

Part 1 General**1.1 MINIMUM STANDARDS**

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

1.2 PRECEDENCE

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

1.3 TAXES

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

1.4 FEES, PERMITS AND CERTIFICATES

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

1.5 FIRE SAFETY REQUIREMENTS

- .1 Comply with the National Building Code of Canada 2010 (NBC) for fire safety in construction and the National Fire Code of Canada 2010 (NFC) for fire prevention, fire fighting and life safety in building in use.
- .2 Comply with PWGSC COE Fire Protection Engineering Services Standards.
- .3 Welding and cutting:
 - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit as approved by the Departmental Representative. Store flammable liquids in approved CSA containers inspected by the Departmental Representative. No open flame shall be used unless authorized by the Departmental Representative.
 - .2 At least 48 hours prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
 - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
 - .2 Completed welding permit as defined in NFC 2010 and NBC 2010.
 - .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
 - .3 A fire watcher as described in NFC 2010 and NBC 2010 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.
 - .4 Where work requires interruption of fire alarms or fire suppression, extinguishing or protection systems:

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- .1 Provide watchman service as described in FC 301; In general, watchman service is defined as an individual conversant with Fire Emergency Procedures, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
- .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by FCC, to isolate and protect all devices relating to:
 - .1 Modification of fire alarms, fire suppression, extinguishing or protection systems.
 - .2 Cutting, welding, soldering or other construction activities which might activate fire protection systems.
- .5 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
- .6 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.6 FIELD QUALITY CONTROL

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

1.7 REMOVED MATERIALS

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

1.8 CUT PATCH AND MAKE GOOD

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

1.9 SLEEVES HANGERS AND INSERTS

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

1.10 HAZARDOUS MATERIALS

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and the provision of Material Safety Data Sheets (MSDS).

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- .2 For work in occupied buildings give the Departmental Representative 1 weeks' notice for work involving designated substances, hazardous substances (Canada Labour Code Chapter 10), and before painting, caulking or using adhesives.

1.11 TEMPORARY UTILITIES

- .1 Existing services required for the work, excluding power required for space heating, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.
- .2 Maximum power supply of 15 amps at 120V, single phase, is available and will be provided for general construction usage at no cost. Connect to existing power supply in accordance with Canadian Electrical Code. Power provided must not be used for space heating at any time.
- .3 Water Supply. Departmental Representative will provide continuous supply of potable water for construction use.
- .4 Notify the Departmental Representative and utility companies of intended interruption of services. Obtain requisite permission.
- .5 Give the Departmental Representative minimum of 10 working days notice (could be shorter timeframe, not less 2 working days, if non-critical areas are involved) for 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 preferably on weekends.
- .6 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .7 Permanent power and lighting systems installed may be used for construction requirements only with prior approval of Departmental Representative provided that warrantees are not affected. Make good damage to electrical system caused by use. Replace lamps which have been used for more than 3 months.
- .8 Remove all temporary facilities from site after use.

1.12 EXAMINATION

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

1.13 PROTECTION

- .1 Protect adjacent building areas, and finished 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.

1.14 USE OF SITE AND FACILITIES

- .1 Carry out work during "regular hours" Monday to Friday from 07:00 to 18:00 hours and on Saturdays, Sundays and statutory holidays.
- .2 Carry out noise and odour producing activities during "off hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays. Thoroughly ventilate areas painted and carpeted during "off hours".

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- .3 Give the Departmental Representative 48 hours notice for work to be carried out during "off hours".
- .4 Execute all work within construction zone as identified on the drawings.
- .5 Execute work with least possible interference or disturbance to the normal use of occupied spaces above, below, and adjacent. Make arrangements with Departmental Representative to facilitate work as stated.
- .6 A temporary Contractor site trailer will not be permitted on site.
- .7 Construction Office: The contractor is to provide a Construction Office within the construction zone phase. Relocate construction office as work progresses and for phasing.
- .8 Maintain existing services to adjacent building areas.
- .9 Where security is reduced by work, provide temporary means to maintain security. Consult the Departmental Representative for guidance prior to the start of the project.
- .10 Freight Elevator: Freight elevators can be available for occasional use during regular business hours between 07:00 hrs and 18:00 hrs. Use during off hours requires a minimum of 48 hours notice. Elevator cannot be put on service but can be used throughout normal working hours. Use during normal working hours shall be negotiated with the Departmental Representative on a case by case basis. Protect from damage, safety hazards and overloading. Use of freight elevator will be scheduled to the approval of the Departmental Representative.
- .11 Protect work temporarily until permanent enclosures are completed.
- .12 Sanitary facilities: Sanitary facilities will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean.
- .13 Clean adjacent roadways where affected by Contractor's equipment.
- .14 Construction Garbage and Debris: Stockpile construction garbage within the Limits of Site and remove from the construction site at the end of each work shift. Schedule garbage removals with building security personnel as approved by Departmental Representative. Waste dumpsters are not permitted to remain on site.
- .15 The Contractor shall install maintain and move proper site separation and identification in order to maintain "Time and Space" at all times throughout the life of the project. When the Departmental Representative requires access to equipment in order to operate the building, proper coordination and communication must exist between all parties involved.
- .16 Contractors must accept liability for damage, safety equipment, and overloading of existing and new equipment.
- .17 Parking: Contractor is responsible for arranging for parking off site. No on site parking is available.

1.15 SITE STORAGE, DELIVERY AND SHIPMENT

- .1 Site storage is permitted within the phase under construction within the construction zone defined on the drawing. The site storage area shall be secure and equipped and maintained by the Contractor. Spread heavy stored items out to ensure floor is not over loaded. Site storage area to be kept tidy and clean.
- .2 Do not unreasonably encumber site with materials or equipment.

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- .3 Move stored products or equipment which interfere with operations of Departmental Representative or other Contractors.
- .4 Do not load or permit to load any part of work with weight or force that will endanger work.
- .5 Loading dock space will be assigned for waste bins.
- .6 Loading dock can be used for deliveries with 48 hours notice.

1.16 BUILDING SMOKING ENVIRONMENT

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

1.17 INTERFACE TESTING

- .1 Fire alarm and or Security System – Work associated with the Interface to or testing with Life Safety or Security systems, shall be done “outside normal working hours”.
- .2 Notice of “System” interface and/or testing shall be provided to the Departmental Representative, a minimum of 10 working days prior to the requested

1.18 TESTING LABORATORY SERVICES

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

1.19 SIGNS

- .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etc, in both official languages or by the use of commonly-understood graphic symbols to the Departmental Representative's approval.
- .2 All site specific signage is the Contractor's responsibility. Clear indicators for controlling people movements must be visible for occupants as well as sub-contractors accessing and exiting their respective work areas. No advertising signage is allowed.

1.20 TEMPORARY SHORING SCAFFOLDS AND WORK PLATFORMS

- .1 Design, install, and inspect temporary shoring, scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.
- .2 Provide engineered design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Quebec, for temporary shoring, scaffolds and work platforms.
- .3 Additions or modifications to scaffolding must be approved by the Professional Engineer in writing.

GENERAL INSTRUCTIONS**1.21 RECORDS**

- .1 As work progresses, maintain accurate records to show deviations from technical drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative with 1 set of white prints with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.

1.22 PHASING

- .1 Within the main project construction schedule indicate detailed phasing required to complete the project.
- .2 Phasing of the work shall be the responsibility of the contractor and shall be organised to meet the scope of work and contract timeline. Details of phasing shall be reflected in the contractors scheduling.
- .3 Schedule all site measurement, shop drawings submittals, and allow for specified approval times by Departmental Representative to suit the order of operations.
- .4 Refer to typical details on electrical drawings for description of phased co-ordination required with the furniture systems installed by the Departmental Representative's forces. Follow the installation logic described.

1.23 SCHEDULING

- .1 Within two weeks of award submit a detailed bar chart construction schedule for work indicating detailed phasing and interaction of work in other spaces within time of completion. In the schedule, include any additional detailed sub-phasing required to complete the construction work.
- .2 When schedule has been reviewed and accepted by the Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative. Update the project schedule once every month if time lines have changed since last update.
- .3 Identify phasing, critical path and long lead items in schedule.
- .4 Within main schedule, indicate separate detailed schedule breakdowns for work.

1.24 COST BREAKDOWN

- .1 Before submitting first progress claim, submit cost breakdown of amount in detail as approved by Departmental Representative and aggregating the amount. Costs are to be broken out under two (2) project numbers, one for the 5th Floor work and one for the 7th Floor work. After approval by Departmental Representative cost breakdown will be used as the basis of progress payments.
- .2 Submit a valid Statutory Declaration and Workplace Safety & Insurance Board Certificate with each request for progress payment.

1.25 MATERIAL AND FINISH SUBMITTALS

- .1 Submit duplicate samples of all material and finish samples in project within 20 working days of date of award for review and selection by Departmental Representative. Refer to Section 01 33 00 Submittal Procedures.

GENERAL INSTRUCTIONS**1.26 DUST CONTROL AND TEMPORARY CONSTRUCTION ENCLOSURE**

- .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers and finished areas of work.
- .2 Completely enclose limits of site with temporary dust and vision proof construction enclosure constructed using 16 mm gypsum board, 0.15mm polyethylene sheet on 92 mm steel studs spaced at 600 mm on center. Temporary construction enclosures are to be constructed from floor to underside of concrete slab above, completely closing off the ceiling plenum.
- .3 Do not fasten into existing surfaces to remain. At completion of work remove enclosures, vacuum and clean, reinstate all surfaces to the approval of the Departmental Representative.
- .4 Maintain and relocate protection for phasing until such work is complete.
- .5 All temporary hoarding and dust enclosures shall comply with the National Fire Code of Canada and the National Building Code of Canada.
- .6 Design, construct and maintain temporary "access to" and "egress from" work areas; and safe separation of work areas from non-work areas during all phases of the work, including stairs, runways, ramps or ladders and scaffolding; independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations. Any damage to the building or existing or new equipment will be reported immediately to the Departmental Representative and repaired in an expedient manner at no cost to the Crown.
- .7 Contractor's personnel to keep within limits of work and avenues of ingress and egress.

1.27 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary ventilation required during construction period, including attendance, maintenance and fuel.
- .2 Provide temporary ventilation in enclosed areas as required to:
 - .1 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .2 Provide adequate ventilation to meet health regulations for safe working environment.
- .3 During each phase of the work, provide and maintain temporary ventilation (supply air and fresh air) to all other adjacent occupied building areas served by the HAVC unit that is not part of the current phase of work. Modify temporary ventilation to maintain service to adjacent spaces at all times.
- .4 Maintain temperatures of minimum 19 degrees C where construction is in progress.
- .5 Ventilating:
 - .1 Maintain temporary ventilation to work areas to prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Within the phased construction area, provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

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- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent HVAC system of building is not to be used unless written permission is provided from Departmental Representative. Be responsible for damage to heating system if use is permitted. Pay costs for maintaining temporary heat when using permanent heating system.
- .7 On completion of Work for which permanent HVAC system is used, replace filters and clean all equipment to "as new" condition.
- .8 Maintain strict supervision of operation of temporary ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .9 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.28 WORKPLACE HEALTH AND SAFETY

- .1 Due diligence on this subject must be practiced at every step of the project or contract. This requires that all relevant measures and procedures (Federal & Provincial) be respected. Everything warranted is to be done, starting from the appropriate health and safety clauses in the construction contract or other contract on to the subsequent request for a Site Specific Safety Plan (SSSP) from the contractor through to the Post-Project Safety Assessment. The Departmental Representative will work collaboratively with the project site Health & Safety Representative, and the General Contractor's Health & Safety Representative, to foster construction site health & safety.

Part 2 Products**2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

PART 1 – GENERAL

1.1 REFERENCES

1. Federal Legislation
 1. Canada Labour Code, Part II, section 124 and 125. Canada Occupational Health and Safety Regulations
 2. Transportation of Dangerous Goods Act, 1992 (TDGA)
 3. Canada Consumer Product Safety Act
 1. Surface Coating Materials Regulations SOR/2005-109.
 4. Canadian Environmental Protection Act, 1999 (CEPA)
 1. PCB Regulations (SOR/2008-273)
 2. Federal Halocarbon Regulations, 2003 (SOR/2003-289)
2. Provincial Legislation
 1. Act Respecting Occupational Health And Safety (as amended)
 1. Québec R.S.Q., Chapter S-2.1
 2. Province of Québec's Safety Code for the Construction Industry
 1. Work Liable to Produce Asbestos Dust Emissions. Québec R.S.Q., Chapter S-2.1, r.4, Section 3.23
 3. Regulation Respecting Occupational Health and Safety
 1. Québec R.S.Q., Chapter S-2.1, r.13
 4. Regulation Respecting the Quality of the Work Environment
 1. Québec R.S.Q., Chapter S-2.1, r. 11
 5. Regulation Respecting Hazardous Materials (O.C. 1310-97), under the Environmental Quality Act
 1. R.S.Q., c. Q-2 - (21)
3. Canadian General Standards Board (CGSB).
4. Canadian Standards Association (CSA International). CAN/CSA-Z94.4-11 - Respiratory Protection
5. Underwriters' Laboratories of Canada (ULC).

1.2 DEFINITIONS

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

Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

Time-weighted average exposure limit (TWAEL): the time-weighted average airborne concentration of a biological or chemical agent to which a worker may be exposed in a work day or work week as outlined in the Québec R.S.Q Chapter S-2.1, r. 13.

1.3 DESIGNATED SUBSTANCES

Refer to Designated Substances Summary Report "Project Specific Designated Substances Survey, ESDS Office Fit-up Project, Place du Portage Phase IV Building", prepared by DST Consulting Engineers Inc. (DST File No. GV-SO-022034) dated November 17, 2015 for the description of the methodology used to assess the designated substances within the project area.

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

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

Should any additional material, suspected to be a designated substance, be encountered within the project area, any disturbance of such material must be stopped, precautionary measures taken, and the Departmental Representative must be notified immediately. Do not proceed until written instructions have been received.

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

Bulk sampling and subsequent laboratory analysis has determined that the following materials contain regulated amounts of asbestos:

- Non-friable black caulking, observed throughout select areas the 5th Floor at select wall penetrations/joints of walls, assumed to be used as an acoustic sealant or firestop was confirmed to contain 0.68% Chrysotile asbestos
- Non-friable 12"x12" (30 cm x 30 cm) vinyl floor tile, orange, observed in the electrical closets throughout the 5th Floor was confirmed to contain 0.74% Chrysotile asbestos. These vinyl floor tiles were observed to be in good condition.
- Non-friable black caulking/tar, observed throughout select areas the 7th Floor at select wall penetrations/joints of walls and on the concrete floor under the raised server floor was confirmed to contain 5.31% Chrysotile asbestos.
- Non-friable 12"x12" (30 cm x 30 cm) vinyl floor tile, off-white with grey streaks, observed as a concealed second layer in the 7th floor stairwell entry way, was confirmed to contain 2.43% Chrysotile asbestos.

4. BENZENE: Not Identified
5. COKE OVEN EMISSIONS: Not identified
6. ETHYLENE OXIDE: Not Identified

7. ISOCYANATES: Not Identified

8. LEAD: **Assumed**

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

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

- Emergency light batteries.

9. MERCURY: **Identified**

Mercury is assumed to be present in the following:

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

10. SILICA: **Identified**

Free crystalline silica is assumed to be present in concrete and cement building materials, vinyl floor tiles, drywall and associated materials, and floor mastics.

11. VINYL CHLORIDE MONOMER: Not Identified

12. POLYCHLORINATED BIPHENYLS (PCBs): Not Identified

13. MOULD: Not Identified

14. HALOCARBONS: **Assumed**

Halocarbons are assumed to be present in:

- Cooling units associated with former server rooms.
- Halon fire suppression system, 7th Floor.

15. OTHER HAZARDOUS MATERIALS: Not Identified

1.4 RECOMMENDATIONS

1. ASBESTOS

1. As per section 3.23.3 of the Québec Safety Code for the Construction Industry, the employer shall determine the types of asbestos present

in the materials before undertaking work liable to generate asbestos dust. In the case of asbestos removal work or demolition work involving asbestos, it is required to use the methods and procedures, as well as to attest to the existence of a training and information program that complies with section 3.23.7 of the Québec Safety Code for the Construction Industry. Sections 3.23.14, 3.23.15, and 3.23.16 stipulate that in a work environment where asbestos dust is present or expected to be produced, workers shall wear respirators suitable for such asbestos work in accordance with *CSA Standard Z94.4-93* "Selection, Use, and Care of Respirators".

2. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition or renovation. The Québec Commission de la santé et de la sécurité du travail (CSST) must be notified of any project involving removal of asbestos-containing materials.
3. Based on the *Québec Safety Code for the Construction Industry*, work involving ACMs is categorised into three categories: low; moderate and high risk, depending on whether the ACMs are friable or non-friable and how the material will be manipulated or removed. The following work procedures apply to identified and suspected ACMs:
 1. Removal or disturbance of non-friable ACMs (black caulking, vinyl floor tiles, and a black tar) can be completed using low-risk work procedures, provided the materials remain in a non-friable condition during removal and only hand tools are used. If this condition cannot be met, than more stringent (moderate or high risk) work procedures are required.
 2. The handling and packaging of asbestos waste must comply with the requirements of Québec R.S.Q., Chapter S2.1, r.4, Section 3.23.10 and the Regulation Respecting Occupational Health and Safety (Québec R.S.Q., Chapter S-2.1, r.13). The *Federal Transportation of Dangerous Goods Act* controls the transport of the waste to a disposal site. Although there is no specific legislation on the disposal of asbestos waste in Québec, it is recommended in terms of best management practices, to inform the waste transporter and waste disposal site of the nature of the asbestos waste before transport

2. LEAD

1. Follow recommendations provided in the CSST document entitled *Guide de Prévention – L'exposition au plomb* and the Ontario Ministry of Labour's (MoL) Guideline "Lead on Construction Projects", September, 2004. The Ontario guideline classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification.
2. Regulatory limits have been established under the Quebec's *Regulation respecting the quality of the work environment* for

occupational exposure to airborne lead that may be present in a workplace. The Time Weighted Average Exposure Values (TWA_{EV}) to airborne lead dust or fumes should not exceed 0.05 milligram per cubic metre (mg/m³) limit during the removal of paints and products containing any concentration of lead.

3. The use of mechanically-powered tools or torches on lead-containing materials increases the concentration of airborne lead dust or fumes requiring more stringent respiratory protection and controlled work procedures.
 1. The welding or high temperature cutting of lead-containing coatings or materials (e.g. a structural ceiling beam with a lead-containing coating) indoors or in a confined space is a Type 3a operation.
4. Even at low concentrations, there may be a potential for exposure to high concentrations of lead depending on the activities performed that disturb the lead-containing materials. At low lead concentrations, conducting a risk assessment to assess the potential for exposure is required to determine the need to follow precautionary measures.
5. The disposal of construction waste containing lead is controlled by the *Regulation Respecting Hazardous Materials* (O.C. 1310-97), under the *Environmental Quality Act*, R.S.Q., c. Q-2 - (21). Any material that produces a leachate containing lead in a concentration higher than 5 mg/L is considered as a hazardous material and should be handled accordingly.

3. MERCURY

1. The exposure of workers to mercury should be reduced to a minimum as defined under Schedule 1 of the Québec *Regulation Respecting Occupational Health and Safety*.
2. Follow recommendations provided in the CSST published worker respiratory and clothing protective measures based on presumed airborne concentrations of mercury generated during the work, as well as clean-up procedures for minor and major disturbances of mercury containing products. In addition, the OHS Branch of the Ontario MoL has published *The Safe Handling of Mercury: A Guide for the Construction Industry*. This information should be followed during the disturbance of materials or products containing mercury. In the event of conflict, the more stringent procedures should be applied.
3. The Québec *Regulation respecting Hazardous Materials* (O.C. 1310-97), under the *Environmental Quality Act*, R.S.Q., c. Q-2 - (21) stipulates that fluorescent light tubes, in quantities where it is anticipated that a leachable extract could have a concentration higher than 0.1 mg/L or ppm, is considered hazardous waste and should be treated as such. Environment Canada states that a 2-8 foot lamps

can contain between 10 and 50 ppm of mercury. Since the number of fluorescent light tubes required to exceed the hazardous materials threshold for mercury leachate content is so low, as stipulated in this regulation, the regulation and its requirements shall be applied in all cases of fluorescent tube disposal.

4. Fluorescent lamp tubes are considered hazardous material in the Province of Québec and shall be recycled if removed from service. For information regarding the collection of fluorescent lamp tubes, please consult the Departmental Representative.

4. SILICA

1. The Québec *Regulation Respecting Occupational Health and Safety* defines crystalline silica in the form of respirable dust as a suspected carcinogen.
2. Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is presumed present in concrete building materials, flooring compounds/mastics, vinyl floor tiles and drywall within the project area, appropriate respiratory protection and ventilation must be donned during the demolition and modifications of these structures, as per the "*Guide des appareils de protection respiratoire utilisés au Québec*", published by the *Institut de recherche Robert-Sauvé en santé et en sécurité du travail*. Personal protective equipment shall be selected, adjusted, used and cared for in accordance with the *CSA Standard Z94.4-93* entitled "*Selection, Use and Care of Respirators*".
3. The exposure of workers to silica should be reduced to a minimum as defined under Schedule 1 of the Québec *Regulation Respecting Occupational Health and Safety*. Follow recommendations provided in the CSST document entitled: *Guide des bonnes pratiques – Prévention de l'exposition des travailleurs à la silice* and the MoL Guideline entitled "Guideline: Silica on Construction Projects". This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

5. HALOCARBONS

1. The handling, transport and disposal of halocarbons is governed by the following:
 - *Ozone-depleting Substances Regulations, 1998, as amended;*
 - *Quebec Regulation respecting halocarbons, Environment Quality Act. Chapter Q-2, r.29*
 - *Federal Halocarbon Regulations, 2003 (FHR).*

2. When suspected halocarbon-containing equipment is taken out of service, the halocarbon refrigerants must be captured and reclaimed by a licensed technician. The presence of halocarbon refrigerants within unit's no longer in service should be verified. If halocarbon refrigerants are found to be present, they must be captured and reclaimed by a licensed technician. Appropriate records of equipment decommissioning must be maintained in accordance with requirements of the FHR.

END OF SECTION

SUBMITTAL PROCEDURES**Part 1 General****1.1 ADMINISTRATIVE**

- .1 Submit to Departmental Representative, all submittals listed for review. Submit in orderly sequence so as to not cause delay in Work.
- .2 Delays resulting from incomplete or unsatisfactory submittals of Shop Drawings shall be the responsibility of the Contractor.
- .3 Do not proceed with Work affected by submittal until review is complete.
- .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .5 Where items or information is not produced in SI Metric units converted values are acceptable.
- .6 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 Technical Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .7 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Technical Documents stating reasons for deviations.
- .8 Verify field measurements and affected adjacent Work are coordinated.
- .9 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .10 Contractor's responsibility for deviations in submission from requirements of Technical Documents is not relieved by Departmental Representative review.
- .11 Keep one reviewed copy of each submission on site.

1.2 MATERIAL AND FINISH SUBMITTALS

- .1 Submit duplicate samples of all material and finish samples for review and selection by Departmental Representative.

1.3 SHOP DRAWING LOG

- .1 Prepare a shop drawing log and maintain the log during the complete construction period. Submit draft Shop Drawing log within 14 days of award and update log weekly or more frequently as approved by Departmental Representative.
- .2 Log to include a comprehensive schedule for the submission of all shop drawings required for the execution of the work. Provide for a review time by Departmental Representative for each submission as appropriate for construction element and as approved by Departmental Representative.
- .3 Present updated log at each project meeting.

SUBMITTAL PROCEDURES**1.4 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 shop drawings bearing stamp and signature of qualified Professional Engineer registered or licensed in Province of Quebec, Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Technical Documents. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of the Contractor, supplier and manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Technical 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.

SUBMITTAL PROCEDURES

- .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit one electronic copy 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 one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of award for project.
- .13 Submit one electronic copy 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 complete with project name.
- .14 Submit one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit one electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit one electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project. Supplement standard information to provide details applicable to project.
- .18 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, a marked up electronic copy 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 may proceed.
- .19 The review of shop drawings by the Departmental Representative is for sole purpose of ascertaining conformance with general concept.

SUBMITTAL PROCEDURES

- .1 This review shall not mean that the Departmental Representative approves detailed 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 Technical Documents.
- .20 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 co-ordination.

1.5 SAMPLES

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

1.6 MOCK-UPS

- .1 Erect mock-ups in accordance with Section 01 45 00 - Quality Control and as noted in the individual specification sections.

1.7 CERTIFICATES AND TRANSCRIPTS

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

Part 2 Products**2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

**HEALTH AND SAFETY
REQUIREMENTS****Part 1 General****1.1 REFERENCES**

- .1 Province of Quebec.
 - .1 An Act respecting Occupational Health and Safety, R.S.Q. Chapter S-2.1. 1997 (updated 01 April 2016).
 - .2 Safety Code for the Construction Industry. S-2.1 R6. 1997 (updated 01 April 2016).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide 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 7 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal, and Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .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 3 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 Departmental Representative will provide details of on-site Contingency and Emergency Response Plan. Address all standard operating procedures to be implemented during emergency situations as approved by Departmental Representative.

1.3 FILING OF NOTICE

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

**HEALTH AND SAFETY
REQUIREMENTS****1.4 SAFETY ASSESSMENT**

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

1.5 MEETINGS

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

1.6 HAZARDOUS MATERIALS

- .1 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and the provision of Material Safety Data Sheets (MSDS).
- .2 Demolition of asbestos can be hazardous to health. Should material resembling spray or trowel applied asbestos be encountered in the course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Do not proceed until written instructions have been received.

1.7 GENERAL REQUIREMENTS

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

1.8 RESPONSIBILITY

- .1 Be responsible and assume the role of "Principal Contractor" as described in the Quebec Act and Code for only their scope and areas of work as defined in this Project Specification.
- .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.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with all applicable Acts, Codes and Regulations of the Province of Quebec for Construction Projects.
- .2 Comply with NBC 2010 (Part 8, Safety Measures at Construction and Demolition Sites).
- .3 For work in occupied buildings provide the Departmental Representative a minimum of 48 hours notice for work involving designated substances, hazardous substances and before commencing any painting, caulking, installing carpet or using adhesives.

1.10 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse

**HEALTH AND SAFETY
REQUIREMENTS**

Work in accordance with Acts and Regulations of Province of Quebec and authorities having jurisdiction and advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

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

1.12 POSTING OF DOCUMENTS

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

1.13 CORRECTION OF NON-COMPLIANCE

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

1.14 POWDER ACTUATED DEVICES

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

1.15 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Health and Safety Co-ordinator to stop or start Work when, at Health and Safety Co-ordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

**HEALTH AND SAFETY
REQUIREMENTS****Part 2 Products****2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

Part 1 General**1.1 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give 3 working days' notice requesting inspection of Work is designated for special tests, inspections or approvals by Departmental Representative or law of Province 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 any part of Work to be examined if Work is suspected to be not in accordance with Technical Documents. If, upon examination such work is found not in accordance with Technical Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Technical Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

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

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.

QUALITY CONTROL**1.4 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and / or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay 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 Technical Documents. Replace or re-execute in accordance with Technical Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements within 3 working days' from notice.

1.6 REPORTS

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

1.7 TESTS AND MIX DESIGNS

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

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct mock-up in locations acceptable to Departmental Representative and as specified in specific Section.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.9 MILL TESTS

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

QUALITY CONTROL**Part 2 Products****2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

COMMON PRODUCT REQUIREMENTS**Part 1 General****1.1 REFERENCES**

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

1.2 QUALITY

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

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, contamination, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

COMMON PRODUCT REQUIREMENTS

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

1.4 TRANSPORTATION

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

1.5 MANUFACTURER'S INSTRUCTIONS

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

1.6 QUALITY OF WORK

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

1.7 CO-ORDINATION

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

1.8 CONCEALMENT

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

1.9 REMEDIAL WORK

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

1.10 LOCATION OF FIXTURES

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

1.11 FASTENINGS

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

1.12 FASTENINGS - EQUIPMENT

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

1.13 PROTECTION OF WORK IN PROGRESS

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

1.14 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and occupants.

COMMON PRODUCT REQUIREMENTS**Part 2 Products****2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

EXECUTION**Part 1 General****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide 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 any element of Project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .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.

1.2 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 MATERIALS**

- .1 Provide materials as required for original installation. Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

Part 3 Execution**3.1 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching. After uncovering, inspect conditions affecting performance of Work.
- .2 Beginning of cutting or patching means acceptance of existing conditions.
- .3 Provide supports to assure structural integrity of surroundings. Provide devices and methods to protect other portions of project from damage.

EXECUTION

- .4 Provide protection from elements for areas which may be exposed by uncovering work. Maintain excavations free of water.

3.2 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work. Remove samples of installed Work for testing.
- .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 Technical 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, 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.

END OF SECTION

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

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials and debris from site daily at regularly scheduled times and deposit in waste containers at end of each working day. Remove waste materials more frequently as approved by Departmental Representative to ensure a clean and orderly work site. Work site must be suitable for employees and public for emergency egress and safe access after each work shift.
- .3 Do not burn rubbish or waste materials on site.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Dispose of waste materials and debris at designated dumping areas off site.
- .5 Provide on-site containers for collection of waste materials and debris. Provide appropriate sized disposal bins and locate bins on site where approved by Departmental Representative. Empty waste disposal bins daily or more frequently at times as approved by Departmental Representative, and in accordance with Section 010010 – General Instructions.
- .6 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed and prior to final review, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work. Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .2 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

CLEANING**Page 2**

- .3 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .4 Clean lighting reflectors, lenses, and other lighting surfaces.
- .5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .6 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .7 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .8 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .9 Clean equipment and fixtures to a sanitary condition. Clean or replace filters of mechanical equipment.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction / Demolition Waste Management and Disposal.
- .2 Provide and use clearly marked separate bins for recycling.

Part 2 Products**2.1 NOT USED****Part 3 Execution****3.1 NOT USED****END OF SECTION**

Part 1 General**1.1 WASTE MANAGEMENT GOALS**

- .1 Waste Management Goal: 85 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative with documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Cost / Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4 Inert Fill: inert waste. Exclusively asphalt and concrete.
- .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.
- .6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from renovation 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.
- .10 Salvage: removal of structural and non-structural materials from deconstruction or disassembly projects for purpose of reuse or recycling.
- .11 Separate Condition: refers to waste sorted into individual types.

**CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND DISPOSAL**

- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
- .14 Waste Management Co-ordinator (WMC): Contractor responsible for supervising waste management activities as well as coordinating required submittal and reporting requirements.
- .15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
 - .1 Waste Audit.
 - .2 Waste Reduction Workplan.
 - .3 Material Source Separation Plan.
 - .4 Schedules A, B, C, D and E completed for project.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up.
 - .1 Submit 2 copies of completed Waste Audit: Schedule A.
 - .2 Submit 2 copies of completed Waste Reduction Workplan: Schedule B.
 - .3 Submit 2 copies of completed Demolition Waste Audit: Schedule C.
 - .4 Submit 2 copies of Cost/Revenue Analysis Workplan: Schedule D.
 - .5 Submit 2 copies of Materials Source Separation Program description.
- .3 Submit before final payment a complete summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction / disassembly material audit form.
 - .1 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
 - .2 For each material reused, sold or recycled from project, include amount in tonnes quantities by number, type and size of items and the destination.
 - .3 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.5 WASTE AUDIT (WA)

- .1 Conduct WA prior to project start-up.
- .2 Prepare WA: Schedule A.

**CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND DISPOSAL**

- .3 Record, on WA - Schedule A the extent to which materials or products used consist of recycled or reused materials or products.

1.6 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare WRW prior to project start-up.
- .2 WRW must include but not limited to:
 - .1 Destination of materials listed.
 - .2 Location of project and location of disposal facilities.
 - .3 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.
- .3 Describe management of waste.
- .4 Post WRW or summary where workers on site are able to review content.
- .5 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

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

1.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

- .1 Prepare CRAW: Schedule D.

1.9 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental 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 as approved by Departmental Representative, 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 in separate condition. Transport to approved and authorized recycling facility.

**CONSTRUCTION / DEMOLITION
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- .8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
 - .1 Ship materials to site operating under Certificate of Approval.
 - .2 Materials must be immediately separated into required categories for reuse or recycling.

1.10 STORAGE, HANDLING AND PROTECTION

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

1.11 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil or paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins. Waste type of each bin.
 - .2 Total tonnage generated. Tonnage reused or recycled.
 - .3 Reused or recycled waste destination.
- .4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

**CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND DISPOSAL**

Part 2 Products**2.1 NOT USED****Part 3 Execution****3.1 SELECTIVE DEMOLITION**

- .1 Do not demolish building elements beyond what is indicated on Drawings without approval by Departmental Representative, as described in Section 02 41 99 – Demolition for Minor Works.

3.2 APPLICATION

- .1 Do Work in compliance with WRW. Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.3 CLEANING

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

3.4 DIVERSION OF MATERIALS

- .1 From the following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire regulations.
- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged, recovered, reusable, recyclable materials is not permitted.
- .3 Demolition Waste

Material Type	Recommended Diversion %	Actual Diversion %
Acoustic Tile	80	<input type="text"/>
Acoustical Insulation	100	<input type="text"/>
Carpet	100	<input type="text"/>
De-mountable Partitions	80	<input type="text"/>
Doors and Frames	100	<input type="text"/>
Electrical Equipment	80	<input type="text"/>
Mechanical Equipment	100	<input type="text"/>
Metals	100	<input type="text"/>
Wood (uncontaminated)	90	<input type="text"/>
Other	100	<input type="text"/>

**CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND DISPOSAL**

.4 Construction Waste

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	[]
Plastic Packaging	100	[]
Rubble	100	[]
Steel	100	[]
Wood (uncontaminated)	100	[]
Other		[]

3.5 WASTE AUDIT (WA)**.1 Schedule A - Waste Audit (WA)**

(1) Material Category	(2) Material Quantity Unit	(3) Estimated Waste %	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Acoustic Tile						
Acoustical Insulation						
Carpet						
Demount Partitions						
Doors and Frames						
Electrical Equipment						
Mech Equipment						
Metals						
Wood (uncontaminated)						
Other						

3.6 WASTE REDUCTION WORKPLAN (WRW)**.1 Schedule B**

(1) Material Category	(2) Person(s) Responsible	(3) Total Quantity of Waste (unit)	(4) Amount Reused (units) Projected	Actual	(5) Amount Recycled (unit) Projected	Actual	(6) Material (s) Destination
Wood & Plastic Warped Pallet							
Forms							
Plastic							
Card-board							
Wood							
Metal							
Other							

**CONSTRUCTION / DEMOLITION
WASTE MANAGEMENT AND DISPOSAL**

3.7 DEMOLITION WASTE AUDIT (DWA)

.1 Schedule C - Demolition Waste Audit (DWA)

(1) Material Description	(2) Qty	(3) Unit	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks and Assumptions
Acoustic Tile						
Acoustical Insul						
Carpet						
Demount Partitions						
Doors and Frames						
Electrical Equipment						
Mech Equipment						
Wood and Plastics						
Warped Pallet Forms						
Card-board						
Wood						
Metal						
Other						

3.8 COST/REVENUE ANALYSIS WORKPLAN (CRAW)

.1 Schedule D - Cost/Revenue Analysis Workplan (CRAW)

(1) Material Description	(2) Total Qty (unit)	(3) Volume (cum)	(4) Weight (cum)	(5) Disposal Cost/Credit \$(+/-)	(6) Category Sub-Total \$(+/-)	(7) Cost (-) Revenue (+)
Acoustic Tile						
Acoustical Insul						
Carpet						
Demountable						
Partitions						
Doors and Frames						
Elec Equipment						
Mech Equipment						
Wood and Plastic						
Warped Pallet Forms						
Card-board						
Wood						
Metal						
Other						

3.9 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment

Quebec	Développement durable, Environnement et Lutte contre les changements climatiques, 29 th Floor 675, boul. René Lévesque Est Québec, QC G1R 5V7	(418) 521-3830 (800) 561-1616
Canada	Environment Canada Toronto, ON	(416) 734-4494

END OF SECTION

Part 1 General**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final hardcopies (4 English and 4 French) and one electronic copy (1 English and 1 French) of operating and maintenance manuals.
- .4 A copy will be returned after final inspection, with Departmental Representative's comments.
- .5 Revise content of documents (4 English and 4 French Operating and Maintenance Manuals) as required prior to final submittal.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 If requested, furnish evidence as to type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.2 FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.

CLOSEOUT SUBMITTALS

- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents:
 - .1 Provide title of project.
 - .2 Date of submission.
 - .3 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .4 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system, list names, addresses and telephone numbers of Contractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly 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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
 - .1 Technical Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Technical Documents.
 - .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. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

CLOSEOUT SUBMITTALS**1.5 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Technical Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finished 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 Technical Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly 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, and other documentation as required by individual specifications sections.

1.6 FINAL SURVEY

- .1 Submit final site survey certificate certifying that elevations and locations of completed Work are in conformance, or non-conformance with Technical Documents.

1.7 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and

CLOSEOUT SUBMITTALS

emergency instructions. Include summer, winter, and any special operating instructions.

- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports.
- .15 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

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

1.9 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.

CLOSEOUT SUBMITTALS

- .3 Deliver to site. Place and store in location as approved by Departmental Representative.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.10 MAINTENANCE 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. Place and store in location as approved by Departmental Representative.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 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. Place and store in location as approved by Departmental Representative.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.12 STORAGE, HANDLING AND PROTECTION

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

1.13 WARRANTIES

- .1 Develop warranty management plan to contain information relevant to Warranties.

CLOSEOUT SUBMITTALS

- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative's approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List Contractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties, executed in duplicate by Contractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.

CLOSEOUT SUBMITTALS

- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .9 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .10 Written verification will follow oral instructions.

1.14 PRE-WARRANTY CONFERENCE

- .1 Meet with Departmental Representative, to develop understanding of requirements of this section. Schedule meeting prior to project completion, and at time designated by Departmental Representative.
- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is available, and is responsive to inquiries for warranty work action.

1.15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Project number.
 - .5 Warranty period.

CLOSEOUT SUBMITTALS

- .6 Inspector's signature.
- .7 Construction Contractor.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****Part 1 General****1.1 RELATED REQUIREMENTS:**

- .1 Section 01 91 31 - Commissioning Plan.
- .2 Section 01 91 33 - Commissioning Forms.
- .3 Section 01 91 41 - 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 Project Manager to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Contractor to hire services of independent Commissioning Agent.
- .3 Cx Team to consist of following members:
 - .1 PWGSC Cx Group is to oversee:
 - .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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .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 PWGSC Cx Group to review documentation and witness selected tests.
- .4 Contractor's Cx Agent shall be responsible for all commissioning.
- .5 PWGSC Cx Group to oversee commissioning. Commissioning to be completed by Contractor's Cx Agent. Contractor to hire independent Cx Agent to:
 - .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.
- .6 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 Preparing Cx testing.
 - .2 Preparing Cx schedule.
 - .3 Coordinating and execution of TAB.
 - .4 Preparation of O&M Manual.
 - .5 Performance of Cx activities.
 - .6 Delivery of training and Cx documentation.
- .7 Consultant: The prime consultant and the engineers are the design team responsible for the specification, design and implementation of the project.
- .8 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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .9 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 effectively training to O&M staff.
- .2 Commissioning is a team effort. The Commissioning Team will be comprised of the Contractor Commissioning Agent, Contractor's Representatives, Design Consultants, and Departmental Representatives. The Contractor's Cx Agent and the Contractor's representatives are required at all commissioning activities; the Departmental 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. PWGSC Cx Group is to oversee only.
- .3 General Contractor to provide a Contractors 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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****1.5 COMMISSIONING OVERVIEW**

- .1 The Commissioning process for this project will be as follows:
 - .1 The Contractor's Cx Agent will update the Cx 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 Project Manager 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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .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 Before balancing, TAB Contractor to submit reviewed of system condition, ability, adequacy and methodology for balancing systems, submit TAB reports to Commissioning Team for review and approval.
 - .10 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 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 Company and name of Cx Agent.
 - .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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****1.10 COMMISSIONING DOCUMENTATION**

- .1 Contractor's Cx Agent to provide Project Specific Commissioning Forms as required.
- .2 Refer to Section 01 91 33 - Commissioning (Cx) 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.
- .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 Sub-contractors, 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 Contractor's Cx Agent, 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

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

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 Contractor's Cx Agent and Contractors 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.

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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .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 Contractor's Cx Agent 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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS****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 (Cx) - 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.

**GENERAL COMMISSIONING
(CX) REQUIREMENTS**

- .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.

END OF SECTION

**COMMISSIONING
(CX) PLAN****Part 1 General****1.1 RELATED REQUIREMENTS:**

- .1 Section 01 91 13 - General Commissioning Requirements.
- .2 Section 01 91 33 - Commissioning Forms.
- .3 Section 01 91 41 - 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: 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 facility:
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 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".
 - .1 Commissioning by Contractor's Cx Agent.
 - .2 PWGSC Cx Group is to oversee on-going commissioning only.
- .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.

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- .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 Contractor's Cx Agent and submitted to the General 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 Contractor's Cx Agent 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.

**COMMISSIONING
(CX) PLAN**

- .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 Project Manager 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 Contractor's Cx Agent 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 PWGSC Cx Group role is to oversee only.
 - .3 Departmental Representative: during construction, will conduct periodic site reviews to observe general progress.
 - .4 Property and Facility 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.
 - .5 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 Preparing Cx testing.
 - .2 Preparing Cx schedule.

**COMMISSIONING
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- .3 Coordinating and execution of TAB.
 - .4 Preparation of O&M Manual.
 - .5 Performance of Cx activities.
 - .6 Delivery of training and Cx documentation.
- .6 Consultant: The prime consultant and the engineers are the design team responsible for the specification, design and implementation of the project.
- .7 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/Sub-contractor:
- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
- .3 Specialist Sub-contractor: equipment and systems supplied and installed by specialist Sub-contractor.
- .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.

**COMMISSIONING
(CX) PLAN****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 Cx Structural and Architectural Systems:
 - .1 Architectural and structural:
 - .1 Equipment:
 - .1 Door Hardware.
 - .2 Client equipment installed under contract.
- .3 Commission mechanical systems and associated equipment but not limited to:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS systems.
 - .2 Domestic water heating systems.
 - .3 Sanitary drainage systems.
 - .4 Trap seal priming systems.
 - .5 Plumbing fixtures.
 - .2 HVAC and exhaust systems:
 - .1 HVAC systems c/w make-up air units, air handling units, fan coil units, energy recovery unit, roof top units, packaged split AC units, unit heaters.
 - .2 Exhaust systems c/w fans, intake air.
 - .3 Fire Dampers.
 - .3 Fire and life safety systems:
 - .1 Wet pipe sprinkler systems.
 - .2 Dry pipe sprinkler.
 - .3 Pre-action sprinkler systems.
 - .4 Dry pipe standpipe systems.
 - .4 Noise and vibration control systems for mechanical equipment.
 - .5 Seismic restraint and control measures.
 - .6 EMCS.
- .4 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Low voltage distribution systems.
 - .2 Lighting systems:
 - .1 Lighting equipment - lighting controls and occupancy sensing.
 - .2 Distribution systems.
 - .3 Emergency lighting systems.
 - .4 Fire exit emergency signage.

**COMMISSIONING
(CX) PLAN****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.

**COMMISSIONING
(CX) PLAN****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 - ARCHITECTURAL:

Manufacturer or installer to provide installation and operation report for the following:

 - .1 Doors, windows, related hardware:
 - .1 Door and window hardware.
- .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 Complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .2 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
 - .3 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, PWGSC Cx Group, O&M personnel, and

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- 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".
- .4 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include but not limited to equipment and systems identified.
 - .1 Fire Alarm.
 - .2 Fire Dampers.
 - .3 Fire Suppression System.
 - .4 Smoke Detection System.
 - .2 Reports of test results to be witnessed and certified by the Departmental Representative before verification.
- .5 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 Lighting systems:
 - .1 Emergency lighting systems: Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .3 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Once the Departmental Representative has witnessed and certified the report, demonstrate devices and zones to Departmental Representative and Authority having Jurisdiction.
 - .4 Low voltage systems: these include:
 - .1 Low voltage lighting control systems and data communications systems.

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.

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- .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 HVAC and associated systems forming part of integrated HVAC systems:
 - .2 Indoor air quality:
 - .3 Environmental space conditions:
 - .4 Fire alarm systems:
 - .5 Emergency power generator:
 - .6 Transfer switch and controllers:
 - .7 Lighting control systems:
 - .8 Emergency lighting systems:
- .6 Identification:
 - .1 During the construction, the Contractor to complete inventory data sheets and provide assistance to BGIS in full implementation of MMS identification system of components, equipment, sub-systems, systems.

**COMMISSIONING
(CX) PLAN****1.15 INSTALLATION CHECK LISTS (ICL)**

- .1 Refer to Section 01 91 33 - Commissioning (Cx) 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 (Cx) 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 (Cx) 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 Pre-TAB review: 28 days after contract award, and before construction starts.
 - .3 Cx procedures: 3 months after award of contract.
 - .4 Report format: 3 months after contract award.
 - .5 Discussion of heating/cooling loads for Cx: 3 months before start-up.
 - .6 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .7 Notification of intention to start TAB: 21 days before start of TAB.
 - .8 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .9 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.
 - .10 Identification of deferred Cx.
 - .11 Implementation of training plans.
 - .12 Cx of smoke management/control systems: after Cx of related systems is completed and 7 days before proposed date of Cx these systems.
 - .13 Cx reports: immediately upon successful completion of Cx.
 - .14 Emergency evacuation exercises: after 80 % occupancy and at same time as Cx demonstration of Fire Alarm system to the client.

**COMMISSIONING
(CX) PLAN**

- .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 Contractor's Cx Agent 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 DEPARTMENTAL REPRESENTATIVE

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

1.22 TRAINING PLANS

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - 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 Products**2.1 NOT USED**

- .1 Not Used.

**COMMISSIONING
(CX) PLAN**

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

COMMISSIONING FORMS**Part 1 General****1.1 RELATED REQUIREMENTS:**

- .1 Section 01 91 13 - General Commissioning Requirements.
- .2 Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Section 01 91 41 - 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.

COMMISSIONING FORMS**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 AND NUMBERING

- .1 The Contractor's Cx Agent will provide commissioning forms to document the Cx process carried out by the Contractor.
- .2 Contractor's Cx Agent required to collect and record all data for mechanical and electrical systems worked on under this contract based on the BGIS CMMS Inventory Sheet.
 - .1 Departmental Representative to assign numbering sequence to components and return to Contractor.
 - .2 Contractor to fabricate and install new identification tags.
 - .3 Contractor to complete labelling prior to issuance of acceptance of project.

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 Contractor's Cx Agent 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.

COMMISSIONING FORMS

- .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.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS:**

- .1 Section 01 91 13 - General Commissioning 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.

COMMISSIONING: TRAINING

- .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 Contractor's Cx Agent 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.

COMMISSIONING: 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 Contractor's Cx Agent.

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 videotapes 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