

Part 1 General**1.1 RESERVED****1.2 RESERVED****1.3 CONSTRUCTION PROGRESS SCHEDULE**

- .1 On award of contract the contractor must submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion, in compliance with Section 01 32 16.07 - Construction Progress Schedule Bar (GANTT) Chart. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .2 Carry out work during "regular hour", Monday to Friday from 07:00 to 18:00 hours and on Saturdays, Sundays and statutory holidays.
- .3 Reserved.
- .4 Sprinkle work must be carried out during "off hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
- .5 Must provide the Departmental Representative 48 hours notice for work to be carried out during "off hours".
- .6 Must provide the Department Representative 7 days notice for any work requiring shutting down any systems.

1.4 REGULATORY REQUIREMENTS

- .1 References and Codes:
 - .1 Materials must be new and work must conform to the minimum applicable standards of the "References" indicated in the specification sections, the National Building Code of Canada 2015 (NBC) and all applicable Provincial and Municipal codes.
- .2 Building Smoking Environment:
 - .1 Smoking is not permitted in the Building. Obey smoking restrictions on building property.
- .3 Hazardous Material Discovery:
 - .1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance is encountered during demolition work.
 - .1 Take preventative measure and promptly notify Departmental Representative.

- .2 Do not proceed until written instructions have been received from Departmental Representative.

1.5 FIRE SAFETY REQUIREMENTS

- .1 Must comply with both the National Building Code of Canada 2015 and the National Fire Code of Canada 2015 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows:
 - .1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
 - .2 The National Fire Code (NFC):
 - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
 - .2 The conduct of activities that might cause fire hazards in and around buildings.
 - .3 Limitations on hazardous contents in and around buildings.
 - .4 The establishment of fire safety plans.
 - .5 Fire safety at construction and demolition sites.
- .2 Retain all fire safety documents and standards on site.
- .3 Welding and cutting:
 - .1 Before welding, soldering, grinding and/or cutting work, obtain a permit from the Real Property Service Provider as directed by the Departmental Representative. Store flammable liquids in approved CSA containers. No open flame shall be used unless authorized by the Real property Service Provider
 - .2 At least 1 week 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.
 - .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
 - .3 A fire watch shall be provided in accordance with the NFC 2010 edition when hot work is carried out.
- .4 Where work requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems:
 - .1 Provide "Watchman Service" as described in NFC 2015; In general, watchman service is defined as an individual conversant with "Fire Emergency

- Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
- .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:
 - .1 modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
 - .2 cutting, welding, soldering or other construction activities that might activate fire protection systems.
 - .3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.
 - .4 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.
 - .5 Designated contractor: shall retain the services of Siemens to do all the work related to the fire alarm system and Direct Energy for any work relating to Energy Management Control System (EMCS).

1.6 QUALITY CONTROL

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

1.7 HAZARDOUS MATERIALS

- .1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS).

- .3 For work in occupied buildings, give the Department Representative 1 week notice for work involving designated substances (O. Reg. 490/09, Designated Substances), and before painting, caulking, installing carpet or using adhesives and other materials, that cause off gassing.

1.8 TEMPORARY UTILITIES

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

1.9 CONSTRUCTION FACILITIES

- .1 Designated elevators: freight elevators to be used by construction personnel and transporting of materials.
 - .1 Co-ordinate with Departmental Representative.
 - .2 Protect from damage, safety hazards and overloading of existing equipment.
- .2 Site Storage:
 - .1 The Departmental Representative will assign storage space that shall be equipped and maintained by the Contractor.
 - .2 Do not unreasonably encumber site with materials or equipment.
 - .3 Move stored products or equipment that interfere with operations of Departmental Representative or other contractors.
 - .4 Obtain and pay for use of additional storage or work areas needed for operations.
 - .5 Do not load or permit to load any part of work with weight or force that will endanger work.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Sanitary facilities: will be assigned for Contractor's personnel. Others shall not be used. Keep facilities clean and return in same condition as prior to start of construction. Provide protection for flooring, walls and countertops.

1.10 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Maintain existing services to building and provide for personnel and vehicle access. The contractor shall agree to install proper site separation and identification in order to maintain "Time and Space" at all times throughout the life of the project. When Building Operations staff requires access to equipment in order to operate the building, proper coordination and communication must exist between all parties involved
- .2 Work zone locations are identified on the drawings.
- .3 Dust Control:
 - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .4 Protection:
 - .1 Protect work against damage until take-over.
 - .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
 - .3 Protect operatives and other users of site from all hazards.

1.11 EXAMINATION and PREPARATION

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

1.12 FIELD QUALITY CONTROL

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

1.13 SIGNS

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

1.14 EXECUTION

- .1 Cut, Patch and Make Good:
 - .1 Cut existing surfaces as required to accommodate new work.
 - .2 Remove all items so shown or specified.
 - .3 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval.
- .2 Firestop and smoke seal systems: in accordance with CAN-ULC-S115-05 - Standard Method of Fire Test of Firestop Systems. Install around pipe, ductwork, cables, and other objects penetrating fire separations to provide fire resistance not less than the fire resistance rating of surrounding floor, ceiling, and wall assembly.
- .3 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
- .4 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

1.15 WASTE MANAGEMENT

- .1 Comply with Environmental Protection Act, Ontario Regulations: O. Reg. 102/94 - Waste Audits and Waste Reduction Work Plans; and O. Reg. 103/94 - Industrial, Commercial and Institutional Source Separation Programs; for waste management on construction and demolition projects.
- .2 Conduct "waste audit" to determine what waste will be generated during construction and demolition operations. Prepare written "waste reduction work plan" and implement the principles to reduce, reuse and recycle materials to the extent that is possible.
- .3 Provide a "source separation program" to disassemble and collect in an orderly fashion the following "materials designated for alternative disposal" from the "general waste" stream:
 - .1 brick and Portland cement concrete;
 - .2 cardboard (corrugated);
 - .3 gypsum board (unfinished);

- .4 steel; and
- .5 wood (not including painted, treated or laminated wood).
- .4 Submit complete records of all removals from site for both "materials designated for alternative disposal" and "general waste" including:
 - .1 time and date of removal;
 - .2 description of material and quantities; and
 - .3 proof that materials have been received at an approved Waste Processing Site or certified Waste Disposal Site as required.

1.16 CLEANING

- .1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
- .2 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.
- .3 Clean and polish glass, mirrors, ceramic tile, aluminum, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware and washroom fixtures. Clean manufactured articles in accordance with manufacturer's written instructions.
- .4 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

1.17 RESERVED

1.18 RESERVED

1.19 COST BREAKDOWN

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

1.20 PRECEDENCE

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

1.21 PHOTOGRAPHS

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

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1. GENERAL

1.1 REFERENCES

1. *Federal Legislation*

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

2. *Provincial Legislation*

1. *Ontario Occupational Health and Safety Act, R.S.O. 1990, 2010 edition.*
 1. *Ontario Regulation 490/09 – Designated Substances (O.Reg. 490/09).*
 2. *Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations, (O.Reg. 278/05).*
 3. *Ontario Regulation 213/91 for Construction Projects (O.Reg. 213/91)*
 2. *Ontario Environmental Protection Act, R.R.O. 1990,*
 1. *Ontario Regulation 347/90, General – Waste Management (O.Reg. 347/90).*
 2. *Ontario Regulation 463/10, Ozone Depleting Substances and Other Halocarbons (O.Reg. 463/10).*
 3. *Ontario Dangerous Goods Transportation Act*
3. *Canadian General Standards Board (CGSB).*
 4. *Canadian Standards Association (CSA International). CAN/CSA-Z94.4-11 - Respiratory Protection*
 5. *Underwriters' Laboratories of Canada (ULC).*

1.2 DEFINITIONS

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

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

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

1.3 DESIGNATED SUBSTANCES

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

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

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

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

Bulk sample and laboratory analysis has confirmed that the following materials contain regulated amounts of asbestos:

- Drywall joint compound was confirmed to contain 1% Chrysotile asbestos. Based on the results, all drywall joint compound throughout the project areas shall be considered asbestos-containing.

The following materials have also been historically confirmed to be asbestos-containing materials and applicable to the project areas:

- Non-friable 12"x12" (30cm x 30cm) vinyl floor tile, off-white with streaks and mastic contains 2% Chrysotile asbestos, and are present on each floor and associated with, but not limited to, the following: janitor closets, electrical rooms, telephone rooms, photocopy areas/storage rooms.
- Non-friable fire stopping caulking/material at perimeter induction units contains 40% Chrysotile asbestos, and is present throughout all floors where perimeter induction units are present. All perimeter induction units should be assumed to contain firestop/caulking materials in sporadic locations inside the internal components, throughout the entire length of the perimeter induction unit installation, where present. In addition, firestop caulking (black, brown) may also be present around pipe penetrations through floors/ceiling and walls. All instances of black and brown firestop caulking should be assumed to contain asbestos, where present.
- Non-friable vinyl baseboard mastic associated with vinyl baseboards contains 0.53% Chrysotile asbestos.
- Non-friable cast iron drainpipe bell joint caulking, containing 40% Amosite and 30% Chrysotile asbestos, if present and encountered.

- Non-friable window weather stripping/caulking was confirmed to contain 14% Chrysotile asbestos. As such, all window caulking is suspected to contain asbestos, unless extensive delineation sampling and laboratory analysis proves otherwise, or windows can be confirmed as newer installations that would post-date the use of asbestos in window caulking applications.

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

- Black floor tile mastic associated with asbestos-containing 12"x12" (30cm x 30cm) vinyl floor tile, off-white with streaks, observed in janitor closets, electrical rooms, telephone rooms, photocopy areas/storage rooms,
- Carpet mastic observed throughout the project areas,
- Large pinhole with fissures ceiling tiles
- Small pinhole with fissures ceiling tiles
- Fissures with pinhole ceiling tiles
- Stipple Wall/Ceilings – West Tower Elevator Lobbies. However, this material should be assumed to be applied to drywall with asbestos-containing joint compound.
- Other ceiling tiles were comprised of fiberglass, or verified as non-asbestos containing via identification of the manufacturer date code (which would post-date the use of asbestos in ceiling tiles) where present, and
- Other vinyl flooring products were observed to be newer installations, and thus not suspected to contain asbestos.

4. BENZENE: Not Identified

5. COKE OVEN EMISSIONS: Not identified

6. ETHYLENE OXIDE: Not Identified

7. ISOCYANATES: Not Identified

8. LEAD: **Assumed**

All paints and surface coatings not sampled throughout the project areas shall be assumed to contain detectable concentrations of lead, unless specific bulk sampling and laboratory analysis proves otherwise.

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

- Ceramic Tile Glazing,
- Solder on the joints of copper piping,

- Cast-iron drain pipe joint caulking, and
- 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**

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

- Concrete and cement building elements,
- Ceramic tiles, marble, mortars and grout,
- Drywall building elements,
- Flooring layers,
- Ceiling tiles,
- Vinyl flooring products,

11. **VINYL CHLORIDE MONOMER: Not Identified**

12. **POLYCHLORINATED BIPHENYLS (PCBs): Not Identified**

Light fixtures with T12 lamps are more likely to contain ballasts that were manufactured prior to 1981. T8 lamps are associated with light fixtures that were manufactured after the phase-out of PCB-containing ballasts. The letter "T" denotes the shape of the light fixture (e.g. tubular) and the number which follows indicates the diameter in eighths of an inch. Light fixtures in the building were observed to be comprised of T8 lamp tubes, where the ballasts associated with these light fixtures are not suspected to contain PCBs.

Transformers in the project areas were observed to be dry-type transformers, and are not suspected to contain PCBs.

13. **MOULD: Not Identified**

14. **HALOCARBONS: Not Identified**

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

1.4 RECOMMENDATIONS

1. ASBESTOS

1. All work must be done in accordance with *Canada Occupational Health and Safety Regulations (as amended)*, *PSPC Asbestos Management Standard*, and *O.Reg 278/05 (as amended)*. In the event of conflict between the federal and provincial regulations, the most stringent procedures apply.
2. The disturbance of ACMs on construction and demolition projects by the *Canada Occupational Health and Safety Regulations*, *PSPC Asbestos Management Standard*, and in the province of Ontario by *O.Reg 278/05*, as amended. These Regulations classifies all asbestos disturbances as Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition. The Ontario Ministry of Labour (MoL) must be notified of any project involving removal of more than a minor amount (e.g. typically 1 square metre) of friable asbestos material.
3. The removal or disturbance of less than one square meter of drywall in which joint-filling compounds that are asbestos-containing material have been used can be completed using Low Risk asbestos procedures. The removal or disturbance of one square meter or more of drywall in which joint-filling compounds that are asbestos-containing material have been used must be completed using a minimum of Moderate Risk asbestos procedures.
4. Low Risk work procedures can be used for the removal of non-friable ACMs, provided that the material can be wetted and removed using only non-powered hand tools. If these conditions cannot be met, then more stringent (e.g., Moderate Risk or High Risk) procedures are necessary.
5. The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials if the work is done by means of a power tool that is attached to a dust-collecting device equipped with HEPA filters, can be performed using Moderate Risk asbestos work procedures. The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials, if the work is done by means of a power tool that is not attached to a dust-collecting device

equipped with HEPA filters, requires High Risk asbestos work procedures.

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

2. LEAD

1. Follow recommendations provided in the Ontario Ministry of Labour (MoL) Guideline entitled "Guideline: Lead on Construction Projects". This guideline classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification.
2. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed the TWAEL of 0.05 milligram per cubic metre (mg/m^3) prescribed by O.Reg. 490/09.
3. Even at low concentrations, there may be a potential for exposure to high concentrations of lead depending on the activities performed (e.g. by aggressive means such as sandblasting, grinding, etc.) 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.
4. Disposal of construction waste containing lead must be done in accordance with O.Reg. 347/90 – General Waste Management, as amended, under the Ontario Environmental Protection Act, the Ontario Dangerous Good Transportation Act, and the federal Transportation of Dangerous Goods Act. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as "hazardous", "non-hazardous" or "registerable solid waste" depending on the results of the leachate test.

3. MERCURY

1. All work involving disturbance of mercury-containing equipment must be done in accordance with O.Reg. 490/09.
2. When removal of fluorescent light tubes is required, the tubes should be removed intact from the fixtures. Other sources of liquid mercury should be removed intact to prevent worker exposure.
3. Disposal of waste containing mercury must be done in accordance with "General – Waste Management" O.Reg. 347/90 (as amended) under the Ontario Environmental Protection Act, the Ontario Dangerous Goods Transportation Act, and the federal Transportation of Dangerous Goods Act.

4. SILICA

1. Comply with Ontario Regulations O.Reg. 490/09 when performing works that may disturb silica-containing materials. The regulation provides requirements for allowable exposure levels.
2. Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in select materials within the project area, appropriate respiratory protection and ventilation must be donned during the demolition and modifications of these structures.
3. Follow recommendations provided in the MoL Guideline entitled "Guideline: Silica on Construction Projects". This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

2. PRODUCTS

Not used

3. EXECUTION

Not used

END OF SECTION

1. GENERAL

1.1 REFERENCES

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

1.3 DESIGNATED SUBSTANCES

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

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

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

Bulk sample and laboratory analysis has confirmed that the following materials contain regulated amounts of asbestos:

- Drywall joint compound was confirmed to contain 1% Chrysotile asbestos. Based on the results, all drywall joint compound throughout the project areas shall be considered asbestos-containing.

The following materials have also been historically confirmed to be asbestos-containing materials and applicable to the project areas:

- Non-friable 12"x12" (30cm x 30cm) vinyl floor tile, off-white with streaks and mastic contains 2% Chrysotile asbestos, and are present on each floor and associated with, but not limited to, the following: janitor closets, electrical rooms, telephone rooms, photocopy areas/storage rooms.
- Non-friable fire stopping caulking/material at perimeter induction units contains 40% Chrysotile asbestos, and is present throughout all floors where perimeter induction units are present. All perimeter induction units should be assumed to contain firestop/caulking materials in sporadic locations inside the internal components, throughout the entire length of the perimeter induction unit installation, where present. In addition, firestop caulking (black, brown) may also be present around pipe penetrations through floors/ceiling and walls. All instances of black and brown firestop caulking should be assumed to contain asbestos, where present.
- Non-friable vinyl baseboard mastic associated with vinyl baseboards contains 0.53% Chrysotile asbestos.
- Non-friable cast iron drainpipe bell joint caulking, containing 40% Amosite and 30% Chrysotile asbestos, if present and encountered.

- Non-friable window weather stripping/caulking was confirmed to contain 14% Chrysotile asbestos. As such, all window caulking is suspected to contain asbestos, unless extensive delineation sampling and laboratory analysis proves otherwise, or windows can be confirmed as newer installations that would post-date the use of asbestos in window caulking applications.

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

- Black floor tile mastic associated with asbestos-containing 12"x12" (30cm x 30cm) vinyl floor tile, off-white with streaks, observed in janitor closets, electrical rooms, telephone rooms, photocopy areas/storage rooms,
- Carpet mastic observed throughout the project areas,
- Large pinhole with fissures ceiling tiles
- Small pinhole with fissures ceiling tiles
- Fissures with pinhole ceiling tiles
- Stipple Wall/Ceilings – West Tower Elevator Lobbies. However, this material should be assumed to be applied to drywall with asbestos-containing joint compound.
- Other ceiling tiles were comprised of fiberglass, or verified as non-asbestos containing via identification of the manufacturer date code (which would post-date the use of asbestos in ceiling tiles) where present, and
- Other vinyl flooring products were observed to be newer installations, and thus not suspected to contain asbestos.

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

All paints and surface coatings not sampled throughout the project areas shall be assumed to contain detectable concentrations of lead, unless specific bulk sampling and laboratory analysis proves otherwise.

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

- Ceramic Tile Glazing,
- Solder on the joints of copper piping,

- Cast-iron drain pipe joint caulking, and
- 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**

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

- Concrete and cement building elements,
- Ceramic tiles, marble, mortars and grout,
- Drywall building elements,
- Flooring layers,
- Ceiling tiles,
- Vinyl flooring products,

11. **VINYL CHLORIDE MONOMER: Not Identified**

12. **POLYCHLORINATED BIPHENYLS (PCBs): Not Identified**

Light fixtures with T12 lamps are more likely to contain ballasts that were manufactured prior to 1981. T8 lamps are associated with light fixtures that were manufactured after the phase-out of PCB-containing ballasts. The letter "T" denotes the shape of the light fixture (e.g. tubular) and the number which follows indicates the diameter in eighths of an inch. Light fixtures in the building were observed to be comprised of T8 lamp tubes, where the ballasts associated with these light fixtures are not suspected to contain PCBs.

Transformers in the project areas were observed to be dry-type transformers, and are not suspected to contain PCBs.

13. **MOULD: Not Identified**

14. **HALOCARBONS: Not Identified**

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

1.4 RECOMMENDATIONS

1. ASBESTOS

1. All work must be done in accordance with *Canada Occupational Health and Safety Regulations (as amended)*, *PSPC Asbestos Management Standard*, and *O.Reg 278/05 (as amended)*. In the event of conflict between the federal and provincial regulations, the most stringent procedures apply.
2. The disturbance of ACMs on construction and demolition projects by the *Canada Occupational Health and Safety Regulations*, *PSPC Asbestos Management Standard*, and in the province of Ontario by *O.Reg 278/05*, as amended. These Regulations classifies all asbestos disturbances as Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition. The Ontario Ministry of Labour (MoL) must be notified of any project involving removal of more than a minor amount (e.g. typically 1 square metre) of friable asbestos material.
3. The removal or disturbance of less than one square meter of drywall in which joint-filling compounds that are asbestos-containing material have been used can be completed using Low Risk asbestos procedures. The removal or disturbance of one square meter or more of drywall in which joint-filling compounds that are asbestos-containing material have been used must be completed using a minimum of Moderate Risk asbestos procedures.
4. Low Risk work procedures can be used for the removal of non-friable ACMs, provided that the material can be wetted and removed using only non-powered hand tools. If these conditions cannot be met, then more stringent (e.g., Moderate Risk or High Risk) procedures are necessary.
5. The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials if the work is done by means of a power tool that is attached to a dust-collecting device equipped with HEPA filters, can be performed using Moderate Risk asbestos work procedures. The breaking, cutting, drilling, abrading, grinding, sanding, or vibrating of asbestos-containing materials, if the work is done by means of a power tool that is not attached to a dust-collecting device

equipped with HEPA filters, requires High Risk asbestos work procedures.

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

2. LEAD

1. Follow recommendations provided in the Ontario Ministry of Labour (MoL) Guideline entitled “Guideline: Lead on Construction Projects”. This guideline classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification.
2. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed the TWAEEL of 0.05 milligram per cubic metre (mg/m^3) prescribed by O.Reg. 490/09.
3. Even at low concentrations, there may be a potential for exposure to high concentrations of lead depending on the activities performed (e.g. by aggressive means such as sandblasting, grinding, etc.) 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.
4. Disposal of construction waste containing lead must be done in accordance with O.Reg. 347/90 – General Waste Management, as amended, under the Ontario Environmental Protection Act, the Ontario Dangerous Good Transportation Act, and the federal Transportation of Dangerous Goods Act. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as “hazardous”, “non-hazardous” or “registerable solid waste” depending on the results of the leachate test.

3. MERCURY

1. All work involving disturbance of mercury-containing equipment must be done in accordance with O.Reg. 490/09.
2. When removal of fluorescent light tubes is required, the tubes should be removed intact from the fixtures. Other sources of liquid mercury should be removed intact to prevent worker exposure.
3. Disposal of waste containing mercury must be done in accordance with "General – Waste Management" O.Reg. 347/90 (as amended) under the Ontario Environmental Protection Act, the Ontario Dangerous Goods Transportation Act, and the federal Transportation of Dangerous Goods Act.

4. SILICA

1. Comply with Ontario Regulations O.Reg. 490/09 when performing works that may disturb silica-containing materials. The regulation provides requirements for allowable exposure levels.
2. Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is present in select materials within the project area, appropriate respiratory protection and ventilation must be donned during the demolition and modifications of these structures.
3. Follow recommendations provided in the MoL Guideline entitled "Guideline: Silica on Construction Projects". This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification. These work procedures should be followed when performing work involving the disturbance of silica-containing materials.

2. PRODUCTS

Not used

3. EXECUTION

Not used

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 00 10 - General Instructions.

1.02 ADMINISTRATIVE

- .1 Attend weekly project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Provide physical space and make arrangements for meetings.
- .3 Meeting Minutes will be recorded by the Consultant.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.03 PRECONSTRUCTION MEETING

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.
 - .3 Schedule of submission of shop drawings and submittals. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Delivery schedule of specified equipment in accordance with Section 01 00 10 - General Instructions.
 - .5 Site security in accordance with Section 01 00 10 - General Instructions.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .7 Owner provided products.
 - .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
 - .10 Take-over procedures, acceptance, warranties in accordance with

Section 01 78 00 - Closeout Submittals.

- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.04 PROGRESS MEETINGS

- .1 During course of Work up to project completion, schedule progress meeting weekly
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative Consultant and other stakeholders to determined be are to be in attendance.
- .3 Meetings will be held at an agreed-to day and time each week.
- .4 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for affect on construction schedule and on completion date.
 - .12 Other business.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 00 10 - General Instructions.

1.02 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative DCC Representative Consultant to enable monitoring of project work in relation to established milestones.

1.03 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.

- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 5 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.05 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Refer to contractual requirements as set out by PSPC.

1.06 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.07 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Interior Architecture (Walls, Floors and Ceiling).
 - .6 Plumbing.
 - .7 Lighting.
 - .8 Electrical.
 - .9 Piping.
 - .10 Controls.
 - .11 Heating, Ventilating, and Air Conditioning.
 - .12 Millwork.
 - .13 Fire Systems.

- .14 Testing and Commissioning.
- .15 Supplied equipment long delivery items.

1.08 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.09 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 00 10 - General Instructions.

1.02 ADMINISTRATIVE

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

1.03 SHOP DRAWINGS AND PRODUCT DATA

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

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

- .4 Allow 3 days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.

- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.

- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

- .18 Delete information not applicable to project.

- .19 Supplement standard information to provide details applicable to project.

- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- .21 The review of shop drawings by Public Services and Procurement Canada (PSPC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PSPC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site,

for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.04 SAMPLES

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

1.05 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 01 00 10 - General Instructions.
 - .2 Section 01 14 25 - Designated Substances Report.
- 1.2 REFERENCES
- .1 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c. 0.1, as amended and O. Reg. 213/91, as amended.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Submit a copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
 - .4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors to the Departmental Representative within 24 hours.
 - .1 Advise the Departmental within 24 hours of any Authority Having Jurisdiction visiting the site.
 - .5 Submit copies of any Notice required by legislation, incident and accident reports to the Departmental Representative within 48 hours.
 - .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 00 10 - General Instructions.
 - .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.
 - .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and

-
- Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- 1.4 FILING OF NOTICE .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- 1.5 SAFETY ASSESSMENT .1 Perform site specific safety hazard assessment related to project.
- 1.6 MEETINGS .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
- 1.7 PROJECT/SITE CONDITIONS .1 Work at site will involve contact with the following materials. Refer to Section 01 14 25 - Designated Substances Report.
- .1 Asbestos
 - .2 Lead
 - .3 Mercury
 - .4 Silica
- 1.8 GENERAL REQUIREMENTS .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- 1.9 RESPONSIBILITY .1 Be responsible and assume the role of "Constructor" as described in the Ontario Occupational Health and Safety Act and the Regulations for Construction projects. Refer to Section 01 00 10 - General Instructions, sentence 1.10 for information pertaining to Work Zone Locations & Identification.
- .2 Assume responsibility for health and safety of all other contractors present on site under the prescriptions of the present section.
- .3 Comply with and enforce compliance by all persons granted access with safety requirements of Contract Documents, applicable federal, provincial and local statutes, regulations, and ordinances, and with

site-specific Health and Safety Plan.

- 1.10 COMPLIANCE REQUIREMENTS
- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, C.0.1.
 - .2 Comply with the Ontario Regulations for Construction Projects, O. Reg. 213/91.
- 1.11 UNFORSEEN HAZARDS
- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- 1.12 RESERVED
- 1.13 POSTING OF DOCUMENTS
- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.
- 1.14 CORRECTION OF NON-COMPLIANCE
- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
 - .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
 - .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.
- 1.15 POWDER ACTUATED DEVICES
- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.
- 1.16 WORK STOPPAGE
- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- PART 2 - PRODUCTS
- 2.1 NOT USED
- .1 Not used.
- PART 3 - EXECUTION
- 3.1 NOT USED
- .1 Not used.

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.

1.02 REFERENCES

- .1 Definitions:
 - .1 Closed-loop Recycling: a product which is re-manufactured into the same product.
 - .2 Open-loop Recycling: a product which is re-manufactured into different types of products.
 - .3 Nylon - Type 6: carpet fibre with one base ingredient: Caprolactam.
 - .4 Nylon - Type 6,6: carpet fibre with two base ingredients: Adipic Acid and Hexamethylene.
- .2 Reference Standards:
 - .1 Carpet and Rug Institute (CRI)
 - .1 CRI Carpet Installation Standard - 2011.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit control submittals.
- .3 Submit report outlining proposed dust control measures.
- .4 Submit carpet schedule using same room designations indicated on drawings.
- .5 Submit schedule of carpet recycling activities including the following:
 - .1 Sequence of carpet removal.
 - .2 Inventory of items to be removed and recycled.
 - .3 Indicate type of carpet fibre Nylon 6 or Nylon 6,6.
 - .4 Recycling.
- .6 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.04 CLOSEOUT

SUBMITTALS

- .1 Submit schedule of carpet reclamation activities.
 - .1 Indicating the following:
 - .1 Detailed sequence of removal work.
 - .2 Areas of partial occupied floor space.

- .3 Inventory of used carpet to be removed and reclaimed.
- .4 Proposed packing and transportation measures.
- .2 Reclamation Agencies' records indicating receipt and disposition of used carpet.
- .3 Certification: Reclamation Agency to verify in writing that used carpet was removed and recycled in accordance with carpet fibre manufacturers' reclamation program.
 - .1 Indicate type of recycling program:
 - .1 Closed-loop or Open-loop.
- .4 Record off-site removal of debris and materials and provide the following information regarding removed used carpet materials.
 - .1 Time and date of removal.
 - .2 Type of material Nylon 6 or Nylon 6,6.
 - .3 Weight and quantity of materials.
 - .4 Final destination of materials.

1.05 QUALITY ASSURANCE SUBMITTALS

- .1 Certificates: submit from Reclamation Agency and Carpet remover certificates that used carpet was removed and recycled in accordance with Carpet Reclamation Program. Extraction of embodied energy by incineration is not acceptable.

1.06 ENVIRONMENT

- .1 Obtain written approval from Departmental Representative before performing operations which generate contaminants.

2 PRODUCTS

2.01 MATERIALS

- .1 Carpet adhesive removal solvents: in accordance with CRI Carpet Installation Standard.
- .2 Used Carpet:
 - .1 Maintain possession of removed used carpet. Remove immediately from area of Work and place in container or trailer.
- .3 Underlay Undercushion:
 - .1 Include recycling of carpet underlay undercushion where locally available or as designated by Carpet Reclamation Agency.

3 EXECUTION

3.01 EXAMINATION

- .1 Examine and verify Work areas and conditions are suitable to perform work. Identify and report to Departmental Representative problems that will delay start and completion of Work.

- .1 Do not proceed until problems or conditions have been corrected, and instructed by Departmental Representative.

3.02 PREPARATION

- .1 Vacuum used carpet prior to removal.

3.03 CARPET REMOVAL

- .1 Remove used broadloom carpet in large pieces.
 - .1 Roll carpet tightly and pack neatly in disposal container.
 - .2 Remove used carpet tile stack, pack in cardboard boxes and pack in trailer on pallets.
 - .3 Pack only clean dry carpet tile in disposal container. Clean is defined as carpet free from demolition debris, asbestos, garbage and tack strips.
 - .4 Remove carpet adhesive per CRI Carpet Installation Standard.

3.04 CONTAINER DISPOSAL

- .1 Maximize packing techniques of used carpet, container should hold between 1,500 to 2,500 m³.
 - .1 Re-pack used carpet in cardboard boxes prior to placing in containers.
- .2 Co-ordinate with Reclamation Agency for pickup and drop off of replacement containers.
 - .1 Remove lock from container prior to pick up.

3.05 TRUCK TRAILER DISPOSAL

- .1 Place used carpet in trailer supplied by Reclamation Agency. Place only used commercial carpet in trailer.
 - .1 Keep trailer off limits to workers not involved in reclamation activities and from public
- .2 Maximize packing techniques of used carpet.
 - .1 Do not stack carpet tiles more than 1.828 m high on trailer.
- .3 Comply with Department of Transportation weight limit regulations.
 - .1 Maximum weight of used carpet on trailer is 20,455 kg.
- .4 Co-ordinate with Reclamation Agency for pickup and drop off of replacement trailer.
 - .1 Remove lock from trailer prior to pick up.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.07 PROTECTION

- .1 Protect installed products and components from damage during reclamation activities.
- .2 Repair damage to adjacent materials caused by reclamation activities installation.

END OF SECTION

PART 1 - GENERAL1.1 RELATED
REQUIREMENTS

- .1 Section 01 00 10 - General Instructions.

1.2 REFERENCES

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

1.3 QUALITY

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

1.4 STORAGE,
HANDLING AND
PROTECTION

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

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S
INSTRUCTIONS

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

- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

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

1.7 CO-ORDINATION

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

1.9 CONCEALMENT

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

1.10 REMEDIAL WORK

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

1.11 LOCATION OF FIXTURES

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

installation. Install as directed.

1.12 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.

1.13 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.

1.14 PROTECTION OF WORK IN PROGRESS

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

1.15 EXISTING UTILITIES

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

PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner 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 Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.03 MATERIALS

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

1.04 PREPARATION

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

1.05 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to

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

1.06 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 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 00 10 - General Instructions.

1.02 REFERENCES

- .1 Not used.

1.03 PROJECT CLEANLINESS

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

1.04 FINAL CLEANING

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

- and equipment.
- .4 Remove waste products and debris including that caused by Owner or other Contractors.
 - .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative.
 - .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
 - .7 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.
 - .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
 - .9 Clean lighting reflectors, lenses, and other lighting surfaces.
 - .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
 - .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
 - .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
 - .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
 - .14 Remove dirt and other disfiguration from exterior surfaces.
 - .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
 - .16 Sweep and wash clean paved areas.
 - .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
 - .18 Clean roofs, downspouts, and drainage systems.
 - .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
 - .20 Remove snow and ice from access to building.

1.05 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 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PSPC's waste management goal and Contractor's proposed Waste Reduction Workplan for Construction, Renovation and /or Demolition (CRD) waste to be project generated.
- .2 PWGSC's waste management goal: to divert a minimum 75 percent of total Project Waste from landfill sites. Prior to project completion provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.
- .4 Protect environment and prevent environmental pollution damage.

1.02 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 43.10 - Carpet Reclamation.

1.03 REFERENCES

- .1 Definitions:
 - .1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative .
 - .2 Class III: non-hazardous waste - construction renovation and demolition waste.
 - .3 Construction, Renovation and/or Demolition (CRD) Waste: Class III solid, non-hazardous waste materials generated during construction, demolition, and/or renovation activities
 - .4 Cost/Revenue Analysis Workplan (CRAW): based on information from Waste Reduction Workplan, and intended as financial tracking tool for determining economic status of waste management practices (Schedule E).
 - .5 Inert Fill: inert waste - exclusively asphalt and concrete.
 - .6 Waste Source Separation Program (WSSP): implementation and co-ordination of ongoing activities to ensure designated waste materials will be sorted into pre-defined categories and sent for recycling and reuse, maximizing diversion and potential to reduce disposal costs.
 - .7 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
 - .8 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
 - .9 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.
- .10 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
 - .11 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
 - .12 Separate Condition: refers to waste sorted into individual types.
 - .13 Source Separation: act of keeping different types of waste materials separate beginning from the point they became waste.
 - .14 Waste Audit (WA): detailed inventory of estimated quantities of waste materials that will be generated during construction, demolition, deconstruction and/or renovation. Involves quantifying by volume/weight amounts of materials and wastes that will be reused, recycled or landfilled. Refer to Schedule A.
 - .15 Waste Diversion Report: detailed report of final results, quantifying cumulative weights and percentages of waste materials reused, recycled and landfilled over course of project. Measures success against Waste Reduction Workplan (WRW) goals and identifies lessons learned.
 - .16 Waste Management Co-ordinator (WMC) : contractor representative responsible for supervising waste management activities as well as co-ordinating required submittal and reporting requirements.
 - .17 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials generated by project. Specifies diversion goals, implementation and reporting procedures, anticipated results and responsibilities. Waste Reduction Workplan (Schedule B) information acquired from Waste Audit.
- .2 Reference Standards:
- .1 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
 - .2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
 - .3 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
 - .4 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.
 - .2 Ontario Ministry of Environment
 - .1 Ontario 3 R's Regulations (regulation 102/94) for waste management programs applicable to construction and demolition

- projects greater than 2,000 m³.
- .2 Ontario Environmental Protection Act (EPA)
 - .1 Regulation 102/94, Waste Audits and Waste Reduction Workplans.
 - .2 Regulation 103/94, Source Separation Programs.
 - .3 Canadian Construction Association (CCA)
 - .1 CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.
 - .4 Public Works and Government Services Canada (PWGSC)
 - .1 2002 National Construction, Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.
 - .2 CRD Waste Management Market Research Report (available from PWGSC's Environmental Services).
 - .3 Sustainable Development Strategy 2007-2009: Target 2.1 Environmentally Sustainable Use of Natural Resources.
 - .1 Real Property projects over \$1 million and in communities where industrial recycling is supported, implementation of CRD waste management practices will be completed, with waste materials being reused or recycled.
 - .2 Contractually ensure resources used in construction or maintenance are consumed and recovered in a sustainable manner.

1.04 DOCUMENTS

- .1 Post and maintain in visible and accessible area at job site, one copy of following documents:
 - .1 Waste Audit (Schedule A).
 - .2 Waste Reduction Workplan (Schedule B).
 - .3 Waste Source Separation Program.
 - .4 Schedules A B completed for project.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
 - .1 1 copy and 1 electronic copy of completed Waste Audit (WA): Schedule A.
 - .2 1 copy and 1 electronic copy of completed Waste Reduction Workplan (WRW): Schedule B.
 - .3 1 copy and 1 electronic copy of Cost/Revenue Analysis Workplan (CRAW): Schedule E.
 - .4 1 copy and 1 electronic copy of Waste Source Separation Program (WSSP).
- .3 Prepare and submit on weekly basis, throughout project or at intervals agreed to by Departmental Representative the following:
 - .1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
 - .2 Updated Waste Materials Tracking form (Schedule D).
 - .3 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

- .4 Submit prior to final payment the following:
 - .1 Waste Diversion Report, indicating final quantities in tones by material types salvaged for reuse, recycling or disposal in landfill and recycling centres, re-use depots, landfills and other waste processors that received waste materials (See Schedule C).
 - .2 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.06 WASTE AUDIT (WA)

- .1 Departmental Representative will prepare WA prior to project start-up. WA will be provided with bid documentation (see Schedule A).
- .2 WA provides detailed inventory, estimated quantities and types of waste materials that will be generated as well as their potential to be reused and/or recycled and project's waste diversion goals and objectives.
- .3 After award of contract, contractor to review WA and confirm that anticipated quantities of waste generated are accurate and goals achievable.
- .4 If after review, contractor determines that indicated quantities or opportunities in WA are not accurate or achievable, contractor to provide written details of discrepancies and revised quantities for areas of concern. Contractor to meet with Departmental Representative to review and justify revisions.
- .5 Post on-site WA where contractor and sub-contractors are able to review content.

1.07 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare and submit WRW (Schedule B) at least 10 days prior to project start-up.
- .2 WRW identifies strategies to optimize diversion through reduction, reuse, and recycling of materials and comply with applicable regulations, based on information acquired from WA.
- .3 WRW should include but not limited to:
 - .1 Applicable regulations.
 - .2 Specific goals for waste reduction, identify existing barriers and develop strategies to overcome them.
 - .3 Destination of materials identified.
 - .4 Deconstruction/disassembly techniques and schedules.
 - .5 Methods to collect, separate, and reduce generated wastes.
 - .6 Location of waste bins on-site.
 - .7 Security of on-site stock piles and waste bins.
 - .8 Protection of personnel, sub-contractors.
 - .9 Clear labelling of storage areas.
 - .10 Training plan for contractor and sub-contractors.
 - .11 Methods to track and report results reliably (Schedule D).
 - .12 Details on materials handling and removal procedures.
 - .13 Recycler and reclaimer requirements.
 - .14 Quantities of materials to be salvaged for reuse or recycled and materials sent to landfill.

- .15 Requirements for monitoring on-site wastes management activities.
- .4 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .5 Post WRW or summary where workers at site are able to review content.
- .6 Monitor and report on waste reduction by documenting total volume (in tonnes) and cost of actual waste removed from project (Schedule D).

1.08 WASTE SOURCE SEPARATION PROGRAM (WSSP)

- .1 As part of Waste Reduction Workplan, prepare WSSP prior to project start-up.
- .2 WSSP will detail methodology and planned on-site activities for separation of reusable and recyclable materials from waste intended for landfill.
- .3 Provide list and drawings of locations that will be made available for sorting, collection, handling and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide sufficient on-site facilities and containers for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .5 Locate containers to facilitate deposit of materials without hindering daily operations.
- .6 Provide training for contractor, sub-contractors and workers in handling and separation of materials for reuse and/or recycling.
- .7 Locate separated materials in areas which minimizes material damage.
- .8 Clearly and securely label containers to identify types/conditions of materials accepted and assist contractor, sub-contractors and workers in separating materials accordingly.
- .9 Monitor on-site waste management activities by conducting periodic site inspections to verify: state of signage, contamination levels, bin locations and condition, personnel participation, use of waste tracking forms and collection of waybills, receipts and invoices.
- .10 On-site sale of salvaged materials is not permitted unless authorized in writing by Departmental Representative and provided that site safety regulations and security requirements are adhered to.

1.09 USE OF SITE AND FACILITIES

- .1 Execute Work with minimal interference and disturbance to normal use of premises.
- .2 Maintain security measures established by facility provide temporary security measures approved by Departmental Representative.

1.10 WASTE PROCESSING SITES

- .1 Contractor is responsible to research and locate waste diversion resources

and service providers. Salvaged materials are to be transported off site to approved and/or authorized recycling facilities or to users of material for recycling.

1.11 QUALITY ASSURANCE

- .1 After award of Contract, a mandatory site examination will be held for this Project for Contractor and/or sub-contractors responsible for construction, renovation demolition/deconstruction waste management.
 - .1 Date, time and location will be arranged by Departmental Representative.
- .2 Waste Management Meeting: Waste Management Co-ordinator is to provide an update on status of waste diversion and management activities at each meeting. Written monthly Waste Diversion Report summary to be provided by Waste Management Coordinator (refer to the Waste Diversion Report form in Schedule C and Waste Materials Tracking form in Schedule D).

1.12 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative .
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed and salvaged materials 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 Provide on-site facilities and containers for collection and storage of reusable and recyclable materials.
- .9 Separate and store materials produced during project in designated areas.
- .10 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off site processing facility for separation.
 - .3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
 - .4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.13 DISPOSAL OF WASTES

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

1.14 SCHEDULING

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 APPLICATION

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

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Source separate materials to be reused/recycled into specified sort

areas.

3.03 DIVERSION OF MATERIALS

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

3.04 WASTE DIVERSION REPORT

- .1 At completion of Project, prepare written Waste Diversion Report indicating quantities of materials reused, recycled or disposed of as well as the following:
 - .1 Identify final diversion results and measure success against goals from Waste Reduction Workplan.
 - .2 Compare final quantities/percentages diverted with initial projections in Waste Audit and Waste Reduction Workplan and explain variances.
 - .1 Supporting documentation.
 - .2 Waybills and tracking forms.
 - .3 Description of issues, resolutions and lessons learned.

3.05 WASTE AUDIT (WA)

(1)	(2)	(3)	(4)	(5)	(6) %	(7) %
Material Category	Material Quantity Unit	Estimate d Waste %	Total Quantity of Waste (unit)	Generati on Point	Recycled	Reused
Wood						
and						
Plastics						
Material						
Descript ion						
Off-cuts						
Warped						
Pallet						
Forms						
Plastic						
Packagin g						
Cardboar d						
Packagin g						
Other						
Doors						
and						
Windows						

Material
 Descript
 ion
 Painted
 Frames
 Glass
 Wood
 Metal
Other

3.06 WASTE REDUCTION WORKPLAN (WRW)

	.1	Schedule B					
(1)	(2)	(3)	(4)	Actual	(5)	Actual	(6)
Material	Person(Total	Reused		Recycle		Material
Category	s) Respon-	Quantity of	(units)		Amount		l(s)
	sible	Waste	Project		(unit)		Destina
		(unit)	ed		Project		- tion
					ed		

Wood
 and
 Plastic
 s
 Material
 l
 Descrip
 tion
 Chutes
 Warped
 Pallet
 Forms
 Plastic
 Packagi
 ng
 Cardboa
 rd
 Packagi
 ng
 Other
 Doors
 and
 Windows
 Material
 l
 Descrip
 tion
 Painted
 Frames
 Glass
 Wood
 Metal
Other

3.7 CANADIAN

GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1	Schedule G - Government Chief Responsibility for the Environment: Province					
	Address	General	Fax	Inquires	Alberta	Alberta
	403-427-27	Environmen	39	tal	Protection	Petroleum Plaza,
	South Tower	9915	- 108	th	Street	Edmonton AB T5K 2G8
					Alberta	403-422-50 403-428-96
					Special	29 27
					Waste	
					Management	
					Corporatio	
					n Pacific	
					Plaza,	
					Suite 610	
					10909	
					Jasper	
					Avenue NW	
					Edmonton	
					AB T5J 3L9	
	British				Ministry	604-387-11 604-356-64
	Columbia				of	61 64
					Environmen	
					t Lands	
					and Parks	
					810	
					Blanshard	
					Street,	
					4th Floor	
					Victoria	
					BC V8V 1X4	
					Waste	604-660-95 604-660-95
					Reduction	50 96
					Commission	
					Soils and	
					Hazardous	
					Waste 770	
					South	
					Pacific	
					Blvd,	
					Suite 303	
					Vancouver	
					BC V6B 5E7	
	Manitoba				Manitoba	204-945-71
					Environmen	00
					t Building	
					2, 139	
					Tuxedo	
					Avenue,	
					Winnipeg,	
					MB R3N 0H6	
					The Clean	204-326-23 204-326-24
					Environmen	95 72
					t	
					Commission	
					284 Reimer	
					Avenue,	

New Brunswick	Box 21420 Steinback MB R0A 2T3 Department of the Environment 364 Argyle Street, Box 6000 Fredericton NB E3B 5H1	506-453-3700	506-453-3843
Newfoundland and Labrador	Department of Environment, Confederation Building, Box 8700 St. John's NL A1B 4J6	709-729-2664	709-729-1930
Northwest Territories	Department of Renewable Resources Scotia Centre Building, Box 21 5102 - 50 Avenue Yellowknife NT X1A 3S8	403-873-7420	403-873-0114
Nova Scotia	Department of the Environment 5151 Terminal Road, 5th Floor, Box 2107 Halifax NS B3J 3B7	902-424-5300	902-424-0503
Nunavut	Department of Sustainable Development Environmental Protection Service,	867-975-5910	

	Box 1000, Station 1195 Iqaluit NU X0A 0H0		
Ontario	Ministry of Environmen t and Energy, 135 St. Clair Avenue West Toronto ON M4V 1P5	416-323-43 21 800-565-49 23	416-323-46 82
Prince Edward Island	Environmen t Canada Toronto ON Department of Environmen tal Resources 11 Kent Street, 4th Floor, PO Box 2000 Charlottet own PE C1A 7N8	416-734-44 94 902-368-50 00	
Québec	Ministère de l'Environn ement et de la Faune, Siège social 150, boul, René-Léves que Est Québec QC G1R 4Y1 Conseil de la conservati on et de l'environn ement 800, place d'Youville , 19e étage Québec QC	418-643-31 27 800-561-16 16 418-643-38 18	418-646-59 74

	G1R 3P4		
Saskatchewan	Saskatchewan	306-787-27	306-787-39
an	an	00	41
	Environmen		
	t and		
	Resource		
	Management		
	3211		
	Albert		
	Street		
	Regina SK		
	S4S 5W6		
Yukon	Yukon	403-667-56	403-667-36
	Renewable	83	41
	Resources		
	PO Box		
	2703		
	Whitehorse		
	YT Y1A 2C6		

3.08 SCHEDULES

- .1 Following Schedules are attached to this Specification:
 - .1 Waste Audit - Schedule A.
 - .2 Waste Reduction Workplan Form - Schedule B.
 - .3 Waste Diversion Report Form - Schedule C.
 - .4 Waste Materials Tracking Form - Schedule D.
 - .5 Cost/Revenue Analysis Workplan - Schedule E.
 - .6 Market Research Report - Schedule F (When Available).

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 01 00 10 - General Instructions.
- 1.2 REFERENCES .1 Canadian Environmental Protection Act (CEPA)
.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.
- 1.3 ADMINISTRATIVE REQUIREMENTS .1 Pre-warranty Meeting:
.1 Convene meeting one week prior to contract completion with Departmental Representative, in accordance with to:
.1 Verify Project requirements.
.2 Review manufacturer's installation instructions and warranty requirements.
.2 Departmental Representative to establish communication procedures for:
.1 Notifying construction warranty defects.
.2 Determine priorities for type of defects.
.3 Determine reasonable response time.
.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.
.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
.4 Provide evidence, if requested, for type, source and quality of products supplied.
- 1.5 FORMAT .1 Organize data as instructional manual.
.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
.3 When multiple binders are used correlate data into

related consistent groupings.

- .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project, building name and address, project number and project completion date. Identify subject matter of contents.
- .5 Arrange content as follows:
 - A. Signed Letter of Warranty: dated; identifying project by name; project number; location and warranty period. Any extended equipment warranty must also be identified.
 - B. Contact information for all sub-contractors and suppliers.
 - C. Reports:
 - Copy of all TAB reports for HVAC systems
 - Pre-functional tests and/or start-up reports
 - Functional test reports
 - Completed performance verification forms
 - Load balancing reports
 - ESA certification - Certificate of Inspection and Requested Outcome Summary Report
 - Typewritten panel directories
 - Emergency lighting letter indicating the lighting is connected to emergency power as per drawings and specifications
 - TSSA certification
 - Fire alarm certifications
 - NFPA 13 certifications
 - Seismic Reports
 - Building Occupancy Permits and/or Inspection Reports
 - Other required certifications required by the National Building Code
 - D. As built drawings - changes marked in red ink per 1.7.
 - E. Sequence of Operation: outline how the system is designed to operate.
 - F. CMMS Data Sheets: all equipment which is to be deleted, removed, added or replaced from site is to have a CMMS inventory sheet completed and included in the O&M manual. If this equipment is a pressure vessel and is included in the annual inspection with TSSA, the orange tag that is attached to the equipment must be removed prior to demolition and forwarded to the commissioning manager.
 - G. Copy of all reviewed shop drawings.
 - H. Copy of specific service and maintenance manual for new equipment.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

1.6 CONTENTS -
PROJECT RECORD
DOCUMENTS

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.7 AS -BUILT
DOCUMENTS AND
SAMPLES

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

1.8 RECORDING
INFORMATION ON
PROJECT RECORD
DOCUMENTS

purposes.

- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .1 Record information on set of black line opaque drawings, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.9 EQUIPMENT AND
SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .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.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 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 Design-Builder's co-ordination 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 as specified.
 - .15 Additional requirements: as specified in individual specification sections.
- 1.10 MATERIALS AND FINISHES
- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products.

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- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional requirements: as specified in individual specifications sections.
- 1.11 MAINTENANCE
MATERIALS
- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
 - .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
 - .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
- 1.12 DELIVERY,
- .1 Store spare parts, maintenance materials, and special

STORAGE AND
HANDLING

tools in manner to prevent damage or deterioration.

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

1.13 WARRANTIES AND
BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission; leave date of beginning of time of warranty until Date of Substantial Performance is determined.

-
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
 - .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, pumps, motors, transformers, 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.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
 - .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
 - .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the

Departmental Representative to proceed with action against Contractor.

1.14 WARRANTY TAGS

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 01 00 10 - General Instructions.
 - .2 Section 01 33 00 - Submittal Procedures.
- 1.2 ADMINISTRATIVE REQUIREMENTS
- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of substantial performance.
 - .2 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
 - .3 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
 - .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
 - .4 Give time and date of each demonstration, with list of persons present.
 - .5 Provide copies of completed operation and maintenance

manuals for use in demonstrations and instructions.

1.4 QUALITY
ASSURANCE

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

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Related Requirements
 - .1 Section 01 00 10 - General Instructions.
- .3 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 Cx - Commissioning.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 O&M - Operation and Maintenance.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

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

1.3 COMMISSIONING
OVERVIEW

- .1 For Cx responsibilities refer to Section 01 91 33 - Commissioning Forms.

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

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

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

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.

- .5 Understand completely design criteria and intent and special features.
- .6 Submit complete start-up documentation to Departmental Representative.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
- .10 Ensure "As-Built" system schematics are available.

- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

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

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Qualified Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

- .1 Departmental Representative to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

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

re-verification.
.4 Training.

1.10 STARTING AND TESTING

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

1.11 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.

1.12 MANUFACTURER'S INVOLVEMENT

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

1.13 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to

-
- specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
 - .4 Document require tests on approved PV forms.
 - .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.
- 1.14 START-UP DOCUMENTATION
- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
 - .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.
- 1.15 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS
- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
 - .2 With assistance of manufacturer develop written maintenance program and submit Departmental

Representative for approval before implementation.

- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.16 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.

1.17 START OF COMMISSIONING

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

1.18 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.

1.19 COMMISSIONING PERFORMANCE VERIFICATION

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

1.20 WITNESSING COMMISSIONING

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

1.21 AUTHORITIES

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of

HAVING JURISDICTION

authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.22 EXTRAPOLATION OF RESULTS

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

1.23 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.24 DEFICIENCIES, FAULTS, DEFECTS

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

1.25 COMPLETION OF COMMISSIONING

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

1.26 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.
- .2 Obtain MMS data forms from Departmental Representative and fill in all information for new and removed equipment. Forward all maintenance data for including in PMSS. Obtain equipment tag from Departmental Representative and include on P-touch label.

-
- 1.27 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.
- 1.27 OCCUPANCY .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.
- 1.29 INSTALLED INSTRUMENTATION .1 Use instruments installed under Contract for TAB and PV if:
.1 Accuracy complies with these specifications.
.2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.
- 1.30 PERFORMANCE VERIFICATION TOLERANCES .1 Application tolerances:
.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
.1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
.1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.
- 1.31 OWNER'S PERFORMANCE TESTING .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

PART 2 - PRODUCTS

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

- 3.1 NOT USED .1 Not Used.

1 GENERAL

1.01 SUMMARY

- .1 Section Includes:
 - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.
- .2 Related Requirements
 - .1 Section 01 91 13 - General Commissioning Requirement.
 - .2 Section 01 91 33 - Commissioning Forms.
 - .3 Section 01 91 41 - Training.

1.02 REFERENCES

- .1 American Water Works Association (AWWA)
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA-13-02, Installation of Sprinkler Systems Handbook.
 - .2 NFPA-14-02, Automatic Sprinkler Systems Handbook.
 - .3 NFPA-20-03, Standard for the Installation of Stationary Fire Pumps for Fire Protection.
- .3 Public Works and Government Services Canada (PWGSC)
 - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-03.
- .4 Underwriters' Laboratories of Canada (ULC)

1.03 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 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet Owner/Investor's design requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

- .1 Overview of Cx.
- .2 General description of elements that make up Cx Plan.
- .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 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.

1.04 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 95% completed before added into Project Specifications.
- .2 Cx Plan to be 100% completed within 8weeks of award of contract to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .3 Submit completed Cx Plan to Owner Representative and obtain written approval.

1.05 REFINEMENT OF CX PLAN

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 6 months weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Owner Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.06 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Owner Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

- .2 Project Manager will select Cx Team consisting of following members:
 - .1 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 PWGSC Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O&M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.
 - .5 Work closely with members of Cx Team.
 - .3 Owner Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
 - .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
 - .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
 - .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.07 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
- .3 Specialist subcontractor: equipment and systems supplied and installed by

- specialist subcontractor.
- .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
 - .5 Client: responsible for intrusion and access security systems.
 - .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of 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.
 - .7 Provide names of participants to Owner Representative DCC Representative Consultant and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.08 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Architectural:
 - .1 Doors and related hardware:
 - .1 Door Hardware.
 - .2 Client equipment installed under contract.
 - .3 Operable Partitions.
- .2 Commission mechanical systems and associated equipment but not limited to:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS.
 - .2 Regular sanitary waste systems.
 - .2 HVAC and exhaust systems:
 - .1 HVAC systems c/w make-up air unites, air handling units, fan coil unites, packaged split AC units, unit heaters.
 - .2 Exhaust systems c.w fans, intake air.
 - .3 Fire Dampers.
 - .3 Fire and life safety systems:
 - .1 Standpipe and hose systems.
 - .2 Fire extinguishers.
 - .4 Noise and vibration control systems for mechanical equipment.
 - .5 Seismic restraint and control measures.
 - .6 EMCS.
- .3 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Lighting systems:
 - .1 Lighting equipment.

- .2 Distribution systems.
- .3 Emergency lighting systems, including battery packs.
- .4 Fire exit emergency signage.

1.09 DELIVERABLES RELATING TO O&M PERSPECTIVES

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

1.10 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).
 - .4 Completed product information (PI) report forms.
 - .5 Completed performance verification (PV) report forms.
 - .6 Results of Performance Verification Tests and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Tests of following witnessed by PWGSC Design Quality Review Team.
 - .10 Tests performed by Owner/User.
 - .11 Training Plans.
 - .12 Cx Reports.
 - .13 Prescribed activities during warranty period.
- .4 Owner Representative to witness and certify tests and reports of results provided to Owner Representative.
- .5 Owner Representative to participate.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:

-
- .1 Pre-Start-Up inspections: by Owner Representative prior to permission to start up and rectification of deficiencies to Owner Representative's satisfaction.
 - .2 Owner Representative to use approved check lists.
 - .3 Owner Representative will monitor all of these pre-start-up inspections.
 - .4 Include completed documentation with Cx report.
 - .5 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 Owner Representative and does not form part of Cx specifications.
 - .6 Owner Representative will monitor some of these inspections and tests.
 - .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL: Manufacturer to provide installation and operation report for the following:
 - .1 Doors, windows, related hardware:
 - .1 Door and window hardware.
 - .2 Operable partitions.
- .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 Owner 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 Owner Representative 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 have 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.
 - .2 Reports of test results to be witnessed and certified by Owner 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:
 - .1 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. Owner Representative has witnessed and certified report, demonstrate devices and zones to Owner Representative.
- .4 Low voltage systems: these include:
 - .1 Low voltage lighting control systems and data communications systems.
 - .2 Sound masking system.
- .5 Security, surveillance and intrusion alarm systems: to include verification by Owner Representative.

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

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed by Owner Representative and approved by Owner Representative.
- .2 Owner Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Owner Representative to witness, certify reported results of, Cx activities

and forward to Owner Representative.

- .5 Owner Representative reserves 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 by specified Cx specialist, using procedures developed by Owner Representative and approved by Owner Representative .
- .2 Tests to be witnessed by Owner Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Owner Representative and submitted to Owner Representative for review.
- .4 Owner Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 HVAC and associated systems forming part of integrated HVAC systems.
 - .2 Fire alarm systems.
 - .3 Emergency lighting systems.
 - .4 .
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Owner Representative, Contractor, Project Manager, and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PSPC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 INSTALLATION CHECK LISTS (ICL)

- .1 Refer to Section 01 91 33 - Commissioning (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 DELIVERABLES RELATING TO ADMINISTRATION OF CX

- .1 General:
 - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.19 CX SCHEDULES

- .1 Prepare detailed critical path Cx Schedule and submit to Owner Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28days after contract award, and before construction starts.
 - .3 Cx agents' credentials: 60 days before start of Cx.
 - .4 Cx procedures: 3 months after award of contract.
 - .5 Cx Report format: 3months after contract award.
 - .6 Discussion of heating/cooling loads for Cx: 3 months before start-up.
 - .7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .8 Notification of intention to start TAB: 21 days before start of TAB.
 - .9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .10 Notification of intention to start Cx: 14 days before start of Cx.
 - .11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14days before start of integrated system Cx.
 - .12 Identification of deferred Cx.
 - .13 Implementation of training plans.
 - .14 Cx of smoke management/control systems: after Cx of related systems is completed and 7 days before proposed date of Cx these systems.
 - .15 Cx reports: immediately upon successful completion of Cx.
 - .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
 - .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Consultant, Contractor, Contractor's Cx agent, and Owner Representative will monitor progress of Cx against this schedule.

1.20 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Owner Representative to Owner 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 Owner Representative.

1.21 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.

1.22 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None is anticipated on this project.

1.23 TRAINING PLANS

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.24 FINAL SETTINGS

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.
- .2 Related Requirements:
 - .1 Section 01 91 13 - General Commissioning (CX) Requirements.

1.2 INSTALLATION/
START-UP CHECK
LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT
INFORMATION (PI)
REPORT FORMS

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

Departmental Representative's approval.

1.4 PERFORMANCE
VERIFICATION (PV)
FORMS

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

1.5 SAMPLES OF
COMMISSIONING FORMS

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

1.6 CHANGES AND
DEVELOPMENT OF NEW
REPORT FORMS

- .1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

1.7 COMMISSIONING
FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician

and reviewed and signed off by Departmental Representative .

- .9 Submit immediately after tests are performed.
- .10 Reported results in true measured SI unit values.
- .11 Provide Departmental Representative with originals of completed forms.
- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual.

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.

PART 1 - GENERAL1.1 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Related Requirements
 - .1 Section 01 91 13 - General Commissioning (CX) Requirements.

1.2 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.

1.3 INSTRUCTORS

- .1 Departmental Representative will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

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

-
- 1.5 TRAINING MATERIALS
- .1 Instructors to be responsible for content and quality.
 - .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
 - .3 Project Manager, Commissioning Manager and Facility Manager will review training manuals.
 - .4 Training materials to be in a format that permits future training procedures to same degree of detail.
 - .5 Supplement training materials:
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.
- 1.6 SCHEDULING
- .1 Include in Commissioning Schedule time for training.
 - .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
 - .3 Training to be completed prior to acceptance of facility.
- 1.7 RESPONSIBILITIES
- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
 - .2 Departmental Representative will evaluate training and materials.
 - .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.
- 1.8 TRAINING CONTENT
- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
 - .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including

step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

.7 Maintenance and servicing.

.8 Trouble-shooting diagnosis.

.9 Inter-Action among systems during integrated operation.

.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.9 VIDEO-BASED TRAINING

.1 Manufacturer's 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 professional quality.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.