

PART 1 GENERAL

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 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 2010 (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 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.

1.4 FIRE SAFETY REQUIREMENTS

- .1 Comply with both the National Building Code of Canada 2010 and the National Fire Code of Canada 2010 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 Comply with Human Resources and Skills Development Canada (HRSDC), Fire Commissioner of Canada Standards:
 - .1 FC 301, Standard for Construction Operations, June 1982 - Standards
 - .2 FC 302, Standard for Welding and Cutting, June 1982 - Standards
 - .3 FC 374, Fire Protection Standard for General Storage (Indoor and Outdoor), September 1994 - Standards
 - .4 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 Fire Prevention Unit as requested by the Departmental Representative. Store flammable liquids in approved CSA containers inspected by the Fire Prevention Unit. No open flame shall be used unless authorized by the Fire Prevention Unit.
 - .2 "Fire Watchers" as described in FC 302 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.

1.5 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) acceptable to Human Resources and Skills Development Canada (HRSDC), Labour Program.
- .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.

1.6 TEMPORARY UTILITIES

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

- .2 Notify the Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.
- .3 Give the Departmental Representative 48 hours 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.

1.7 CONSTRUCTION FACILITIES

- .1 Access Scaffold:
 - .1 Scaffolding: in accordance with CSA Z797-09 (R2014) - Code of Practice for Access Scaffold.
 - .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 Site Storage:
 - .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
 - .2 Do not unreasonably encumber site with materials or equipment.
 - .3 Move stored products or equipment that 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.
- .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 The Departmental Representative will provide a sign describing the project for the information of building users. Locate sign as requested by Departmental Representative.

- .4 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as requested by Departmental Representative.

1.8 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Maintain existing services to building and provide for personnel and vehicle access.
- .2 Hoarding:
 - .1 Design, erect and maintain temporary site enclosure as required by Authority Having Jurisdiction.
- .3 Dust Control:
 - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .4 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .5 Protection:
 - .1 Protect work against damage until take-over.
 - .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
 - .3 Protect operatives and other users of site from all hazards.

1.9 COMMON PRODUCT REQUIREMENTS

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

- .3 Manufacturer's Instructions: unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

1.10 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.

1.11 EXECUTION

- .1 Cut, Patch and Make Good:
 - .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove all items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match adjacent material, colour, finish and texture.
- .2 Firestop and smoke seal systems: in accordance with Section 07 84 00 - Firestopping.
- .3 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
- .4 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

1.12 SECURITY CHECK

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

1.13 SECURITY ESCORT

- .1 All personnel employed on this project shall be escorted when executing work in non-public areas.

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- .2 Submit an escort request to Departmental Representative at least 14 days before the service is needed. For requests submitted within the time mentioned above, the Departmental Representative will pay for the costs of the security escort. The cost incurred by a late request will be charged to the Contractor.
 - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 24 hours before the scheduled time of the escort. The cost incurred by a late cancellation will be charged to the Contractor.
 - .4 Scheduling of work:
 - .1 Carry out non disruptive work in non-secured areas work during "regular Hours" Monday to Friday from 06:00 to 18:00 hours.
 - .2 Carry out all disruptive work "after-hours". Disruptive work includes work generating excessive noise such as cutting and drilling, emitting odours, and "Hot Work" such as electrical tie-in, power shut downs and impacts to building operations.
 - .1 "After-hours" during House of Common "in session": Monday to Friday 21:00 to 06:00 hours and 24 hours Saturdays, Sundays and statutory holidays.
 - .2 "After-hours" during House of Common "Recess": Monday to Friday 18:00 to 06:00 hours and 24 hours Saturdays, Sundays and statutory holidays.
 - .3 Provide Departmental Representative a minimum of 10 working days notice prior to carrying out work after hours.
 - .4 Exterior Grounds construction activities:
 - .1 Exterior construction activities regardless of location of grounds where work is likely to create a disturbance to the building occupants shall be performed during off hours from 18:00 to 6:00 hours, and 24 / 24 on Saturdays, Sundays and statutory holidays. A disturbance is caused by disruptive work creating vibrations, impacts, noise, dust, fumes, or unsightly condition; perceptible to building occupants. The Contractor may be required to cease work for limited periods of time. Refer to Section 1.13.4.7 for details.
 - .2 Work requiring the use of a crane including delivery and removal of materials must be carried out during "off hours" Monday to Friday from 18:00 to 6:00 hours and on Saturdays, Sundays and statutory holidays unless otherwise directed by the Departmental Representative. Provide Departmental Representative with a minimum of 10 days notice.
 - .3 Work requiring the obstruction of roads or obstruction of building access/egress must be carried out on weekends, starting Friday 18:00 hours to Monday 6:00 hours. Provide Departmental Representative with a minimum of 10 days notice. During the dates and times listed below, work, deliveries or removal of materials are not permitted. Also, site construction lighting must be shut down, booms lowered to horizontal position; and audible equipment must be shut off such as compressors, generators, excavation or hoisting equipment, and other noise-producing equipment.
 - .5 Deliveries and Removal of materials and equipment:
 - .1 Schedule deliveries and removals to minimize vehicle waiting time on site or adjacent areas.

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- .2 Materials shall be delivered and unloaded within hoarded areas. If this is not possible, unloading should be carried out close to the entry point of the construction zone in order to minimize disruption to building operations. Minimize the time spent unloading and do not allow materials or equipment to remain outside the hoarded areas.
 - .3 Deliveries or removals using articulated tractor trailers or vehicles with large or heavy items shall be scheduled and agreed with Departmental Representative a minimum of 48 hours in advance.
 - .4 Use of loading Docks:
 - .1 Use of loading docks for deliveries or removal must be scheduled and coordinated with the Departmental Representative a minimum of 48 hours in advance.
 - .2 Permitted hours of use:
 - .1 Weekdays between 8:00 and 16:00 hours.
 - .2 Weekdays between 0:00 to 8:00 hours, and 16:00 to 24:00 hours, HoC Security escort will be required; request must be submitted by Departmental Representative a minimum of 48 hours in advance.
 - .3 Saturdays, Sundays and statutory holidays, HoC Security escort will be required; request must be submitted to Departmental Representative a minimum of 48 hours in advance.
 - .3 Vehicles shall not be left unattended. Unattended vehicles shall be ticketed and/or towed.
 - .4 Materials shall be unloaded and immediately transported to the designated materials storage area. Materials or equipment shall not remain in the vicinity of the loading docks.
 - .6 Working in mechanical and electrical rooms located in building basement and sub-basement is permitted.
 - .1 Contractor shall co-ordinate all work within the mechanical and electrical rooms with the Departmental Representative.
 - .2 Rooms shall be protected during construction from dust & debris.
 - .3 Provide adequate signage identifying construction in the rooms.
 - .4 Electrical rooms and mechanical rooms shall be locked at the end of each work period and when leaving rooms during lunch and breaks.
 - .5 Refer to the project drawings for mechanical and electrical room locations.
 - .6 Existing equipment within the mechanical & electrical rooms shall be protected from damage, and dust.
 - .7 Co-ordinate power and mechanical interruptions with Departmental Representative.
 - .8 Working areas shall be accessible in front of mechanical and electrical equipment.
 - .7 Late Sitzings:
 - .1 Work may create an undesirable disturbance to the building occupants and/or disrupts HoC operations. A disturbance is caused by disruptive work creating vibrations, impacts, noise, dust, fumes, or unsightly condition; perceptible to building occupants.
 - .2 When the HoC has late sittings, all work that creates a disturbance shall cease until at least one hour after the House has adjourned.

.3 PWGSC may consider planning for work stoppages. Based on past data, as a rough guide; per year there are approximately 20 days of HoC late sittings.

.4 Allow for five (5) unplanned twenty-four (24) hour work stoppages to project schedule. Assume no construction will be possible during these interruptions. Coordinate work and temporary stoppages with Departmental Representative to account potential changes to schedule.

1.14 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. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.

1.15 PRECEDENCE

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 – GENERAL

1.1 REGULATORY REQUIREMENTS

- .1 An investigation into the presence of designated substances for the High/Low Voltage Upgrade Project at the Confederation Building, 295 Wellington Street, Ottawa, Ontario, was performed in order to meet the requirements of the Canada Labour Code under Part II, Section 124 that every employer shall ensure that the health and safety at work of every person employed by the employer is protected. Furthermore, Section 125(1) (z.14) of the *Canada Labour Code* stipulates that the employer, to the extent that he controls the activity, will take all reasonable care to ensure that all persons granted access to the work place, other than the employer's employees, are informed of every known or foreseeable health and safety hazard to which they are likely to be exposed in the work place. In addition, it was performed to meet the requirements of Section 30 of the Ontario Occupational Health and Safety Act, Revised Statutes of Ontario, 1990, Chapter 0.1. By having a Designated Substances Report (DSR) conducted, the PWGSC Departmental Representative will be able to inform his or her employees, contractors, and tenants of any designated substances that may be present and possibly disturbed throughout the duration of the project. The informed Departmental Representative will then be able to impose appropriate health and safety precautions for all applicable personnel as required.
- .2 The designated substances identified in the *Occupational Health and Safety Act* and its corresponding regulations are:
 - .1 **Acrylonitrile:** “Designated Substances”
O. Reg. 490/09 (as amended)
 - .2 **Arsenic:** “Designated Substances” O. Reg. 490/09 (as amended)
 - .3 **Asbestos:**
 - .1 “Designated Substances”
O. Reg. 490/09 (as amended)
 - .2 “General – Waste Management”
O. Reg. 347/90 (as amended)
 - .3 “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations”
O. Reg 278/05 (as amended)
 - .4 **Benzene:** “Designated Substances”
O. Reg. 490/09 (as amended)
 - .5 **Coke Oven Emissions:** “Designated Substances” O. Reg. 490/09 (as amended)

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

1.2 VALIDITY DATE

- .1 The on-site survey for this report was completed on December 2, 2014 by DST Consulting Engineers Inc. (DST).
- .2 The work area is located at the Confederation Building, 295 Wellington Street, Ottawa. The scope of the work proposed consists of a survey in support of the High/Low Voltage Upgrade Project.
 - .1 The scope of work for this report involved a visual inspection of building materials and contents for the presence of suspected designated substances in the project area on December 2, 2014.
 - .2 From the visual inspection suspect materials were sampled and analyzed, where appropriate, for the above substances. On the basis of the visual inspection, a total of eighteen (18) bulk samples of suspected asbestos-containing materials (ACMs), and six (6) bulk samples of suspected lead-containing paints were collected. Two (2) duplicate bulk asbestos samples were collected and

submitted as part of quality assurance/quality control procedure QA/QC). Bulk ACM samples were collected in order to satisfy the requirements of *O. Reg. 278/05* (as amended).

The bulk samples were then submitted for analysis to Paracel Laboratories Ltd (Paracel) (accredited by the Canadian Association for Laboratory Accreditation (CALA) and National Voluntary Laboratory Accreditation Program (NVLAP)) located at 2319 St. Laurent Blvd, unit 300, Ottawa, Ontario, K1G 4J8.

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

The lead analysis of the paint samples was completed using Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) in accordance with MOE E3470, ICP-OES.

- .3 The survey was limited to project specific areas, as communicated to DST by WSP (WSP, consulting engineer retained by PWGSC for upgrade to medium? and low voltage power distribution equipment) and as per applicable project drawings provided to DST by WSP and PWGSC.¹ The survey did not include a full building asbestos and/or designated substances survey.
- .4 The visual inspection and sampling was limited to readily accessible areas. Destructive testing was not included in the investigation. Due to the nature of the structures, some inherent limitations exist as to the possible thoroughness of the designated substance survey. The survey did not include the demolition of walls, ceiling, floors, or other areas to examine concealed conditions.
- .5 It is possible that the designated substances aforementioned are present in non-accessible areas and concealed spaces (i.e., wall and ceiling cavities), or confined spaces. No other areas outside the defined work boundaries have been assessed.
- .6 Prior to beginning work, it must be confirmed with the Departmental Representative that no additional designated substances have been brought to the project area.

¹ Confederation Building High/Low Voltage System Upgrade, RS3 Design Development Report. Policy/Report No: 141-18313-00. Prepared by WSP Canada Inc. August, 2014.

- .7 In addition, the survey refers to polychlorinated biphenyls (PCBs) and halocarbons; however, it does not refer to other substances that may be present in the day-to-day usage for specialized equipment or areas in buildings (i.e. lead shields, fume hoods, etc.).
- .8 There is a possibility that materials which could not be reasonably identified within the scope of this assessment or which were not apparent during previous site visits may exist. Should any designated substance be encountered in the course of demolition, work must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. **Do not proceed until written instructions have been received.**

PART 2 - DESIGNATED SUBSTANCES

2.1 SURVEY RESULTS

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

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

Representative bulk samples, collected from materials located within the project areas have been analyzed for asbestos. Analytical results indicate that select samples contain asbestos in the project areas.

Table 1 summarizes the analytical results of bulk samples collected during the site investigation:

Table 1: Summary of Bulk Samples Analyzed for Asbestos Content				
Sample I.D.	Sampled by, Year	Sample Location	Sample Description	Asbestos Content and Type
19984-01A	DST, 2014	Sub-basement, SB-03	Drywall Joint Compound	None Detected
19984-01B		Corridor, Sub-basement		None Detected
19984-01C		Adjacent to SB-02, Caged Area, Sub-basement		None Detected
19984-02A		Sub-basement	Firestop, Pink	None Detected
19984-02B				None Detected
19984-02C				None Detected
19984-03A		Sub-basement	Firestop, Grey	None Detected
19984-03B				None Detected
19984-03C				None Detected
19984-04A		Sub-basement	Terracotta Mortar	None Detected
19984-04B				None Detected
19984-04C				None Detected
19984-05A		Sub-basement, SB-62	Drywall Joint Compound	None Detected
19984-05B				None Detected
19984-05C				None Detected
19984-06A		Sub-basement, SB-80	Drywall Joint Compound	None Detected
19984-06B				None Detected
19984-06C				None Detected
19884-07		Sub-basement	Firestop, Pink (duplicate sample)	None Detected
19884-08		Sub-basement	Firestop, Grey (duplicate sample)	None Detected
PL01 to PL74	DST, 2012	Throughout	Plaster (74 samples)	None Detected ²
DJC-05A	DST, 2012	Eighth Floor, Centre Wing	Drywall Joint Compound	1% Chrysotile
DJC-06A	DST, 2012	Eighth Floor, Wellington Wing	Drywall Joint Compound	1% Chrysotile
TC-02A	DST, 2012	Twelfth Floor	Texture Coat	1% Chrysotile

Note: **Bold** items exceed the 0.5% regulated concentration of asbestos, as per *O.Reg. 278/05*, as amended

Based on analytical results and/or limited visual observations, the following friable asbestos-containing materials (ACMs) were identified in the project areas:

- Texture coat ceiling materials, observed in the twelfth floor mechanical/storage area contain 1% Chrysotile asbestos (DST 2012 Sample TC-02A). Although non-friable in its current state, disturbance of this material has a high

² Of these samples, an additional thirteen (13) bulk plaster sampled were submitted for further analysis using Transmission Electron Microscopy (TEM). TEM analysis also confirmed these select plaster samples did not contain asbestos.

risk of creating pulverized dust. As such, this material is to be treated as a friable ACM for the purposes of this project. Texture coat materials were generally in good condition;

- Although not anticipated to be impacted or disturbed by the project, assumed friable asbestos-containing mag-block pipe insulation and layered cardboard wrap pipe insulation was observed throughout select sub-basement project areas, as well as assumed friable asbestos-containing pipe fitting insulation. These materials were generally good condition, where observed.

Based on analytical results and limited visual observations, the following non-friable ACMs were identified in the project areas:

- Based on past bulk sampling of drywall joint compound on the 8th floor (DST, 2012), non-friable drywall joint compound associated with drywall materials throughout the 8th floor contain 1% Chrysotile asbestos (DST 2012 Samples DJC-05A and DJC-06A). All drywall joint compound associated with drywall materials throughout the 8th floor should be assumed to contain asbestos, unless proven otherwise by extensive delineation sampling and laboratory analysis. All other instances of drywall joint compound in the project area are considered non-asbestos. Drywall materials were generally in good condition.

The following materials are suspected to contain asbestos:

- A yellow asbestos waste bag was observed in the sub-basement, Room SB-80, placed inside a ceiling penetration where conduits pass through to the floor above. Based on limited visual observations, the asbestos waste bag appeared to be empty, however, due to limited access to the location and the presence of equipment, DST could not confirm if the waste bag contained asbestos containing materials. As such, the waste bag should be assumed to contain asbestos-containing materials, unless proven otherwise.
- The internal components of electrical equipment were not accessible to DST at the time of the site visit. As such, materials and components present inside the electrical equipment were concealed at the time of the

site investigation and could not be confirmed by DST. Asbestos-containing cement products (e.g. Transite™) have been historically used in electrical equipment for insulation purposes. As such, prior to removal or disturbance of electrical equipment or components, the presence of ACMs inside of the equipment should be confirmed.

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

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

- .1 According to the *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended) allowable concentration of lead in surface coatings is 90mg/kg which is equivalent to 90 parts per million (ppm).
- .2 Even at low concentrations, there may be potential for exposure to very high concentrations of lead depending on the activities performed that disturb the lead-containing materials. At low lead concentrations, conducting a risk assessment to assess the potential for exposure is required to determine the need to follow precautionary measures.
- .3 Representative paint samples, collected on December 2, 2014 from the project area, have been analyzed for lead content. Analytical results indicate that paints in the project area have a lead content above the 90ppm threshold outlined in the *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended). The results are shown in Table 2 below.

Table 2: Lead Sample Results by ICP-OES

Table 2: Summary of Bulk Paint Samples Analyzed for Lead Content Analysis			
Sample I.D.	Sample Location	Sample Description	Lead Content (ppm or µg/g)
19884-LP01	Sub-basement	Grey Concrete Floor Paint	11,000
19884-LP02	Sub-basement	Green Concrete Floor Paint	1,000
19951-LP03	Sub-basement	White Wall Paint	<20
19884-LP04	Sub-basement	White Wall Paint	<20
19884-LP05	Sub-basement	Beige Ceiling Paint	71
19884-LP06	8 th Floor	White Wall Paint	<20

Bold items exceed the 90 ppm limit for lead for new applications, as per *Canada Consumer Product Safety Act's Surface Coating Materials Regulations SOR/2005-109* (as amended)

n/d = none detected

- .4 Lead may also be present in solder on the joints of copper pipes and electrical equipment and batteries in emergency lights

.9 MERCURY: Identified

Mercury-containing (fluorescent light tubes were identified within the project area.

.10 SILICA: Identified

Free crystalline silica is present in concrete and cement, and other materials such as concrete block, drywall, plaster materials.

.11 VINYL CHLORIDE MONOMER: Not Identified

.12 POLYCHLORINATED BIPHENYLS (PCBs): Not Identified

Although not a designated substance, PCBs are often found in light ballasts and electrical transformers. PCB - containing equipment suspected in the project area are:

- Transformer located in the transformer room is suspected to contain dielectric fluids with regulated concentrations of PCBs. DST has been advised by PWGSC that transformers in the project area do not contain PCBs. However, prior to removal or disposal of these transformers, written confirmation of this should be obtained from PWGSC.
- Several fluorescent light fixtures were observed within the project area. It is unknown if PCBs are present within these fluorescent light ballasts; however the presence of PCBs is not suspected as lights ballasts observed within the project area were found to be "T8" style.

.13 **HALOCARBONS:** Not Identified

.14 **OTHER HAZARDOUS MATERIALS:** Not Identified

2.2 RECOMMENDATIONS

1. ASBESTOS

- .1 All work must be done in accordance with *O.Reg 278/05* (as amended). *O.Reg 278/05* (as amended) outlines the precautions required when performing work involving asbestos-containing materials. The regulation stipulates appropriate respiratory protection, work procedures and ventilation requirements that must be utilized during the disturbance of any asbestos-containing materials, or materials suspected to contain asbestos.
- .2 The removal or disturbance of one square metre or less of friable asbestos-containing materials (pipe fitting insulation and texture coat ceiling materials) must be conducted using a minimum of Type 2 asbestos work procedures. The removal or disturbance of more than one square metre of friable asbestos-containing materials must be conducted using Type 3 asbestos work procedures.
- .3 The removal of good condition asbestos-containing pipe insulation and pipe fitting insulation can be conducted using Type 2 glove bag procedures, provided the material is in good condition, and a proper seal can be maintained.
- .4 The removal or disturbance of less than one square metre of drywall in which the joint filling compound is asbestos-containing can be completed using Type 1 asbestos precautionary measures provided that the material is wetted and removed using hand tools only. The removal or disturbance of one square metre or more of drywall in which the joint filling compound is asbestos-containing must be completed using a minimum of Type 2 work procedures provided that no power tools are used OR power tools with HEPA filtration.
- .5 Some ACMs may be concealed and thus not observed at the time of the survey. Should any previously unidentified suspect ACMs be encountered as part of future work, these materials are to be treated as ACMs and handled accordingly, unless sampling proves

otherwise. Materials that have not been analyzed, but are visibly similar to other materials identified as asbestos-containing, must be considered asbestos-containing unless proven otherwise by laboratory analysis.

- .6 Disposal of asbestos waste is controlled by "*General – Waste Management*" O.Reg 347/90 (as amended) under the Ontario *Environmental Protection Act*. This regulation requires that asbestos waste be sealed in double containers resistant to puncture and tears, and appropriately labelled. The waste must be disposed at a licensed waste disposal site. Proper notification must be issued to the site representative prior to transportation of waste. The transport of the waste to the disposal site is controlled by the federal *Transportation of Dangerous Goods Act*, 1992 (TDGA).

2. LEAD

- .1 If lead-containing materials are disturbed (i.e. during dry sanding, grinding, polishing and sawing operations), then proper precautions, as outlined under *Regulation 490/09* (as amended) of the *Ontario Occupational Health and Safety Act*, must be followed.
- .2 Under *Regulation 490/09* (as amended), regulatory limits have been established for occupational exposure limits to airborne lead that may be present in a workplace. The Time Weighted Average Exposure Values to airborne lead dust or fumes should not exceed the Ministry of Labour's 0.05 milligram per cubic metre (mg/m³) limit during the removal of paints and products containing any concentration of lead. The TWAEV represents the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects.
- .3 Contractors performing work that requires disturbance of lead-containing materials are responsible to ensure that the workers are not exposed to airborne lead dust levels in excess of the time-weighted average Exposure Concentration for lead-containing paints. It should be noted that the use of mechanically-powered tools or torches on lead-containing materials increases the concentration of airborne lead dust or fumes and thereby requiring more stringent respiratory protection and controlled work procedures.

- .4 Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Lead on Construction Projects*". This document classifies all disturbances of lead-containing materials as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, based on presumed airborne concentrations of lead generated during the work each of which will have defined work practices. Although this document is not a regulation, Ministry of Labour Inspectors use it as guidance during site inspections.
- .5 The disposal of construction waste containing lead is controlled by "*General – Waste Management*" O.Reg 347/90 (as amended) under the *Ontario Environmental Protection Act*. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as "hazardous", "non-hazardous" or "registerable solid waste", depending on the results of the leachate test.

3. MERCURY

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

4. SILICA

- .1 Silica is governed by the *Regulation 490/09* (as amended) under the *Ontario Occupational Health and Safety Act*. The regulation provides requirements for allowable exposure levels.
- .2 Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in select materials within the project area, appropriate respiratory protection and ventilation must be donned during the demolition and modifications of these structures.

- .3 The Occupational Health and Safety Branch of the Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Silica on Construction Projects*". This document classifies the disturbance of materials containing silica as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

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

- .1 PCBs are not recognized as Designated Substances. However, a survey of the project area was completed for this substance due to its risks to both human health and environment. During the site investigation, several fluorescent light fixtures were observed within the project area. It is unknown if PCBs are present within these fluorescent light ballasts; however the presence of PCBs is not suspected as lights ballasts observed within the project area were found to be "T8" style. Therefore, if any lamp ballast is removed during this project, please refer to the Environmental Canada, *Identification of Lamp Ballasts Containing PCBs, August 1991* report in order to identify the ballast type. Ballasts for a typical 1.2 metre fluorescent light fixture made with PCBs contain approximately 23.6 grams of PCB. DST has been advised by PWGSC that transformers in the project area do not contain PCBs. However, prior to removal or disposal of these transformers, written confirmation of this should be obtained from PWGSC.
- .2 If any fluorescent light ballasts are removed during any future works, they must be sorted (as applicable) by a competent person.

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

- Canadian Environmental Protection Act's (CEPA) *PCB Regulations*,
 - Canadian Council of Ministers of the Environment's "*Guidelines for the Management of Wastes Containing Polychlorinated Biphenyls*, and
 - Ontario Environmental Protection Act's *O. Reg 362/90 "Waste Management – PCB's"* as amended (*O. Reg 33/07*).
- .3 Any PCB-containing equipment that is removed from the site or placed into storage shall be

appropriately reported in accordance with the requirements of the CEPA *PCB Regulations*.

6. CONTRACTORS DUTIES

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

END OF SECTION

PART 1 GENERAL1.1 REFERENCES

- .1 Project Supplementary Conditions

1.2 CASH ALLOWANCES

- .1 Include in total tender amount cash allowances stated herein.
- .2 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.
- .3 The total amount, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.
- .4 The total amount will be adjusted by written order to provide for excess or deficit to each cash allowance.
- .5 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.
- .6 Include progress payments on accounts of work authorized under cash allowances in Departmental Representative's monthly certificate for payment.
- .7 Prepare schedule jointly with Departmental Representative and Contractor to show when items called for under cash allowances must be authorized by Departmental Representative for ordering purposes so that progress of Work will not be delayed.
- .8 Amount of each allowance, for Work specified in respective specification Sections is as follows:
 - .1 Include allowance of \$100,000 for the hydro vault modification as per drawing:
Confederation Building, High/Low Voltage System Upgrade
229 Wellington - R.069893.001
92010585 - COM #1
92010585 - COM #2

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 GENERAL1.1 REFERENCES

.1 Definitions:

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (Gantt chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.

.3 Baseline: original approved plan (for Project, work package, or activity), plus or minus approved scope changes.

.4 Cash Flow: projection of progress payment requests based on cash loaded construction schedule.

.5 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.

.6 Constraint: applicable restriction or limitation, either internal or external to project, that will affect performance of Project. Factors that affect activities can be scheduled.

.7 Control: process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.

.8 Critical Activity: any activity on a critical path.

.1 Most commonly determined by using critical path method.

.9 Critical Path: sequence of activities that determines duration of Project. Generally, it is the longest path through Project.

.1 Usually defined as those activities with float less than or equal to specified value, often zero.

.10 Critical Path Method (CPM): network analysis technique used to determine the amount of scheduling flexibility (amount of float) on various logical network paths in Project schedule network, and to determine the minimum total Project duration.

.11 Data Date: date through which project status and progress were last determined and reported for analyses, such as scheduling and performance measurements.

.12 Duration: total number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element.

.1 Usually expressed as workdays or work weeks.

.13 Early Finish Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can finish, based on network logic and schedule constraints.

.1 Early finish dates can change as Project progresses and changes are made to Project plan.

- .14 Early Start Date: in critical path method, earliest possible point in time on which uncompleted portions of activity (or Project) can start, based on network logic and schedule constraints.
 - .1 Early start dates can change as Project progresses and changes are made to Project Plan.
- .15 Finish Date: point in time associated with activity's completion.
 - .1 Usually qualified by one of following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
- .16 Float: amount of time that activity may be delayed from its early start without delaying Project finish date.
 - .1 This resource is available to both Departmental Representative and Contractor.
- .17 Impact Analysis: schedule analysis technique that adds a modeled delay to an accepted construction schedule to determined possible outcome of that delay on project completion.
- .18 Lag: modification of logical relationship that directs delay in successor activity.
- .19 Late Finish Date (LF): in critical path method, latest possible point in time that activity may be completed without delaying specified milestone (usually Project finish date).
- .20 Late Start Date (LS): in critical path method, latest possible point in time that activity may begin without delaying specified milestone (usually Project finish date).
- .21 Lead: modification of logical relationship that allows acceleration of successor task.
- .22 Logic Diagram: see Project network diagram.
- .23 Master Schedule: summary-level schedule that identifies major deliverable; work breakdowns structure and key milestones.
- .24 Milestone: significant point or event in Project, usually completion of major deliverable.
- .25 Monitoring: capture, analysis, and reporting of Project performance, usually as compared to plan.
- .26 Non-Critical Activities: activities which when delayed, do not affect project timeline.
- .27 Project Control System: fully computerized system utilizing commercially available software packages.
- .28 Project Network Diagram: schematic display of logical relationships of Project activities.
 - .1 Always drawn from left to right to reflect Project chronology.
- .29 Project Plan: formal, approved document used to guide both Project execution and Project control.
 - .1 Primary uses of Project plan are to document planning assumptions and decisions, facilitate communication among stakeholders, and document approved scope, cost, and schedule baselines.
 - .2 Project plan may be summary or detailed.
- .30 Project Planning: development and maintenance of Project Plan.
- .31 Project Planning, Monitoring and Control System: overall system operated to enable monitoring of Project Work in relation to established milestones.
- .32 Project Schedule: planned dates for performing activities and planned dates for meeting milestones.

- .33 Quantified days duration: working days based on 5 day work week, discounting statutory holidays.
 - .34 Risk: uncertain event or condition that, if it occurs, has positive or negative effect on Project's objectives.
 - .35 Start Date: point in time associated with activity's start, usually qualified by one of following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
 - .36 Work Breakdown Structure (WBS): deliverable-oriented hierarchical decomposition of Work to be executed by Contractor to accomplish project objectives and create required deliverables. It organizes and defines total scope of Project. Each descending level represents an increasingly detailed definition of Project Work. WBS is decomposed into Work packages.
- .2 Reference Standards:
- .1 Project Management Institute (PMI Standards)
 - .1 A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fifth Edition.
 - .2 Practice Standard for Scheduling - 2011.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Project Meeting:
 - .1 Meet with Departmental Representative within 10 working days of Award of Contract date, to establish Work requirements and approach to project construction operations.
 - .2 Participate in regular project progress meetings with Departmental Representative specifically intended to discuss update of detailed schedule and contract changes.
- .2 Scheduling:
 - .1 Planning: ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made.
 - .2 Ensure project schedule efficiencies through monitoring of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities with their scheduled completions, and review progress of activities that has started but are not yet completed.
 - .3 Monitor sufficiently often so that causes of delays can immediately be identified and removed.
- .3 Project monitoring and reporting:
 - .1 Keep team aware of changes to schedule, and possible consequences as project progresses.
 - .2 Use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
 - .3 Begin narrative reporting with statement on general status of Project followed by summarization of delays, potential problems, corrective measures and Project status criticality.

- .4 Critical Path Method (CPM) Requirements:
- .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
 - .2 Revise Master Schedule and Detail Schedule deemed impractical by Departmental Representative and resubmit for approval.
 - .3 Consider Master Schedule and Detail Schedule deemed practical by Departmental Representative, showing Work completed in less than specified Contract duration, to have float.
 - .4 First Milestone on Master Schedule and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
 - .5 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
 - .6 Substantial Completion with "LF" constraint equal to calculated date.
 - .7 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration then float calculation to reflect negative float.
 - .8 Delays to non-critical activities, those with float may not be basis for time extension.
 - .9 Do not use float suppression techniques such as software constraints, preferential sequencing, special lead/lag logic restraints, extended activity times or imposed dates other than required by Contract.
 - .10 Allow for and show Master Plan and Detail Schedule adverse weather conditions normally anticipated.
 - .1 Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
 - .11 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration.
 - .1 Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
 - .12 Arrange participation on and off site of Subcontractors and suppliers, as required by Departmental Representative, for purpose of network planning, scheduling, updating and progress monitoring.
 - .1 Approvals by Departmental Representative of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
 - .13 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.

- .4 Submit letter ensuring that schedule has been prepared in co-ordination with major Sub-contractors.
- .5 Refer to article "PROGRESS MONITORING AND REPORTING" of this specification Section for frequency of Project control system submittals.
- .6 Submit impact analysis of schedule for any changes.
 - .1 Include draft schedule update and report as outlined in article "PROGRESS MONITORING AND REPORTING".
- .7 Submit Project planning, monitoring and control system data as required by Departmental Representative in following form.
 - .1 CD files in original scheduling software containing schedule and cash flow information, labelled with data date, specific update, and person responsible for update.
 - .2 Master Schedule Bar Chart.
 - .3 Construction Detail schedule Bar Chart.
 - .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
 - .5 Criticality report listing activities and milestones with negative and up to 5 days total float used as first sort for ready identification of critical or near critical paths through entire project. List early and late starts and finishes dates, together with durations, codes and float for critical activities.
 - .6 Progress report in early start sequence, listing for each trade, activities due to start, underway, or finished within 2 months from monthly update date. List activity identification number, description and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.4 QUALITY ASSURANCE

- .1 Use personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.5 WORK BREAKDOWN STRUCTURE (WBS)

- .1 Prepare construction Work Breakdown Structure (WBS) within 10 working days of Award of Contract date.
 - .1 Develop WBS through at least five levels: project, stage, element, sub-element and work package.

1.6 PROJECT MILESTONES

- .1 Phase 1A: EM power and normal 600 V service entrance removals.
- .2 Phase 1B: New equipment and relocates.

- .3 Phase 2A: 4.1 kV distributions, removals.
- .4 Phase 2B: New and relocates for outdoor pole line.
- .5 Phase 3A: Basement distribution transformers and panels removals.
- .6 Phase 3B: Basement new equipment and installations.
- .7 Phase 4A: Wellington wing removals.
- .8 Phase 4B: Wellington wing new equipment installations.
- .9 Phase 5A: Tower wing removals.
- .10 Phase 5B: Tower new equipment installations.
- .11 Phase 6A: Centre wing removals.
- .12 Phase 6B: Centre wing new equipment installations.
- .13 Phase 7A: Bank wiring removals.
- .14 Phase 7B: Bank wiring new equipment installations.
- .15 Phase 8A: Kitchen area removals.
- .16 Phase 8B: Kitchen area new equipment installations.

1.7 MASTER SCHEDULE

- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Schedule (CPM logic diagram) and dependent Cash Flow Projection within 5 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Schedule will be used as baseline.
 - .1 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .2 Departmental Representative as Project progresses will review and return revised baseline within 5 work days.
- .3 Reconcile revisions to Master Schedule and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Schedule will include:
 - .1 CD containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.

- .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
- .3 Network diagram showing coding, activity sequencing (logic), total float, early/late dates, current status and durations.
- .4 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.

1.8 DETAIL SCHEDULE

- .1 Provide detailed project schedule (CPM logic diagram) within 10 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site works.
 - .8 Testing.
 - .9 Commissioning and acceptance.
- .2 Detail CPM schedule to cover in detail minimum period of 6 months beginning from Award of Contract date.
 - .1 Show remaining activities for CPM construction network system up to Final Certificate and develop complete detail as project progresses.
 - .2 Detail activities completely and comprehensively throughout duration of project.
- .3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Schedule.
- .4 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submittals, resubmittals and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from 3 to 15 workdays each.
- .5 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .6 Ensure activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of

activities throughout length of Project to form "Critical Path". Increased number of critical activities is seen as indication of increased risk.

- .7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative for review effects created by insertion of new Change Order.

1.9 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

- .1 Allow 5 work days for review by Departmental Representative of proposed construction Detail Schedule.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 work days.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.
- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.10 COMPLIANCE WITH DETAIL SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 Increase of personnel on site for effected activities or work package.
 - .2 Overtime work and Additional work shifts.

1.11 PROGRESS MONITORING AND REPORTING

- .1 On ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of Subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.
- .3 Perform Detail Schedule update monthly with status dated (Data Date) on last

working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.

- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Departmental Representative copies of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, change orders, possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective measures.
 - .5 Review of progress and status of Critical Path activities.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 GENERAL1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension 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 Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are 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 Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

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- .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 7 days for Departmental Representative's review of each submission.
 - .5 If adjustments made on shop drawings by Departmental Representative affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
 - .9 After Departmental Representative's review, distribute copies.

- .10 Submit electronic 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 certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .13 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .15 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit 2 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, shop drawing will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of

responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

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

1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.

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 GENERAL1.1 REFERENCES

- .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, current edition as amended.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals 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 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 10 - General Instructions.
- .7 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.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 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.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.
- .2 Tunnel is identified as a confined space according to federal regulations.

1.5 MEETINGS

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

1.6 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 00 10 - General Instructions.

1.7 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Asbestos refer to DSR.

1.8 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.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work. Be responsible and assume the role of "Constructor" as described in the Ontario Occupational Health & Safety Act and Regulations for Construction Projects.

- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with the Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 as amended.
- .2 Comply with Ontario Regulations for Construction Projects, O.Reg. 213/91 current edition as amended.

1.11 UNFORSEEN HAZARDS

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

1.12 SITE SUPERVISOR

- .1 Site Supervisor shall be competent person in Health and Safety. Site Supervisor must:
 - .1 Be on site during execution of Work.

1.13 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.

1.14 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.

1.15 POWDER ACTUATED DEVICES

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

1.16 WORK STOPPAGE

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

PART 1 GENERAL

1.1 INSPECTION

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

1.2 INDEPENDENT INSPECTION AGENCIES

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

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

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

1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

1.6 REPORTS

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

1.7 EQUIPMENT AND SYSTEMS

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

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL1.1 RELATED REQUIREMENTS

- .1 Section 07 84 00 - Fire Stopping.

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.

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; maintain excavations free of water.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching 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 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00 - Fire Stopping, full thickness of the construction element.
- .12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as requested by Departmental Representative.
- .3 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.
- .4 Provide and use marked separate bins for recycling.
- .5 Dispose of waste materials and debris off site.
- .6 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .7 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Departmental Representative or other Contractors.

- .5 Remove waste materials from site at regularly scheduled times or dispose of as requested by Departmental Representative.
- .6 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.
- .7 Clean and sweep work area and remove waste.
- .8 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

PWGSC requires that all construction and demolition projects undertaken on federal properties include a Waste Management Program that encourages reuse, recycling and diverting materials that would otherwise be sent to landfill. This Section describes the obligations of the Contractor in managing the waste that is anticipated at this site.

1.1 SECTION INCLUDES

- .1 Text, schedules and procedures for systematic Waste Management Program for this project, including:
 - .1 Waste Audit (WA) Summary - Schedule A.
 - .2 Waste Reduction Workplan (WRW) - Schedule B.
 - .3 Waste Material Tracking Form – Schedule C.

1.2 DEFINITIONS

- .1 Demolition Waste Audit (DWA): Relates to the anticipated waste quantities generated from the demolition project prepared by the Owner. Refer to Schedule A.
- .2 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .3 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .4 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .5 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation. To be prepared by the Contractor. See also Article 1.5 of this Section.
- .6 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related activities, required submittal and reporting requirements.
- .7 Waste Reduction Workplan (WRW): Written report which addresses opportunities for reduction, reuse, or recycling of materials. Prepared by Owner; refer to Schedule B.

1.4 SUBMITTALS

- .1 Prepare and submit following prior to project start-up:
 - .1 Submit 2 copies of written Materials Source Separation Program (MSSP). See Article 1.5 of this Section.

1.5 MATERIALS
SOURCE SEPARATION
PROGRAM (MSSP)

- .2 Prepare and maintain on site at all times for consultation by Owner's Representative -up:
 - .1 Up-to-date Waste Material Tracking Form – Schedule C. Should be updated daily or as per material pick-up frequency.
- .3 Submit at end of project a report of waste materials salvaged for reuse, recycling or disposal:
 - .1 Submit the completed Waste Material Tracking Form – Schedule C to the Owner's Representative.
 - .2 Provide all receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
 - .3 For each material reused, sold or recycled from project, include amount in tones and the destination.
 - .4 For each material land-filled or sent to a dry-materials site project, include amount of material and identity of landfill, dry-materials site or transfer station.
- .1 Prepare MSSP and have ready for use prior to project start-up. MSSP should include but not limited to:
 - .1 Deconstruction / disassembly techniques and sequencing.
 - .2 Schedule for deconstruction / disassembly.
 - .3 Destination of materials listed.
 - .4 Security and protection.
 - .5 Clear labeling of storage areas.
 - .6 Details on materials handling and removal procedures.
 - .7 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Owner's Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials. Transport to approved and authorized recycling facility or to users of material for recycling.

1.6 RECYCLING INFORMATION_
RESOURCES

- .1 Ontario Ministry of Environment, St. Clair Avenue West,
Toronto, ON, M4V 1P5.
 - .1 Telephone: 800-565-4923 or 416-323-4321.
 - .2 Fax: 416-323-4682.
- .2 Recycling Council of Ontario: 51 Wolseley St., Toronto ON, M5T 1A4.
 - .1 Telephone: 416-657-2797.
 - .2 Fax: 416-960-8053
 - .3 Email: rco@rco.on.ca.
 - .4 Internet: <http://www.rco.on.ca/>.

1.7 STORAGE, HANDLING
AND PROTECTION

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

1.8 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of liquid waste, volatile materials, mineral spirits, oil, paint thinner, or any hazardous material into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.

	.4	Remove materials from deconstruction as deconstruction/disassembly work progresses.
	.5	Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.
<u>1.9 USE OF SITE AND FACILITIES</u>	.1	Execute work with least possible interference or disturbance to normal use of premises.
	.2	Provide temporary security measures approved by Departmental Representative.
<u>1.10 SCHEDULING</u>	.1	Coordinate Work with other activities at site to ensure timely and orderly progress of Work.
<u>PART 2 - PRODUCTS</u>	Section not applicable.	
<u>PART 3 - EXECUTION</u>		
<u>3.1 APPLICATION</u>	.1	Perform work in compliance with WRW.
	.2	Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.
<u>3.2 CLEANING</u>	.1	Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
	.2	Clean-up work area as work progresses.
	.3	Source separate materials to be reused/recycled into specified sort areas.
<u>3.3 DIVERSION OF MATERIALS</u>	.1	From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Owner's Representative, and consistent with applicable fire regulations.
	.1	Mark containers or stockpile areas.
	.2	Provide instruction on disposal practices.
	.2	On-site sale of salvaged, recovered, reusable and recyclable materials is not permitted.
	.3	Target Diversions: Metal 100 %; Concrete 0 %; Drywall 0%. See Waste Reduction Workplan (WRW) - Schedule B.

3.4 CONSTRUCTION &
DEMOLITION WASTE

- .1 Carefully deconstruct and separate materials / equipment and divert from waste destined for landfill to maximum extent possible. Reuse, recycle or sell material off site for reuse except where indicated otherwise. On-site sales are not permitted.
- .2 Provide facilities for collection, handling and storage of source separated wastes. Source separate the following waste:
 - .1 Brick and concrete.
 - .2 Drywall.
 - .3 Wood.
 - .4 Electrical cables and wiring.
 - .5 Metal.
- .3 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Owner's Representative prior to removal of waste from the demolition site.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English and French. Where French documents are not available for a given piece of equipment, provide signed letter from manufacturer indicating this is the case.
- .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 PDF document.
- .3 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .4 Text: manufacturer's printed data, or typewritten data.
- .5 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .6 Training: refer to Section 01 91 41 - Commissioning: Training.

1.6 AS-BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Instructions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.

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

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of blue 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 depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.

- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.8 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site 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.

1.9 DELIVERY, STORAGE AND HANDLING

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

- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.10 WARRANTIES

- .1 Provide warranty letter.
 - .1 Warranty shall cover all work and equipment provided under this contract for a period of 1 year from substantial completion.

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 GENERAL1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of final inspection, substantial performance and interim completion.
- .2 Departmental Representative: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation.
 - .4 Ensure testing, adjusting, and balancing has been performed and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment designated location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment is adequate to train all personnel in the use of equipment. Allow for a minimum of 3 sessions for each piece of equipment to ensure all shift personnel are properly trained.
- .6 Training must be provided in English and French.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.

- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Departmental Representative's personnel.
 - .2 Provide written report that demonstration and instructions have been completed.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 GENERAL1.1 RELATED REQUIREMENTS

- .1 Section 01 91 31 - Commissioning (CX) Plan.
- .2 Section 01 91 33 - Commissioning Forms.
- .3 Section 01 91 41 - Commissioning: Training.
- .4 All sections related to Mechanical, Electrical, Controls, Fire Alarm, Security Systems, etc.

1.2 ACRONYMS

- .1 Cx - Commissioning.
- .2 EMCS - Energy Monitoring and Control Systems.
- .3 O&M - Operation and Maintenance.
- .4 PI - Product Information.
- .5 PV - Performance Verification.
- .6 PWGSC - Public Works and Government Services Canada.
- .7 TAB - Testing, Adjusting and Balancing.

1.3 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 Cx Team to consist of following members:
 - .1 Departmental Representative is responsible for:
 - .1 Coordinating and managing the Cx process.
 - .2 Coordination and planning of Cx activities with the Contractor to ensure proper timing and preparation for testing.
 - .3 Preparation and submission of Commissioning test reports.
 - .4 Witnessing, certifying accuracy of Contractor reported results.
 - .5 Reviewing development of O&M manual.
 - .6 Ensuring implementation of final Cx Plan.

- .7 Witnessing verification of performance of installed systems and equipment.
- .8 Coordinating and monitoring implementation of Training Plan.
- .2 Departmental Representative: during construction, will conduct periodic site reviews to observe general progress.
- .3 Public Works 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, and 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, and development of Cx documentation.
 - .5 Work closely with members of Cx Team.
- .4 Construction Team: Contractor, Sub-Contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including but not limited to:
 - .1 Assigning one person as point of contact with Commissioning Authority and Departmental Representative for administrative and coordination purposes.
 - .2 Preparing Cx testing.
 - .3 Preparing Cx schedule.
 - .4 Preparation of O&M Manual.
 - .5 Performance of Cx activities.
 - .6 Delivery of training and Cx documentation.
- .5 Consultant: The prime consultant and the engineers are the design team responsible for the specification, design and implementation of the project.
- .6 Client Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility and implementing operation in the facility.
 - .2 Day-To-Day operation of the facility.
- .7 Other Cx Participants:
 - .1 Refer Section 01 91 31 for Other Cx Participants.

1.4 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the Project. Final Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

Objectives:

- .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the Operation & Maintenance Manual.
 - .3 Provide effective training to O&M staff.
- .2 Commissioning is a team effort. The Commissioning Team will be comprised of the Commissioning Authority (Team Leader), Contractor's Representatives, Design Consultants, and Owners Representatives. The Commissioning Authority and the Contractor's Representatives are required at all commissioning activities; the Consultants and Owners representatives will attend as required. Contractor will include other Cx participants in the Cx process such as installers, Equipment manufacturers, Specialist Sub-Contractors and suppliers.
- .3 Contractor to provide a Contractor's Commissioning Representative, to coordinate and schedule Commissioning Activities as part of the Commissioning Team.
- .4 Contractor to assist in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
- .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .5 Design Criteria: Design criteria to be as per information listed in the specification and drawings. Functional and operational requirements as described must be achieved.

1.5 COMMISSIONING OVERVIEW

- .1 The Commissioning process for this project will be as follows:
 - .1 The Commissioning Authority will draft a Commissioning Plan, which will detail the commissioning activities and testing required at particular stages in the construction project, as specified in the specification and drawings.
 - .2 The Contractor will develop the construction schedule.
 - .3 The commissioning activities and testing will be merged in to the construction schedule by the Contractor.
- .2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .3 Cx is conducted in concert with activities performed during all stages of project delivery. Cx identifies issues in the Planning and Design stages, which are addressed during Construction and Cx stages to ensure the facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.
- .4 Interim Acceptance Certificate will be issued by the Departmental Representative 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.

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

1.7 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to the Departmental Representative and Commissioning Team:
 - .1 Adequacy and understanding of the requirements of Cx.
 - .2 Understanding of 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, Contractors to:
 - .1 Confirm construction team's compliance with commissioning process, to the Commissioning Team.
 - .2 Ensure installation of related components, equipment, sub-systems, and systems are complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation (O&M, Start-up documentation, etc.) in progress and submitted for pre-commissioning review.
 - .5 Understand completely design criteria and intent and special features.

- .6 Submit complete start-up documentation to Commissioning Team for review.
 - .7 Have Cx schedules up-to-date and submitted for review.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Ensure "As-Built" system schematics are available and up-to-date.
- .4 Inform Commissioning Team in writing of discrepancies, deficiencies and unfinished works.

1.8 CONFLICTS

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

1.9 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 Preliminary Cx activity dates.
 - .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 Provide additional documentation relating to Cx process required by Commissioning Team.

1.10 COMMISSIONING DOCUMENTATION

- .1 Commissioning Authority to provide Project Specific Commissioning Forms as required.
- .2 Refer to Section 01 91 33 - Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .3 Commissioning Team to review and approve Cx documentation.

1.11 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with:
 - .1 Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).

- .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.

1.12 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress and identify deficiencies relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At approximately the 60% construction completion stage, Commissioning Team 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 the Commissioning Authority, who will record and distribute minutes.
- .7 It is mandatory that a representative, with decision making ability, from each trade, attend the Commissioning Meetings. Attendance of relevant manufacturer representatives may be required to provide technical support to the Commissioning meetings on an "as needed" basis.

1.13 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.

1.14 WITNESSING OF STARTING AND TESTING

- .1 Provide minimum of 48 hours notice prior to commencement.
- .2 Commissioning Team members to witness start-up and testing at their discretion.

- .3 Commissioning Authority and Contractor's Representatives to be present at all commissioning tests performed. Suppliers and equipment manufacturers to document start-up testing as specified.
- .4 Commissioning is not a troubleshooting exercise. All equipment is to be pre-tested, before attempting commissioning testing.

1.15 MANUFACTURER'S INVOLVEMENT

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

1.16 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment operation compared to specification.
 - .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 Commissioning Team after distinct phases have been completed and before commencing next phase.
- .4 With assistance from the Contractor and Sub-Contractors, the Commissioning Authority will Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Commissioning Team. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by the Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by the Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be removed from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.17 START-UP DOCUMENTATION

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

1.18 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.19 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

1.20 START OF COMMISSIONING

- .1 Notify Departmental Representative 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.

1.21 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.

1.22 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Performance Verification with the Commissioning Team is not a troubleshooting exercise. Systems are to be pre-tested as much as possible to ensure fundamental construction deficiencies are resolved before presenting the system or equipment to the Commissioning Team.
- .2 Carry out Cx:
 - .1 Systems to be tested under actual or accepted simulated operating conditions, over entire operating range, in all modes of operation. Modes to include regular operation, emergency, occupied, unoccupied, summer mode and winter mode.
 - .2 On independent systems and interacting systems.
- .3 Cx procedures to be repeatable and reported results are to be verifiable.
- .4 Follow equipment manufacturer's operating instructions.

- .5 EMCS trending to be available as supporting documentation for performance verification.

1.23 WITNESSING COMMISSIONING

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

1.24 AUTHORITIES HAVING JURISDICTION

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

1.25 COMMISSIONING CONSTRAINTS

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

1.26 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 the Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.27 EXTENT OF VERIFICATION

- .1 All areas:
 - .1 Provide manpower and instrumentation to verify up to 100% of reported results.
- .2 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

- .3 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .4 Perform additional commissioning until results are acceptable to the Departmental Representative.

1.28 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.

1.29 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.

1.30 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of the 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.

1.31 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by the Departmental Representative.

1.32 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.

1.33 TRAINING

- .1 In accordance with Section 01 91 41 - Commissioning: Training.

1.34 MAINTENANCE MATERIALS, SPARE PARTS AND SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.
- .2 Contractor to prepare a triplicate transmittal for maintenance material turned over to the Departmental Representative. Departmental Representative's printed name, signature, date, material, material quantity, and delivered location, must appear on each of the transmittal forms.
- .3 One copy of the transmittal should be retained by the Contractor, one copy should be delivered to the recipient of the material, and one copy submitted to the Departmental Representative. Any material delivered without a transmittal will be considered not delivered.

1.35 OCCUPANCY

- .1 Cooperate fully with Departmental Representatives, and Occupants during stages of acceptance and occupancy of facility.

1.36 INSTALLED INSTRUMENTATION

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

1.37 PERFORMANCE VERIFICATION TOLERANCES

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

- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

1.38 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.

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 91 13 - General Commissioning (CX) Requirements.
- .2 Section 01 91 33 - Commissioning Forms.
- .3 Section 01 91 41 - Commissioning Training.
- .4 All sections related to Mechanical, Electrical, Controls, Fire Alarm, Security Systems, etc.

1.2 REFERENCES

- .1 National Fire Protection Association (NFPA).
 - .1 NFPA 40-2011: Standard for the Storage and Handling of Cellulose Nitrate Film.
- .2 Public Works and Government Services Canada (PWGSC)
 - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition.
- .3 Underwriters' Laboratories of Canada (ULC)

1.3 GENERAL

- .1 Provide a fully functional installation:
 - .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 Facility user and O&M personnel have been fully trained in aspects of installed systems.
 - .3 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources and 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 the verification process of how the facility meets 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 O&M - Operation and Maintenance.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 MSDS - Material Safety Data Sheets.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.
 - .8 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
 - .1 Bumping: short-term start-up to prove ability to start and prove correct rotation.
 - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF CX PLAN

- .1 The Cx Plan will be prepared by the Departmental Representative and submitted to the Contractor and will take into account:
 - .1 Approved shop drawings and product data. Approved changes to contract.
 - .2 Cx activities and testing outline.
 - .3 Information to be implemented in the Contractor's project schedule.
 - .4 Contractor's, Sub-contractor's, suppliers' requirements.
 - .5 Project construction team and Cx team requirements.
- .2 Final Cx Plan complete with Contractor's information to be submitted by the Commissioning Authority to the Departmental Representative and obtain written approval within 8 weeks of award of contract.

1.5 CX SCHEDULE

- .1 During construction phase, the Contractor is to update, refine and revise the Cx schedule to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 6 weeks during construction phase. At each revision, indicate revision number and date.

- .3 Submit each revised Cx Schedule to Commissioning Team for review and obtain written approval.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Cx Team to consist of following members:
 - .1 Departmental Representative is responsible for:
 - .1 Coordinating and managing the Cx process.
 - .2 Coordination and planning of Cx activities with the Contractor to ensure proper timing and preparation for testing.
 - .3 Preparation and submission of Commissioning test reports.
 - .4 Witnessing, certifying accuracy of Contractor reported results.
 - .5 Witnessing and certifying TAB and other tests.
 - .6 Reviewing development of O&M manual.
 - .7 Ensuring implementation of final Cx Plan.
 - .8 Witnessing verification of performance of installed systems and equipment.
 - .9 Coordinating and monitoring implementation of Training Plan.
 - .2 Departmental Representative: during construction, will conduct periodic site reviews to observe general progress.
 - .3 Public Works 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, and 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, and development of Cx documentation.
 - .5 Work closely with members of Cx Team.
 - .4 Construction Team: Contractor, Sub-Contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including but not limited to:
 - .1 Assigning one person as point of contact with Commissioning Authority and Departmental Representative for administrative and coordination purposes.
 - .2 Preparing Cx testing.
 - .3 Preparing Cx schedule.
 - .4 Coordinating and execution of TAB.
 - .5 Preparation of O&M Manual.
 - .6 Performance of Cx activities.
 - .7 Delivery of training and Cx documentation.

.5 Consultant: The prime consultant and the engineers are the design team responsible for the specification, design and implementation of the project.

.6 Client Manager: represents lead role in Operation Phase and onwards and is responsible for:

.1 Receiving facility and implementing operation in the facility.

.2 Day-To-Day operation of the facility.

1.7 OTHER CX PARTICIPANTS

.1 Employ the following Cx participants to verify performance of equipment and systems:

.1 Installation Contractor/Subcontractor:

.2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.

.3 Specialist Subcontractor: equipment and systems supplied and installed by Specialist Subcontractor.

.4 Ensure that other Cx participant(s):

.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 beyond level of training provided to O&M personnel.

.4 Redistribution of electrical services.

.5 Modifications of fire alarm systems.

.6 Modifications to voice communications systems.

.5 Provide names of other 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.

1.8 EXTENT OF CX

.1 Commissioning to include all equipment and systems that have a specific operating or performance rating that must be achieved for proper building operation.

.2 Commission mechanical systems and associated equipment but not limited to:

.1 HVAC and exhaust systems:

.1 Fire Dampers.

.2 Seismic restraint and control measures.

.3 EMCS.

- .3 Commission electrical systems and equipment:
 - .1 Automatic transfer switches.
 - .2 Motor control centres and associated motor controls.
 - .3 Main switchboard and associated breakers.

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

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

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
 - .2 Cx Specifications.
 - .3 Start-up, pre-Cx activities and documentation for systems, and equipment.
 - .4 Installation checklists (ICL).
 - .5 Product information (PI) report forms.
 - .6 Performance verification (PV) report forms.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Training Plans.
 - .10 Prescribed activities during warranty period.
- .3 Commissioning Team to witness and certify tests and reports of results provided.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: pre-start-up reports to be completed and Departmental Representative to review prior to permission to start up, and rectification of deficiencies to Departmental Representative's satisfaction.
 - .2 Contractor to submit check lists for approval.
 - .3 Departmental Representatives will monitor some of these pre-start-up inspections.
 - .4 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Commissioning Team.
 - .5 Departmental Representative will monitor some of these tests.
 - .6 Include completed documentation in Cx report.
- .2 Pre-Cx activities - MECHANICAL:
 - .1 EMCS:
 - .1 EMCS trending to be available as supporting documentation for performance verification.
 - .2 Perform point-by-point testing in parallel with start-up.
 - .3 Carry out point-by-point verification.
 - .4 Demonstrate performance of systems, to be witnessed by Commissioning Team, O&M personnel, and the Departmental Representatives prior to start of 30 day Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period and 30-day test period.
 - .6 Only additional testing after foregoing has been successfully completed to be "Off-Season Tests".
- .3 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include but not limited to equipment and systems identified.
 - .1 Fire Dampers.
 - .2 Reports of test results to be witnessed and certified by the Departmental Representative before verification.
- .4 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .1 Requires independent testing agency to perform pre-energization and post-energization tests.
 - .2 Provide factory test records for all switchgear breakers.
 - .2 Emergency power generation systems:
 - .1 Transfer switches: test by simulating loss of power. Verify availability of power at equipment requiring same.

1.12 START-UP

- .1 Start up components, equipment and systems.

- .2 Equipment manufacturer, supplier, installing specialist Sub-contractor, as appropriate, to start-up, under Contractor's direction.
- .3 Departmental Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of the Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Repeat when necessary until results are acceptable to the Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to witness and certify reported results.
 - .4 Departmental Representative to approve completed reports.
 - .5 Departmental Representative reserves the right to verify up to 30% of reported results at random.
 - .6 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Departmental Representative to monitor Cx activities.
- .2 Upon satisfactory completion, agency performing tests to prepare Report using approved forms.
- .3 Departmental Representative reserves the right to verify a percentage of reported results at no cost to contract.

1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed using procedures outlined in the applicable specification section, and approved by the Departmental Representative.
- .2 Tests to be witnessed by Commissioning Team and documented on approved report forms.
- .3 Upon satisfactory completion, Cx Report, to be certified by the Departmental Representative and submitted to Departmental Representative for review.
- .4 The Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include but are not limited to:
 - .1 Motor control centres.
 - .2 Switchgear.
 - .3 Transfer switch and controllers.

- .6 Identification:
 - .1 During the construction, the Contractor to complete inventory data sheets and provide assistance to CRC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 INSTALLATION CHECK LISTS (ICL)

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

1.16 PRODUCT INFORMATION (PI) REPORT FORMS

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

1.17 PERFORMANCE VERIFICATION (PV) REPORT

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

1.18 CX SCHEDULES

- .1 Prepare detailed critical path Cx Schedule and submit to the Departmental Representative for review and approval at same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Cx procedures: 3 months after award of contract.
 - .3 Report format: 3 months after contract award.
 - .4 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .5 Notification of intention to start Cx: 14 days before start of Cx.
 - Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .6 Identification of deferred Cx.
 - .7 Implementation of training plans.
 - .8 Cx reports: immediately upon successful completion of Cx.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of the project and hand-over to Operations Group and Property Management.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.

1.19 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Cx Authority to the 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 the Departmental Representative.

1.20 ACTIVITIES DURING WARRANTY PERIOD

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

1.21 TESTS TO BE PERFORMED BY OWNER/USER

- .1 The Departmental Representative may conduct Indoor Air Quality testing.

1.22 TRAINING PLANS

- .1 Refer to Section 01 91 41 - Commissioning: Training.

1.23 FINAL SETTINGS

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

PART 2 PRODUCTS2.1 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 (CX) Requirements.
- .2 Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Section 01 91 41 - Commissioning: Training.
- .4 All sections related to Mechanical, Electrical, Controls, Fire Alarm, Security Systems, etc.

1.2 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Refer to Section 01 91 13 for composition, roles and responsibilities of Cx team.
- .2 Refer to Section 01 91 31 for Other Cx Participants.

1.3 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up checklists are acceptable for use. As deemed necessary by the Departmental Representative, supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document checklist verifying checks have been made; indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Checklists will be required during Commissioning.

1.4 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional

testing and used during operation and maintenance of equipment.

- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.5 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2 PV report forms 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.

1.6 COMMISSIONING FORMS

- .1 The Commissioning Authority will provide commissioning forms to document the Cx process carried out by the Contractor.

1.7 PURPOSE OF COMMISSIONING FORMS

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

1.8 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.



Public Works and
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Canada

Travaux publics et
Services gouvernementaux
Canada

NMMS Inventory Sheet
Reference to No.

Building

--

Class

--

☐ Equipment

☐ Component

☐ Assembly

Type

--

☐ Normal

☐ Emergency

☐ Hazardous

Tag Reference

System
Code

--

Equipment
Code

--

Counter

--

☐ Life Support

Floor

--

Area

--

Room

--

☐ In Use

Function

Condition

☐ Unknown

☐ Warranty

☐ Fair

☐ Good

☐ Excellent

Item Number

--

Parent Equipment Number

System
Code

--

Equipment
Code

--

Counter

--

☐ Ozone Depleting Product

Qty (kg)

--

Type

--

Manufacturer Information

Manufacturer Name

--

Model Number

--

Serial Number

--

Frame

--

Electrical Specifications

Amperage

--

Phase

--

Primary Voltage

--

Voltage

--

HP

--

Secondary Voltage

--

RPM

--

KVA

--

Model Type

--

KPA

--

Size

--

Other Information

Belt Size

--

Filter size

--

BTU

--

Belt
Quantity

--

Filter
Quantity

--



Public Works and
Government Services
Canada

Travaux publics et
Services gouvernementaux
Canada

Feuille d'inventaire SGEN
Numéro de référence

Bâtiment

--

Classe

--

☒ Matériel

☐ Composant

☐ Assemblage

Type

--

☐ Normal

☐ Secours

☐ Dangereux

Référence d'étiquette

Code du
système

--

Code du
matériel

--

Compteur

--

☐ Support vital

Étage

--

Endroit

--

Pièce

--

☐ En service

Fonction

État

☐ Inconnu

☐ Sous garantie

☐ Bon

☐ Acceptable

☐ Excellent

Numéro d'article

--

Numéro du matériel parent

Code du
système

--

Code du
matériel

--

Compteur

--

☐ Produit appauvrissant la
couche d'ozone

Qté (kg)

--

Type

--

Renseignements du fabricant

Nom du fabricant

--

Numéro de modèle

	Numéro de série	
--	-----------------	--

Bâti

--

Spécifications électriques

Intensité

--

Phase

--

Tension primaire

--

Tension

--

HP

--

Tension secondaire

--

tr/min

--

kVA

--

Type de modèle

--

kPa

--

Dimensions

--

Autres renseignements

Dimensions
de la
courroie

--

Dimensions du filtre

--

BTU

--

Nombre de
courroies

--

Nombre
de filtres

--

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 91 13 - General Commissioning (CX) Requirements.
- .2 Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Section 01 91 33 - Commissioning Forms.
- .4 All sections related to Mechanical, Electrical, Controls, Fire Alarm, Security Systems, etc.

1.2 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Refer to Section 01 91 13 for Composition, Roles & Responsibilities of Cx team.
- .2 Refer to Section 01 91 31 for Other Cx Participants.

1.3 REQUIRED TRAINING

- .1 Familiarization Training to be given on all Mechanical (plumbing, HVAC), Electrical, Controls and Architectural equipment and system in the project.
- .2 Manufacturers Training required on all equipment as specified in the specific specification sections.

1.4 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.

1.5 INSTRUCTORS

- .1 The 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.

1.6 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.

1.7 TRAINING MATERIALS

- .1 Contractor, Sub-contractor and Instructors are responsible for content and quality.
- .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operation and Maintenance Manual.
 - .3 TAB and PV Reports.
- .3 Departmental Representative, Commissioning Authority and Facility Manager will review training materials.
- .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.

1.8 SCHEDULING

- .1 Include in Commissioning Schedule time for training. Deliver training during regular working hours, training sessions to be 3 hours in length each. Training to be completed prior to acceptance of facility.
- .2 Ensure each piece of equipment is covered in a minimum of 3 sessions to ensure all shift personnel receive adequate training.

1.9 RESPONSIBILITIES

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

1.10 TRAINING CONTENT

- .1 Training to include Instructor demonstrations 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 specified in relevant specification Technical Sections.

1.11 VIDEO-BASED TRAINING

- .1 Manufacturer's video to be used as training tool with Departmental Representative's review and written approval 3 months prior to commencement of scheduled

training.

- .2 On-Site training videos:
 - .1 Videotape training sessions for use during future training.
 - .2 To be performed after systems are fully commissioned.
 - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be high quality with editing of non-productive footage.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION