.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**