

**1.1 TAXES**

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

**1.2 FEES, PERMITS and CERTIFICATES**

- .1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

**1.3 WORK BY OTHERS**

- .1 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to the Departmental Representative, in writing, any defects which may interfere with proper execution of Work.
- .2 Coordinate work of other contractors and provide cooperation to facilitate installation.
- .3 Work of this Project must include provisions for co-ordinating related work, for following principal items.
  - .1 Conduit supply and installation and cut outs in doors, frames and partitions for security devices and hardware supplied and installed by the tenant's Security Systems contractor. See hardware schedule.
  - .2 Wireway and conduit supply and installation for Telecommunications and Data services and devices supplied and installed by the Departmental Representative's telecommunications contractor. See electrical drawings.
  - .3 Installation of basefeed and power harness connections provided by furniture supplier
- .4 Work of Project which will be executed by others during completion of Work of this Contract:
  - .1 Furniture supply and installation c/w systems furniture electrical harness system.
  - .2 Security devices supplied and installed by the tenant's Security Systems contractor
  - .3 Door hardware supplied and installed by the tenant's Security Systems contractor
  - .4 Telecommunications services and devices installed by the Shared Services Canada contractor.

**1.4 TENANT FURNISHED ITEMS**

- .1 Tenant Responsibilities:
  - .1 Arrange for delivery of templates, product data, samples, manufacturer's instructions, and certificates to Contractor.
  - .2 Arrange and pay for delivery to site in accordance with Progress Schedule.
  - .3 Inspect deliveries.
  - .4 Submit claims for transportation damage.
  - .5 Arrange for replacement of damaged, defective or missing items.

- .6 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor, for incorporation into the Operations and Maintenance Manual.
- .2 Contractor Responsibilities:
  - .1 Designate submittals, delivery and installation dates for each product in progress schedule.
  - .2 Review product data, samples, and other submittals. Submit to Departmental Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
  - .3 Protect installed products from damage, and from exposure to elements.
  - .4 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .3 Schedule of Tenant furnished items and services.
  - .1 Supply and installation of Door Security Hardware provided by the Tenant as identified in Door Hardware Schedule in Section 08 71 00 – Door Hardware.
  - .2 Supply and installation of all Security systems and devices.
  - .3 Supply and installation of all Telecommunications systems and devices through Shared Services Canada contractor.

## **1.5 CONSTRUCTION MEETINGS**

- .1 Regular construction meetings will be scheduled bi-weekly or as required by the Departmental Representative.
- .2 Provide physical space within the construction site and make arrangements for meetings including ceasing noisy work during meetings.
- .3 Attend all construction meetings along with any sub-contractors who may be required to address specific items on the agenda.
  - .1 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .4 Provide a detailed “look-ahead” schedule of activities planned for the next 2 weeks following the meeting.

## **1.6 CONSTRUCTION PROGRESS SCHEDULE**

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises:
- .2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, incorporate corrections, issue revised baseline schedule for approval or further correction, and take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.

- .3 Return to Site as directed by Departmental Representative after construction completion, off-hours, to make final electrical connections for systems furniture and to rectify deficiencies.
- .4 Ensure that Project Schedule includes, at minimum, milestone and activity types as follows:
  - .1 Award
  - .2 submittals
  - .3 permits
  - .4 mobilization
  - .5 demolition
  - .6 new partitions
  - .7 painting
  - .8 new ceilings
  - .9 new floors
  - .10 lighting
  - .11 electrical
  - .12 piping
  - .13 controls
  - .14 HVAC
  - .15 Testing and Commissioning
  - .16 Substantial Performance
  - .17 Deficiencies
  - .18 Furniture installation and Client Move-in
  - .19 Final electrical connection of furniture base feeds (dates to be provided by Departmental Representative)
  - .20 Total Completion
- .5 Work can always be performed unless directed otherwise by the Departmental Representative.
  - .1 Carry out work during "regular hour", Monday to Friday from 07:00 to 18:00 hours and on Saturdays, Sundays and statutory holidays.
  - .2 Carry out interior painting in occupied areas during "off hours", Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays. Thoroughly ventilate areas painted during "off hours".
  - .3 Carry out noise generating work during "off hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
  - .4 Give the Departmental Representative 48 hours notice for work to be carried out during "off hours".
- .6 Update schedule monthly reflecting activity changes and completion, as well as activity in progress

## **1.7 REGULATORY REQUIREMENTS**

- .1 References and Codes:

- .1 Materials shall be new and work shall conform to the minimum applicable standards of the "References" indicated in the specification sections, the National Building Code of Canada 2015 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.
- .2 Building Smoking Environment:
  - .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.
- .3 Hazardous Material Discovery:
  - .1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance hazardous substance is encountered during demolition work.
    - .1 Take preventative measure and promptly notify Departmental Representative.
    - .2 Do not proceed until written instructions have been received from Departmental Representative.

## **1.8 FIRE SAFETY REQUIREMENTS**

- .1 Comply with both the National Building Code of Canada 2015 and the National Fire Code of Canada 2015 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 National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
  - .2 The National Fire Code (NFC):
    - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
    - .2 The conduct of activities that might cause fire hazards in and around buildings.
    - .3 Limitations on hazardous contents in and around buildings.
    - .4 The establishment of fire safety plans.
    - .5 Fire safety at construction and demolition sites.
- .2 Retain all fire safety documents and standards on site.
- .3 Welding and cutting:
  - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit from the Real property Service Provider as directed by the Departmental Representative. Store flammable liquids in approved CSA containers. No open flame or hot work shall be undertaken unless authorized by the Real property Service Provider.
  - .2 At least 48 hours prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
    - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
    - .2 Completed welding permit as defined by Departmental Representative.

- .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
- .3 A fire watch shall be provided in accordance with the NFC 2015 edition when hot work is carried out.
- .4 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems:
  - .1 Provide “Watchman Service” as required by Departmental Representative; In general, watchman service is defined as an individual conversant with “Fire Emergency Procedures”, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
  - .2 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.

## **1.9 DESIGNATED CONTRACTOR**

- .1 Hire the services of Chubb Edwards to do all the work related to Section 28 31 00.02 Multiplex Fire Alarm and Voice Communication Systems
- .2 Hire the services of Ainsworth Inc. do all the work related to Division 25: Integrated Automation.

## **1.10 HAZARDOUS MATERIALS**

- .1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS).
- .3 For work in occupied buildings, give the Department Representative 48 hours notice for work involving designated substances (Ontario Bill 208), hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking, installing carpet or using adhesives and other materials, that cause off gassing.

## **1.11 TEMPORARY UTILITIES**

- .1 Existing services required for work, excluding power required for space temporary heating, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.

- .2 Maximum power supply of 110 V, 15 A is available and will be provided at no cost. Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.
- .3 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission:
  - .1 2 weeks in advance
- .4 Give the Departmental Representative 1-week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

## **1.12 CONSTRUCTION FACILITIES**

- .1 Access Scaffold:
  - .1 Scaffolding: install scaffolding in accordance with applicable construction regulations.
  - .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
  - .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.
- .2 Designated elevators: to be used by construction personnel and transporting of materials.
  - .1 Co-ordinate with Departmental Representative.
  - .2 Protect from damage, safety hazards and overloading of existing equipment.
  - .3 Freight elevator must be booked 24 hours in advance.
- .3 Site Storage:
  - .1 Storage will be allowed within the area of Work only, no other storage will be available
  - .2 Do not unreasonably encumber site with materials or equipment.
  - .3 Move stored products or equipment that interfere with operations of Departmental Representative or other contractors.
  - .4 Obtain and pay for use of additional storage or work areas needed for operations.
  - .5 Do not load or permit to load any part of work with weight or force that will endanger work.
- .4 Where security is reduced by work provide temporary means to maintain security.
- .5 Sanitary facilities: will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean and return in same condition as prior to start of construction. Provide protection for flooring, walls and countertops.
- .6 Signage:
  - .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the

- use of commonly understood graphic symbols and to approval of the Departmental Representative.
- .2 No advertising will be permitted on this project.
- .3 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as directed by Departmental Representative.
- .7 Parking:
  - .1 Parking on-site is not available.

### **1.13 TEMPORARY BARRIERS AND ENCLOSURES**

- .1 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. When Building Operations staff requires access to equipment in order to operate the building, proper coordination and communication must exist between all parties involved
- .2 Provide weather tight barricade enclosures to unfinished exterior door and window openings and to mall entrance.
  - .1 Provide to protect and perform demolition and construction work of new Sparks Street exit and demolition and enclosure of Queen and Kent Street southwest corner entrance.
  - .2 Provide secure, rigid barricade from (38mm x 89mm) construction grade lumber framing at 600mm o.c. with (1200 x 2400 x 13mm) exterior grade plywood to CSO-O121 finish complete with roof.
  - .3 Apply plywood panels vertically flush and butt jointed.
  - .4 Design enclosures to withstand wind pressure in accordance with NBC 2015.
  - .5 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CAN/CGSB 1.59. Maintain public side of enclosure in clean condition.
- .3 Protect interior Atrium bay window full height tempered glass during demolition and construction.
  - .1 Provide secure, rigid barricade from (38mm x 89mm) construction grade lumber framing at 600mm o.c. with (1200 x 2400 x 13mm) plywood to CSO-O121 finish.
  - .2 Apply plywood panels vertically flush and butt jointed.
- .4 Dust Control:
  - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.
  - .2 Maintain and relocate protection until such work is complete.
  - .3 Protect all furnishings within work area with 0.102mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .5 Protection:
  - .1 Protect existing construction, infrastructure, and adjacent areas from damage.

- .2 Protect work against damage until take-over.
- .3 Protect adjacent areas and floors against the spread of dust and dirt beyond the work areas.
- .4 Protect operatives and other users of site from all hazards.  
Be responsible for damage incurred due to lack of or improper protection.

#### **1.14 EXAMINATION and PREPARATION**

- .1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
- .2 Before commencing work, establish location and extent of services lines in area of work and notify Departmental Representative of findings.

#### **1.15 FIELD QUALITY CONTROL**

- .1 Carry out Work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.
- .2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.
- .3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
- .4 Testing Laboratory Services:
  - .1 Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.
  - .2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.
  - .3 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

#### **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's approval.
- .2 No advertising will be permitted on this project.

#### **1.17 CLEANING**

- .1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.



- .3 Clean and polish glass, mirrors, ceramic tile, aluminum, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware, perimeter heating units and washroom fixtures. Clean manufactured articles in accordance with manufacturer's written instructions.
- .4 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

#### **1.18 SECURITY CHECK**

- .1 All personnel employed on this project must hold a current Reliability Security Clearance and will be subject to security check.
- .2 Personnel will be checked-in daily at start of work shift and given a pass in exchange for acceptable personal identification, which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

#### **1.19 SECURITY ESCORT**

- .1 All personnel employed on this project shall be escorted when executing work in non-public areas during normal working hours. Personnel shall be escorted in all areas after normal working hours.
- .2 Submit an escort request to Departmental Representative at least 48 hours before the service is needed. For requests submitted within the time mentioned above, the Departmental Representative will pay for the costs of the security escort. The cost incurred by a late request will be charged to the Contractor.
- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before the scheduled time of the escort. The cost incurred by a late cancellation will be charged to the Contractor.
- .4 The calculation of costs will be based on the average hourly rate of a security officer for a minimum of 8 hours per day for a late service request and 4 hours for late cancellations.

#### **1.20 COST BREAKDOWN**

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

#### **1.21 PRECEDENCE**

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

#### **1.22 PHOTOGRAPHS**

- .1 No photography is permitted within the building without the written permission of the Departmental Representative.

- .2 Electronic copies of all permitted photographs must be provided digitally to the Departmental Representative.

**1.23 BASE BUILDING PROTOCOLS**

- .1 The successful bidder will need to comply with base building protocols which will be provided upon contract award.
- .2 The RP1 Equipment Data Collection Form (DCF) FMS 215 03 must be completed and included in project close out

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

## **1. GENERAL**

### **1.1 REFERENCES**

#### *1. Federal Legislation*

1. *Canada Labour Code, Part II, section 124 and 125.*
  1. *Canada Occupational Health and Safety Regulations*
2. *Transportation of Dangerous Goods Act, 1992 (TDGA)*
3. *PSPC Asbestos Management Standard*
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. *Ontario Occupational Health and Safety Act, R.S.O. 1990, 2010 edition.*
  1. *Ontario Regulation 490/09 – Designated Substances (O.Reg. 490/09).*
  2. *Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations, (O.Reg. 278/05).*
  3. *Ontario Regulation 213/91 for Construction Projects (O.Reg. 213/91)*
2. *Ontario Environmental Protection Act, R.R.O. 1990,*
  1. *Ontario Regulation 347/90, General – Waste Management (O.Reg. 347/90).*
  2. *Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons (O.Reg. 463/10).*
3. *Ontario Dangerous Goods Transportation Act*

#### *3. Canadian General Standards Board (CGSB).*

#### *4. Canadian Standards Association (CSA International). CAN/CSA-Z94.4-11 - Respiratory Protection*

#### *5. Underwriters' Laboratories of Canada (ULC).*

### **1.2 DEFINITIONS**

Asbestos-Containing Materials (ACMs): means material that contains 0.5 per cent or more asbestos by dry weight as per *Ontario Regulation 278/05*.

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 prescribed by *Ontario Regulation 490/09 Designated Substances*, as amended.

### 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 areas 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 recent sampling in the work area, the following materials are confirmed to contain regulated amounts of asbestos:

- Non-friable vinyl floor tiles on platforms at south end of work area contain from 2 to 6 % Chrysotile asbestos.

Based on past designated substance survey reports, the following materials contain regulated amounts of asbestos:

- Friable pipe parging cement insulation contains 60% Chrysotile, observed at the ceiling deck level in the main work area and mechanical room;
- Non-friable black tar/firestop caulking observed sporadically on old drywall, concrete deck and around deck penetrations contains 0.81 to 23% Chrysotile asbestos; and
- Friable asbestos-containing packings around pipe and other penetrations have been historically observed in the building.

The following materials could not be inspected and are assumed to contain asbestos:

- Pipe straight run insulation may contain asbestos, unless it is visibly fibreglass; and
- Joint packings of drainpipes.

Based on recent sampling in the work area, the following materials have been confirmed to not contain regulated amounts of asbestos:

- Drywall joint compound;
- Fibrous flooring remnant;
- Cementitious floor penetration sealant;
- Remnant mastic on floor;
- Cementitious floor levelling compound;

- Spray applied fireproofing on deck and beams;
- Wall plaster (observed in isolated location along east wall);
- Vinyl sheet flooring on platforms at south end of work area; and
- Ceiling texture coat inside a bulkhead at the east side of the work area.

4. BENZENE: Not Identified

5. COKE OVEN EMISSIONS: Not identified

6. ETHYLENE OXIDE: Not Identified

7. ISOCYANATES: Not Identified

8. LEAD: **Identified**

Based on sample results, the off-white paint on the high ceiling above the Sparks Street stairs contains 369 parts per million lead.

Lead is assumed to be present in:

- Solder on the joints of copper piping; and
- Joint packings of drainpipes.

9. MERCURY: **Identified**

- Mercury is present within the fluorescent light tubes in the project area.

10. SILICA: Identified

Based on the historic composition of building materials, silica is expected to be present in:

- Plaster;
- Drywall;
- Concrete blocks and associated mortar;
- Concrete floor and ceiling slabs; and
- Other concrete building materials.

11. VINYL CHLORIDE MONOMER: Not Identified

12. POLYCHLORINATED BIPHENYLS (PCBs): Not Identified

## 1.4 RECOMMENDATIONS

### 1. ASBESTOS

1. All work must be done in accordance with *Canada Occupational Health and Safety Regulations (as amended)*, *PSPC Asbestos Management Standard*, and *O.Reg 278/05 (as amended)*. In the event of conflict between the federal and provincial regulations, the most stringent procedures apply.
2. The disturbance of ACMs on construction and demolition projects by the *Canada Occupational Health and Safety Regulations*, *PSPC Asbestos Management Standard*, and in the province of Ontario by *O.Reg 278/05*, as amended. These

Regulations classifies all asbestos disturbances as Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), 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. The Ontario Ministry of Labour (MoL) must be notified of any project involving removal of more than a minor amount (e.g. typically 1 square metre) of friable asbestos material.

3. Disposal of asbestos waste must be done in accordance with “*General – Waste Management*” O.Reg. 347/90 (as amended) under the *Ontario Environmental Protection Act*, the *Ontario Dangerous Goods Transportation Act*, and the *federal Transportation of Dangerous Goods Act*. The waste must be disposed at a licensed waste disposal site. Proper notification must be issued to the Departmental Representative prior to transportation of waste.

## 2. LEAD

1. Follow recommendations provided in the Ontario Ministry of Labour (MoL) Guideline entitled “Guideline: Lead on Construction Projects”. This 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. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed the TWAEL of 0.05 milligram per cubic metre (mg/m<sup>3</sup>) prescribed by O.Reg. 490/09.
3. Disposal of construction waste containing lead must be done in accordance with O.Reg. 347/90 – *General Waste Management*, as amended, under the *Ontario Environmental Protection Act*, the *Ontario Dangerous Good Transportation Act*, and the *federal Transportation of Dangerous Goods Act*. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as “hazardous”, “non-hazardous” or “registerable solid waste” depending on the results of the leachate test.

## 3. MERCURY

1. All work involving disturbance of mercury-containing equipment must be done in accordance with O.Reg. 490/09.
2. When removal of fluorescent light tubes is required, the tubes should be removed intact from the fixtures. Other sources of

liquid mercury should be removed intact to prevent worker exposure.

3. Disposal of waste containing mercury must be done in accordance with "General – Waste Management" O.Reg. 347/90 (as amended) under the *Ontario Environmental Protection Act, the Ontario Dangerous Goods Transportation Act, and the federal Transportation of Dangerous Goods Act.*

#### 4. SILICA

1. Comply with *Ontario Regulations O.Reg. 490/09* when performing work that may disturb silica-containing materials.
2. Silica dust can be generated through such processes as sanding, blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in select materials within the project area, appropriate respiratory protection and ventilation must be used during work.
3. 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. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

## **2. PRODUCTS**

Not used

## **3. EXECUTION**

Not used

**END OF SECTION**

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

- .1 Section 01 45 00 – Quality Control
- .2 Section 01 74 19 – Waste Management and Disposal
- .3 Section 01 91 13.16 – Commissioning Forms

**1.2 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .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 co-ordinated 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 co-ordinated.
- .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 Keep one reviewed copy of each submission on site.

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term shop drawings means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment,



indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

- .4 Allow 3 days for review of each submission by Departmental Representative.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Value of the 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 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 requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .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 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 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.
- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 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.
- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or

omissions in shop drawings or of responsibility for meeting requirements of construction and Specifications and Drawings.

- .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.

#### **1.4 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 the 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.

#### **1.5 MOCK-UPS**

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

#### **1.6 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in jpg format, fine resolution, monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints:
  - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: monthly and as directed by Departmental Representative.
  - .1 Upon completion of: framing and services before concealment, and as directed by Departmental Representative.

#### **1.7 COMMISSIONING AND CMMS FORMS**

- .1 Immediately upon application for Certificate of Substantial Completion of Contract:
  - .1 Submit Completed Commissioning and CMMS Forms
  - .2 Include a copy in the O and M 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 RELATED REQUIREMENTS**

- .1 Section 01 14 25 – Designated Substances Report

**1.2 REFERENCE STANDARDS**

- .1 Province of Ontario
  - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2018.
- .2 CAN/CSA Z462-18, Workplace Electrical Safety.
- .3 CAN/CSA Z460-13 (R2018), Control of Hazardous Energy – Lockout and Other Methods

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site-specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors to Departmental Representative within 24 hours.
- .5 Advise the Departmental Representative within 24 hours of any Authority having Jurisdiction visiting the site.
- .6 Submit copies of incident and accident reports within 24 hours after the event.
- .7 Submit WHMIS Safety Data Sheets (SDS) in accordance with Section 01 00 10 – General Instructions.
- .8 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 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 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

**1.4 FILING OF NOTICE**

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

**1.5 SAFETY ASSESSMENT**

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

**1.6 MEETINGS**

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

**1.7 REGULATORY REQUIREMENTS**

- .1 Do Work in accordance with Section 01 00 10 – General Instructions, “Regulatory Requirements.”

**1.8 PROJECT/SITE CONDITIONS**

- .1 Work at site will involve contact with materials identified in Section 01 14 25 – Designated Substances Report.

**1.9 GENERAL REQUIREMENTS**

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

**1.10 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Assume responsibility for health and safety of all other contractors present on site under the prescriptions of the present section.
- .4 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.

**1.11 COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.
- .2 Comply with CAN/CSA Z462
- .3 Comply with CAN/CSA Z460
- .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.12 UNFORSEEN HAZARDS**

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

**1.13 HEALTH AND SAFETY CO-ORDINATOR**

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

**1.14 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.

**1.15 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.

**1.16 BLASTING**

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

**1.17 POWDER ACTUATED DEVICES**

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

**1.18 WORK STOPPAGE**

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

**Part 2            Products**

**2.1                NOT USED**

.1            Not used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not used.

**END OF SECTION**



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

- .1 Section 01 91 13 – General Commissioning Requirements

**1.2 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection, minimum 5 days, 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. If such Work is found in accordance with Specifications and Drawings, Departmental Representative shall pay cost of examination and replacement.
- .5 Provide equipment required for executing inspections and site reviews, such as ladders.

**1.3 INDEPENDENT INSPECTION AGENCIES**

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

**1.4 ACCESS TO WORK**

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

**1.5 PROCEDURES**

- .1 Notify appropriate agency 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.

**1.6 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to 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 the Work difference in value between Work performed and that called for by Specifications and Drawings, amount of which will be determined by Departmental Representative.

**1.7 REPORTS**

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

**1.8 TESTS AND MIX DESIGNS**

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

**1.9 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations as specified in specific Section acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative with reasonable promptness and in orderly sequence, to not cause delays in Work.

- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule fixing dates for preparation.
- .6 Mock-ups may remain as part of Work at the discretion of the Departmental Representative.

**1.10 MILL TESTS**

- .1 Submit mill test certificates as requested.

**1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to Section 01 91 13 – General Commissioning Requirements for definitive requirements.

**1.12 FIELD QUALITY CONTROL**

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

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

- .1 Not Used.

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

- .1 Not Used.

**END OF SECTION**

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

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

**1.2 QUALITY**

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

**1.3 STORAGE, HANDLING AND PROTECTION**

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

- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

#### **1.4 TRANSPORTATION**

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

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

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

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

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

#### **1.7 CO-ORDINATION**

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

**1.8 CONCEALMENT**

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

**1.9 REMEDIAL WORK**

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

**1.10 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate and subject to relocation prior to installation within a radius of up to 3000mm from the location shown to suit site conditions, interferences or other conditions determined by the Departmental Representative.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

**1.11 FASTENINGS**

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

**1.12 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.13 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

**1.14 EXISTING UTILITIES**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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

- .1 Section 01 74 19 – Waste Management and Disposal

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 MATERIALS**

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

**1.4 PREPARATION**

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



**1.5 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing.
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Specifications and Drawings.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with ULC listed firestop assemblies applicable for the existing construction. provide submittals for proposed firestop assemblies prior to installation for approval by Departmental Representative.
- .13 Patch and make good existing construction that is cut, damaged or disturbed in the course of the Work, to Departmental Representative's approval. Match existing material and finish texture, appearance and colour.
- .14 Remove all traces of existing construction removed in the course of the Work.
- .15 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .16 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.
- .17 At penetration of acoustically-rated partitions, completely seal voids with acoustic sealant on both sides of partition.
- .18 Install furring and blocking within partitions as required to space-out and support casework, cabinets, TV's provided by Departmental Representatives (TV quantity and general location indicated in drawings, exact location and extent of blocking to be clarified on site), wall and ceiling finishes, electrical equipment mounting boards, and other work as required.
- .19 X-ray floor at locations where cuts into the structural slab are required.

**1.6 WASTE MANAGEMENT AND DISPOSAL**

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

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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

- .1 Section 02 41 00.08 – Demolition for Minor Works

**1.2 REFERENCE STANDARDS**

- .1 ASTM International (ASTM)
  - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program

**1.3 DEFINITIONS**

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling operations, repair and demolition
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
  - .1 Solvents in paints and other coatings;
  - .2 Wood preservatives; strippers and household cleaners;
  - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
  - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting, before starting any Work of the Contract attended by the Departmental Representative, to discuss the Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.
  - .2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site that includes the following information:
    - .1 Waste Diversion Method: to generate a minimum of 75% of total waste diversion and four (4) material streams that will be targeted for alternative disposal methods.
    - .2 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed

from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.

- .3 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.
- .4 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
- .5 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist.
- .6 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
- .7 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- .8 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

## 1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation, Diversion Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals as follows:
  - .1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format acceptable to submittal requirements and that includes the following information:
    - .1 Accounting: Submit information indicating total waste produced by the project.
    - .2 Composition: Submit information indicating types of waste material and quantity of each material.
    - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
    - .4 Transportation Documentation, Diversion Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
    - .5 Alternative Daily Cover (ADC): Submit quantities of material that were used as ADC at landfill sites, and that form a part of the total waste generated by the project.

- .6 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.
- .7 Photographs: Submit photographs of waste diversion facilities documenting location and signage describing usage of waste separation containers.

## **1.7 QUALITY ASSURANCE**

- .1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:
  - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
  - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
  - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
  - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 Execution**

### **3.1 (CWM PLAN) IMPLEMENTATION**

- .1 Manager: Contractor is responsible for designating an on-site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.

- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Departmental Representative and other site personnel as required to maintain CWM Plan.
- .3 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractors at appropriate stages of the project.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
  - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
  - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.
- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:
  - .1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Owner and Departmental Representative.
  - .2 Monthly waste summary shall contain the following information:
    - .1 The amount in tonnes or m<sup>3</sup> and location of material landfilled,
    - .2 The amount in tonnes or m<sup>3</sup> and location of materials diverted from landfill, and
    - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

### 3.2 SUBCONTRACTOR'S RESPONSIBILITY

- .1 Subcontractors shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in the Owner not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractors.

### 3.3 SAMPLE CONSTRUCTION WASTE MANAGEMENT FORMS

- .1 Sample waste tracking form below can be used by the Contractor to establish their own forms for recording management of construction waste:

Material Stream	Diverted Waste by Report Date	Total	Units				
Sept	Oct	Nov	Dec				
Material Streams Contributing to Credit	Plastic	1.25	2.5	10	5	18.75	m <sup>3</sup>
Carpet	2.5	2.5	2.5	0	7.5	m <sup>3</sup>	
Paper/Cardboard	5	2.5	2.5	5	15	m <sup>3</sup>	

Clean Wood	0	25	0	1.25	26.25	m <sup>3</sup>	
Metal	1.25	2.5	5.5	7	16.25	m <sup>3</sup>	
Gypsum Board	2.5	2.5	4	5	14	m <sup>3</sup>	
Brick/Concrete	10.5	2.5	5.5	8.75	27.25	m <sup>3</sup>	
Asphalt Shingles	10	0	0	0	10	m <sup>3</sup>	
Total Diverted Waste	135	m <sup>3</sup>					
Material Streams not Contributing to Credit	Landfill	10.75	7.5	15	10	43.25	m <sup>3</sup>
Screen Fines (ADC)	5	1.25	0	2.5	8.75	m <sup>3</sup>	
150 mm Minus (ADC)	1.25	1.25	5	5.5	13	m <sup>3</sup>	
Total Landfill/ADC Waste	65	m <sup>3</sup>					
Total Waste	200	m <sup>3</sup>					
Percent Diverted	67.5	%					

**END OF SECTION**



**Part 1 General****1.1 RELATED SECTIONS****1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with Departmental Representative to:
    - .1 Verify Project requirements.
    - .2 Review warranty requirements and manufacturer's installation instructions.
  - .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.
- .2 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.
- .3 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action
  - .1 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .2 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.
  - .3 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, four (4) final copies of operating and maintenance manuals in English and French.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

**1.4 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 building name and address, project number and project completion date. Identify subject matter of contents and identify subject matter of contents.
- .5 Arrange content by systems, 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.

## **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Signed Letter of Warranty: dated; identifying project by name; project number; location and warranty period. Any extended equipment warranty must also be identified.
- .2 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.
    - .1 Contact information for all subcontractors and suppliers.
  - .3 Schedule of products and systems indexed to content of volume.
- .3 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .4 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .5 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .6 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.
- .7 Training: provide training as required by Departmental Representative.
- .8 Include copies of Commissioning and CMMS forms.
- .9 Include Reports Prepared:

- .1 Copy of all TAB reports for HVAC systems
- .2 re-functional tests and/or start-up reports
- .3 Functional test reports
- .4 Completed performance verification forms
- .5 Load balancing reports
- .6 ESA certification – Certificate of Inspection and Requested Outcome Summary Report
- .7 Typewritten panel directories
- .8 Emergency lighting letter indicating the
- .9 lighting is connected to emergency power as per drawings and specifications
- .10 TSSA certification
- .11 Fire alarm certifications
- .12 NFPA 13 certifications
- .13 Seismic Reports
- .14 Building Occupancy Permits and/or Inspection Reports
- .15 Other required certifications required by the National Building Code

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

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Site Instructions
  - .5 Change Orders and other modifications to Contract.
  - .6 Reviewed shop drawings, product data, and samples.
  - .7 Field test records.
  - .8 Inspection certificates.
  - .9 Manufacturer's certificates.
  - .10 Site Instructions
- .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 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by change orders.
  - .4 Details not on original Contract Drawings.
  - .5 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

**1.8 EQUIPMENT AND SYSTEMS**

- .1 Obtain CMMS data forms from Departmental Representative and fill in all information for all new and removed equipment. See sample form in Appendix A. Forward all maintenance data for inclusion in Preventative Maintenance Support System (PMSS). Obtain equipment tag information from Departmental Representative and include on P-touch label. Provide copies of all MMS data forms in operating and maintenance manuals.
- .2 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .3 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .4 Include installed colour coded wiring diagrams.
- .5 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

- .1 Include regulation, control, stopping, shut-down, and emergency instructions.
- .2 Include summer, winter, and any special operating instructions.
- .6 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .7 Provide servicing and lubrication schedule, and list of lubricants required.
- .8 Include sequence of operation by controls manufacturer.
- .9 Include manufacturer's printed operation and maintenance instructions.
- .10 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .11 Provide installed control diagrams by controls manufacturer.
- .12 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .13 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .14 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .15 Include test and balancing reports as specified in Section 01 45 00 – Quality Control and Section 01 91 13 – General Commissioning Requirements.
- .16 Additional requirements: as specified in individual specification sections.

## **1.9 MATERIALS AND FINISHES**

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

## **1.10 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

- .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to site location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to site location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative
    - .2 Include approved listings in Maintenance Manual.

#### **1.11 DELIVERY, STORAGE AND HANDLING**

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

#### **1.12 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, pumps, motors, transformers, commissioned systems fire protection, alarm systems, sprinkler systems, lightning protection systems.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.

- .4 Contractor's plans for attendance at 4- and 9-month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

### **1.13 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 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

**1.2 INSTRUCTORS**

- .1 Departmental Representative will provide:
  - .1 Descriptions of systems.
  - .2 Instruction on design philosophy, design criteria, and design intent.
- .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.
- .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.

**1.3 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.

**1.4 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
  - .1 "As-Built" Specifications and Drawings.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Management Manual.
  - .5 TAB and PV Reports.
- .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.

- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
  - .1 Transparencies for overhead projectors.
  - .2 Multimedia presentations.
  - .3 Manufacturer's training videos.
  - .4 Equipment models.

#### 1.5 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

#### 1.6 RESPONSIBILITIES

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

#### 1.7 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.

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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 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
  - .1 Verify installed equipment, systems and integrated systems operate in accordance with Drawings & Specifications and design criteria and intent.
  - .2 Ensure appropriate documentation is compiled into the BMM.
  - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be operated interactively with each other as intended in accordance with Drawings & Specifications and design criteria.
  - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- .4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

**1.2 COMMISSIONING OVERVIEW**

- .1 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning Plan.
- .2 Cx to be a line item of Contractor's cost breakdown.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .5 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

### 1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

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

### 1.4 PRE-CX REVIEW

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

### 1.5 CONFLICTS

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

### 1.6 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 agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.

- .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
- .3 Submit proposed Cx procedures to Departmental Representative 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.

#### 1.7 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) /Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

#### 1.8 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.

#### 1.9 COMMISSIONING MEETINGS

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

1.10 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.

1.11 WITNESSING OF STARTING AND TESTING

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

1.12 MANUFACTURER'S INVOLVEMENT

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative:
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

1.13 PROCEDURES

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

1.14 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 Operate and maintain systems for length of time required for commissioning to be completed.
- .3 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.15 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.

1.16 START OF COMMISSIONING

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

1.17 INSTRUMENTS /EQUIPMENT

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

1.18 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.

1.19 WITNESSING COMMISSIONING

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

1.20 EXTRAPOLATION OF RESULTS

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



1.21 EXTENT OF VERIFICATION

- .1 Laboratory areas:
  - .1 Provide manpower and instrumentation to verify up to 100% of reported results.
- .2 Elsewhere:
  - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Departmental Representative.
- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Departmental Representative.

1.22 REPEAT VERIFICATIONS

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

1.23 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.

1.24 DEFICIENCIES, FAULTS, DEFECTS

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

1.25 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.26 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.

1.27 OCCUPANCY

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

1.28 INSTALLED INSTRUMENTATION

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

1.29 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  $\pm 10\%$  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  $\pm 2\%$  of recorded values.

1.30 OWNER'S PERFORMANCE TESTING

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

**PART 2 - PRODUCTS**2.1 NOT USED

- .1 Not Used.

**PART 3 - EXECUTION**

3.1 NOT USED

.1 Not Used.

END OF SECTION

**PART 1 - GENERAL****1.1 REFERENCE STANDARDS**

- .1 Public Works and Government Services Canada (PWGSC)
  - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-03.

**1.2 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 Optimized life cycle costs.
  - .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 design requirements.
  - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
  - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
    - .1 Overview of Cx.
    - .2 General description of elements that make up Cx Plan.
    - .3 Process and methodology for successful Cx.
- .4 Acronyms:
  - .1 Cx - Commissioning.
  - .2 BMM - Building Management Manual.
  - .3 EMCS - Energy Monitoring and Control Systems.
  - .4 WHMIS Safety Data Sheets (SDS).
  - .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.

**1.3 DEVELOPMENT OF 100% CX PLAN**

- .1 Cx Plan to be 95% completed before added into Project Specifications.

- .2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:
  - .1 Contractor's project schedule.
  - .2 Cx schedule.
  - .3 Contractor's, sub-contractor's, suppliers' requirements.
  - .4 Project construction team's and Cx team's requirements.
- .3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

#### 1.4 REFINEMENT OF CX PLAN

- .1 Revise, refine and update every 6 weeks during construction phase. At each revision, indicate revision number and date.
- .2 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.
- .3 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

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

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
  - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
    - .1 Review of Cx documentation from operational perspective.
    - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
    - .3 Protection of health, safety and comfort of occupants and O&M personnel.
    - .4 Monitoring of Cx activities, training, development of Cx documentation.
    - .5 Work closely with members of Cx Team.
  - .3 Departmental Representative is responsible for:
    - .1 Organizing Cx.
    - .2 Monitoring operations Cx activities.
    - .3 Witnessing, certifying accuracy of reported results.
    - .4 Witnessing and certifying TAB and other tests.
    - .5 Developing BMM.
    - .6 Ensuring implementation of final Cx Plan.
    - .7 Performing verification of performance of installed systems and equipment.
    - .8 Implementation of Training Plan.
  - .4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Specifications and Drawings, including:
    - .1 Testing.
    - .2 TAB.
    - .3 Performance of Cx activities.
    - .4 Delivery of training and Cx documentation.
    - .5 Assigning one person as point of contact with Departmental Representative and PWGSC Cx Manager for administrative and coordination purposes.

- .5 Contractor's Cx agent implements specified Cx activities including:
  - .1 Testing.
  - .2 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Receiving facility.
  - .2 Day-To-Day operation and maintenance of facility.

#### 1.6 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 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.
  - .4 Client: responsible for intrusion and access security systems.
  - .5 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 O&M personnel, including:
      - .1 Modify ventilation rates to meet changes in off-gassing.
      - .2 Changes to heating or cooling loads beyond scope of EMCS.
      - .3 Changes to EMCS control strategies.
  - .6 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

#### 1.7 EXTENT OF CX

- .1 Commission mechanical systems and associated equipment:
  - .1 HVAC and exhaust systems:
    - .1 HVAC systems.
    - .2 General exhaust systems.
    - .3 Exhaust systems and related systems.
    - .4 **Laboratory fume hoods, bio-safety cabinets and related systems.**
    - .5 Heat recovery systems.

#### 1.8 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 performance verification (PV) report forms.
  - .4 Results of Performance Verification Tests and Inspections.
  - .5 Description of Cx activities and documentation.
  - .6 Description of Cx of integrated systems and documentation.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

#### 1.9 START-UP

- .1 Start up components, equipment and systems.
- .2 Departmental Representative to monitor some of these start-up activities.
  - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .3 Performance Verification (PV):
  - .1 Approved Cx Agent to perform.
    - .1 Repeat when necessary until results are acceptable to Departmental Representative.
  - .2 Use procedures modified generic procedures to suit project requirements.
  - .3 Departmental Representative to witness and certify reported results using approved PV forms.
  - .4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.
  - .5 Departmental Representative will verify up to 30% of reported results at random.
  - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

#### 1.10 CX ACTIVITIES AND RELATED DOCUMENTATION

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

1.11 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
  - .1 HVAC and associated systems forming part of integrated HVAC systems.
  - .2 Lab & fume hood controls.

1.12 PERFORMANCE VERIFICATION (PV) REPORT

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI) /Performance Verification (PV) Forms.

1.13 CX SCHEDULES

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
    - .1 Design criteria, design intents.
    - .2 Cx agents' credentials: 20 days before start of Cx.
    - .3 Cx procedures: 1 month after award of contract.
    - .4 Cx Report format: 1 months after contract award.
    - .5 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
    - .6 Notification of intention to start TAB: 21 days before start of TAB.
    - .7 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
    - .8 Notification of intention to start Cx: 14 days before start of Cx.
    - .9 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
    - .10 Identification of deferred Cx.
    - .11 Implementation of training plans.
    - .12 Cx reports: immediately upon successful completion of Cx.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.



1.14 CX REPORTS

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

1.15 FINAL SETTINGS

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

**PART 2 - PRODUCTS**

2.1 NOT USED

- .1 Not Used.

**PART 3 - EXECUTION**

3.1 NOT USED

- .1 Not Used.

END OF SECTION

**PART 1 - GENERAL****1.1 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.

**1.2 PERFORMANCE VERIFICATION (PV) FORMS**

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

**1.3 SAMPLES OF COMMISSIONING FORMS**

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.

**1.4 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

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

**1.5 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Confirm operation as per design criteria and intent.
  - .3 Identify variances between design and operation and reasons for variances.
  - .4 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .5 Record analytical and substantiating data.
  - .6 Verify reported results.

- .7 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
- .8 Submit immediately after tests are performed.
- .9 Reported results in true measured SI unit values.
- .10 Provide Departmental Representative with originals of completed forms.
- .11 Maintain copy on site during start-up, testing and commissioning period.
- .12 Forms to be both hard copy and electronic format with typed written results.

**1.6 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