

Part 1 General

1.1 TAXES

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

1.2 FEES, PERMITS and CERTIFICATES

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

1.3 CONSTRUCTION PROGRESS SCHEDULE

- .1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.
- .2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the Departmental Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative.
- .3 Carry out work during "regular hour", Monday to Friday from 07:00 to 18:00 hours and on Saturdays, Sundays and statutory holidays.
- .4 Carry out work, interior painting and laying of floor finish "off hours", Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays. Thoroughly ventilate areas receiving finish during "off hours".
- .5 Carry out noise generating work during "off hours" Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays:
- .6 Give the Departmental Representative 48 hours notice for work to be carried out during "off hours".

1.4 SUBMITTAL PROCEDURES

- .1 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in work.
- .2 Do not proceed with work affected by submittals until review is complete.
- .3 Shop Drawings:
 - .1 Submit six (6) printed copies and electronic copy of shop drawings: bearing stamp and signature of qualified Professional Engineer registered or licensed in Province of Ontario.
- .4 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.
- .5 Submit drawings stamped and signed by professional engineer registered or licensed in Province Ontario of Canada.

- .6 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.
- .7 Allow 5 working days for Departmental Representative's review of each submission.
- .8 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.
- .9 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.
- .10 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.
- .11 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.
- .12 After Departmental Representative's review, distribute copies.
 - .1 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such

review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of her/his responsibility for meeting all requirements of the Contract Documents.

.13 Product Data:

- .1 Submit six (6) printed copies and electronic copy of product data: manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.
- .2 Cross reference product data information to applicable portions on Contract Documents.

.14 Samples:

- .1 Submit samples: examples of materials, equipment, quality, finishes and workmanship.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Reviewed and accepted samples will become standard of material and workmanship, against which installed work will be verified.

.15 Submit photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.5 REGULATORY REQUIREMENTS

.1 References and Codes:

- .1 Materials shall be new and work shall conform to the minimum applicable standards of the "References" indicated in the specification sections, the National Building Code of Canada 2010 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.
- .2 The plumbing and drainage systems shall comply with regulations respecting plumbing made under the Ontario Water Resources Act except as modified by rules, regulations and by-laws of authorities having jurisdiction.
- .3 Natural gas systems shall be in accordance with the Gas utilization Code of the Department of Energy and Resources Management, Ontario.
- .4 These specifications are supplementary to the requirements above.
- .5 Drawings and specifications should not conflict with the above regulations but where there are apparent discrepancies the Contractor shall notify the Departmental Representative.

.2 Building Smoking Environment:

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

.3 Hazardous Material Discovery:

- .1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance hazardous substance is encountered during demolition work.
 - .1 Take preventative measure and promptly notify Departmental Representative.
 - .2 Do not proceed until written instructions have been received from Departmental Representative.

1.6 FIRE SAFETY REQUIREMENTS

- .1 Comply with both the National Building Code of Canada 2010 and the National Fire Code of Canada 2010 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;
 - .1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.
 - .2 The National Fire Code (NFC):
 - .1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.
 - .2 The conduct of activities that might cause fire hazards in and around buildings.
 - .3 Limitations on hazardous contents in and around buildings.
 - .4 The establishment of fire safety plans.
 - .5 Fire safety at construction and demolition sites.
- .2 Comply with Human Resources and Skills Development Canada (HRSDC), Fire Commissioner of Canada Standards:
 - .1 FC 301, Standard for Construction Operations, June 1982 - Standards
 - .2 FC 302, Standard for Welding and Cutting, June 1982 - Standards
 - .3 FC 374, Fire Protection Standard for General Storage (Indoor and Outdoor), September 1994 - Standards
 - .4 Retain all fire safety documents and standards on site.
- .3 Welding and cutting:
 - .1 At least 48 hours prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
 - .1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.
 - .2 Completed welding permit as defined in FC 302.
 - .3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.
 - .2 "Fire Watchers" as described in FC 302 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.
- .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 FC 301; In general, watchman service is defined as an individual conversant with "Fire Emergency Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.
 - .2 Retain services of manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:
 - .1 modification of fire alarms, fire suppression, extinguishing or protection systems; and/or
 - .2 cutting, welding, soldering or other construction activities that might activate fire protection systems.
 - .3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.

- .4 Inform fire alarm system monitoring agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.7 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.

1.8 HAZARDOUS MATERIALS

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

1.9 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 48 hours notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

1.10 CONSTRUCTION FACILITIES

- .1 Designated elevators: to be used by construction personnel and transporting of materials.
 - .1 Co-ordinate with Departmental Representative.
 - .2 Protect from damage, safety hazards and overloading of existing equipment.
- .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.
- .5 Signage:
 - .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly understood graphic symbols and to approval of the Departmental Representative.
 - .2 No advertising will be permitted on this project.
 - .3 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as directed by Departmental Representative.

1.11 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Maintain existing services to building and provide for personnel and vehicle access.
- .2 Hoarding:
 - .1 Design, erect and maintain so not to limit public continued access through building and provide protection as required by authority having jurisdiction.
- .3 Weather Enclosures: protect work temporarily until permanent enclosures completed.
- .4 Dust Control:
 - .1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.
 - .2 Maintain and relocate protection until such work is complete.
 - .3 Protect all furnishings within work area with 0.102mm thick polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .5 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- .6 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.

1.12 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.

1.13 EXECUTION

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

1.14 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.

1.15 SECURITY CHECK

- .1 All personnel employed on this project will be subject to security check. Obtain requisite clearance, as instructed, for each individual required to enter the premises.

- .2 Personnel will be checked daily at start of work shift and given a pass, which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.16 SECURITY ESCORT

- .1 All personnel employed on this project shall be escorted when executing work in non-public areas during normal working hours. Personnel shall be escorted in all areas after normal working hours.
- .2 Submit an escort request to Departmental Representative at least 14 days before the service is needed. For requests submitted within the time mentioned above, the Departmental Representative will pay for the costs of the security escort. The cost incurred by a late request will be charged to the Contractor.
- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before the scheduled time of the escort. The cost incurred by a late cancellation will be charged to the Contractor.
- .4 The calculation of costs will be based on the average hourly rate of a security officer for a minimum of 8 hours per day for a late service request and 4 hours for late cancellations.

1.17 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.

1.18 PRECEDENCE

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 – GENERAL

1.1 REGULATORY REQUIREMENTS

.1 An investigation into the presence of designated substances for the Elevator Modernization Project at Public Archives & National Library, located at 395 Wellington Street, in Ottawa, Ontario, was performed in order to meet the requirements of Section 30 of the *Ontario Occupational Health and Safety Act, Revised Statutes of Ontario, 1990, Chapter 0.1*. The *Canada Labour Code* also stipulates under Part II, Section 124 that every employer shall ensure that the health and safety at work of every person employed by the employer is protected. By having a Designated Substances Report (DSR) completed, the Departmental Representative will be able to inform his or her employees, contractors, and tenants of any designated substances that may be present and possibly disturbed throughout the duration of the project. The informed Departmental Representative will then be able to impose appropriate health and safety precautions for all applicable personnel as required. The *Guide to Green Government* sets out the policy requirements for the federal government to meet or exceed federal environmental statutes and regulations, and the emulation of best practices from the public and private sector. Within the *Guide to Green Government*, pollution prevention efforts are required in federal projects. Pollution prevention is defined as the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health and environment. These policies must be adhered to throughout the duration of the scheduled Elevator Modernization Project at Public Archives & National Library, located at 395 Wellington Street, Ottawa, Ontario

.2 The designated substances identified in the *Occupational Health and Safety Act* and its corresponding regulations are:

- .1 **Acrylonitrile:** “Designated Substances”
O. Reg 490/09, as amended.
- .2 **Arsenic:** “Designated Substances”
O. Reg 490/09, as amended.
- .3 **Asbestos**
 - .1 “Designated Substances”
O. Reg 490/09, as amended.
 - .2 “General – Waste Management”
O. Reg 347/90, as amended
 - .3 “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations”
O.Reg 278/05 (as amended)
 - .4 *PWGSC Departmental Policy DP 057 – “Asbestos Management”*

- .4 **Benzene:** "Designated Substances"
O. Reg 490/09, as amended.
- .5 **Coke Oven Emissions:** "Designated Substances" *O. Reg 490/09, as amended.*
- .6 **Ethylene Oxide:** "Designated Substances"
O. Reg 490/09, as amended.
- .7 **Isocyanates:** "Designated Substances"
O. Reg 490/09, as amended.
- .8 **Lead:**
 - .1 "Designated Substances"
O. Reg 490/09, as amended.
 - .2 "*General – Waste Management*"
O. Reg 347/90, as amended
 - .3 Hazardous Products Act's *Surface Coating Materials Regulations*
SOR/2005-109, as amended (2011)
- .9 **Mercury:**
 - .1 "Designated Substances"
O. Reg 490/09, as amended.
 - .2 "*General – Waste Management*"
O. Reg 347/90, as amended
- .10 **Silica:** "Designated Substances"
O. Reg 490/09, as amended.
- .11 **Vinyl Chloride:** "Designated Substances"
O. Reg 490/09, as amended.
- .3 All contractors requesting tenders from subcontractors shall furnish this report to subcontractors.

1.2 VALIDITY DATE

- .1 DST Consulting Engineers Inc. (DST), conducted the on-site survey for this report on October 26, 2012 (DST File No. BE-OT-015743).
- .2 DST staff completed a visual inspection of building materials for the presence of suspected designated substances within the project areas, which was limited to the two (2) lobby passenger elevators, three (3) staff freight elevators in the building, and their associated elevator mechanical rooms.
 - .1 The scope of work for this report involved a visual inspection of building materials and contents for the presence of suspected designated substances within the project areas on October 26, 2012.
 - .2 From the visual inspection, suspect materials were sampled and analyzed, for select designated substances. On the basis

- of this inspection, a total of forty-two (42) bulk sample layers of suspected asbestos-containing material were collected.
- .3 Samples were submitted for analysis at Paracel Laboratories Ltd., located at 300-2319 St. Laurent Boulevard, Ottawa, ON.
- .4 As part of the survey, DST referenced the sampling and analytical results from the following past designated substances survey, where possible, as it pertained to materials in the immediate project areas.
- *Project-Specific Designated Substance Survey, Fire Alarm Replacement Project at the National Library and Public Archives Canada Summary Report (PN: R.049920.002). Prepared by DST Consulting Engineers Inc. Prepared for Public Works and Government Services Canada.*
- .5 The survey was limited to those areas that could be safely accessed by non-destructive means. The visual inspection and sampling was limited to readily accessible areas. Destructive testing was not included in the investigation. Due to the nature of construction, some inherent limitations exist as to the possible thoroughness of the designated substance survey.
- .6 It is possible that designated substances are present in non-accessible areas and concealed spaces. No other areas outside the defined work boundaries have been assessed.
- .7 Prior to beginning work, it must be confirmed with the Departmental Representative that no additional designated substances have been brought to the project area.
- .8 In addition, the survey refers to Polychlorinated Biphenyls (PCBs) and Halocarbons; however, it does not refer to other substances that may be present in the day-to-day usage for specialized equipment or areas in buildings (i.e., lead shields, fume hoods, chemicals, etc.).
- .9 There is a possibility that materials that could not be reasonably identified within the scope of this assessment or which were not apparent during previous site visits may exist. Should any designated substance be encountered in the course of demolition, renovation, or repair, work must be stopped,

preventative measures taken, and the Departmental Representative must be notified immediately. **Do not proceed until written instructions have been received.**

PART 2 - DESIGNATED SUBSTANCES

2.1 SURVEY RESULTS

.1 **ACRYLONITRILE:** Not Identified

.2 **ARSENIC:** Not Identified

.3 **ASBESTOS: Identified**

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

Representative bulk samples from materials located within the project areas, collected as part of a past designated substances survey, as applicable to the project, and samples collected as part of the current designated substance survey, are referenced below. Analytical results indicate that select samples contain asbestos in the project areas. The following table summarizes the analytical results of bulk samples referenced as part of the site investigation.

Table 1: Asbestos Sample Results by PLM (Past and Current)

Sample Number	Sample d By, Year	Material	Location	Asbestos Type	Asbestos content (%)
14701-01A	DST, 2012	Ceiling Plaster	2nd Level Basement	n/a	n/d
14701-01B				n/a	n/d
14701-01C			1st Floor	n/a	n/d
14701-01D			1st Floor	n/a	n/d
14701-01E			2nd Floor	n/a	n/d
14701-01F			3rd Floor	n/a	n/d
14701-01G			4th Floor	n/a	n/d
14701-02A	DST, 2012	Wall Plaster	4th Floor	Chrysotile	0.5%
14701-02B			4th Floor	Not Analyzed, Positive Stop	
14701-02C			8th Floor	Not Analyzed, Positive Stop	
14701-02D			5th Floor	Not Analyzed, Positive Stop	
14701-02E			5th Floor	Not Analyzed, Positive Stop	
14701-02F			5th Floor	Not Analyzed, Positive Stop	
14701-02G			2nd Level Basement	Not Analyzed, Positive Stop	
14701-03A	DST, 2012	Drywall Joint Compound	7th Floor	n/a	n/d
14701-03B			7th Floor	n/a	n/d
14701-03C			7th Floor	n/a	n/d
14701-03D			6th Floor	n/a	n/d
14701-03E			6th Floor	n/a	n/d
14701-03F			1st Floor	n/a	n/d
14701-03G			1st Floor	n/a	n/d
15743-395-01A	DST, 2012	12"x12" Vinyl floor tile, white with grey streaks	Inside lobby elevators	n/a	n/d
15743-395-01B				n/a	n/d
15743-395-01C				n/a	n/d
15743-395-02A	DST, 2012	Pipe Fitting Insulation	Lobby elevator mechanical room	Chrysotile	60%
15743-395-02B				Not Analyzed, Positive Stop	
15743-395-02C				Not Analyzed, Positive Stop	
15743-395-03A	DST, 2012	Canvas Wrap	Northwest Freight Elevator Pit	Chrysotile	<0.5%
15743-395-03B				Chrysotile	<0.5%
15743-395-03C				Chrysotile	<0.5%
15743-395-04A	DST, 2012	Black Tar	Northwest Freight Elevator Shaft, 5th Floor and Above	Chrysotile	0.77%
15743-395-04B				Not Analyzed, Positive Stop	
15743-395-04C				Not Analyzed, Positive Stop	
15743-395-05A	DST, 2012	Transite	Lobby Elevators (concealed)	Chrysotile	20%
15743-395-05B				Not Analyzed, Positive Stop	
15743-395-05C				Not Analyzed, Positive Stop	
15743-395-06A	DST, 2012	Beige Caulking	Northeast Freight Elevator Shaft, 5th Floor and Above	n/a	n/d
15743-395-06B				n/a	n/d
15743-395-06C				n/a	n/d
15743-395-07A	DST, 2012	Fibreboard	Northeast Freight Elevator Shaft, under rubber floor	n/a	n/d
15743-395-07B				n/a	n/d
15743-395-07C				n/a	n/d

Sample Number	Sample d By, Year	Material	Location	Asbestos Type	Asbestos content (%)
15743-395-08A	DST, 2012	12"x12" Vinyl floor tile, off-white with red flecks, and mastic	1st Floor, Northeast Freight, lobby outside elevator	n/a	n/d
15743-395-08B				n/a	n/d
15743-395-08C				n/a	n/d
15743-395-09A	DST, 2012	12"x12" Vinyl Floor tile, beige with white streaks	5th Floor, Northwest Freight, lobby outside elevator	n/a	n/d
15743-395-09B				n/a	n/d
15743-395-09C				n/a	n/d
15743-395-09A	DST, 2012	12"x12" Vinyl Floor tile, beige with white streaks, mastic		Chrysotile	<0.5%
15743-395-09B				Chrysotile	<0.5%
15743-395-09C				Chrysotile	<0.5%
15743-395-10A	DST, 2012	12"x12" Vinyl Floor tile, beige with pink streaks	3rd Basement, Central Freight	n/a	n/d
15743-395-10B				n/a	n/d
15743-395-10C				n/a	n/d

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

n/d = none detected, n/a = not applicable

Asbestos-Containing Materials

Based on the analytical results listed above, the following asbestos-containing materials were identified in the project areas:

- Wall plaster (homogenous to past DST Sample 14701-02A) contains 0.5% Chrysotile asbestos;
- Pipe fitting insulation, grey cement compound (Sample 15743-395-02A) associated with select pipe fittings in the elevator mechanical room associated with the lobby elevators, contains 60% Chrysotile asbestos;
- Black tar, applied to blue rigid foam insulation in the northwest and northeast freight elevator shafts (Sample 15743-395-04A) contains 0.77% Chrysotile asbestos. Based on visual observations, the tar is applied from approximately the 5th floor to the top of both elevator shafts; and
- Transite/cement board (Sample 15743-395-07A) contains 20% Chrysotile asbestos. The Transite was observed to be installed under a surface layer of non-asbestos containing 12"x12" vinyl floor tiles (Samples 15743-01A-C) inside the north lobby elevator. DST also suspects the Transite layer to be present under non-asbestos 12"x12" vinyl floor tiles in the south lobby elevator, as the elevators are visually similar in construction and materials.

Non-Asbestos Containing Materials

Based on limited visual observations and/or the analytical results listed above, the following materials were confirmed to not contain regulated concentrations of asbestos:

- Ceiling plaster (homogenous to past DST Samples 14701-01A-G);
- Drywall joint compound (homogenous to past DST Samples 14701-03A-G);
- 12"x12" vinyl floor tiles, white with grey streaks (Samples 15743-395-01A-C), observed inside the two (2) lobby elevators
- Canvas wrap (Samples 15743-395-03A-C) observed on a piece of elevator equipment in the elevator pits of all three (3) freight elevators contains less than 0.5% Chrysotile asbestos, which is less than the regulated limit of 0.5% asbestos, as per *O.Reg 278/05* and *PWGSC DP-057*;

- Beige caulking (Samples 15743-395-06A-C) applied on top of black tar and rigid foam in the northeast freight elevator shaft;
- Fiberboard flooring material (Samples 15743-395-07A-C) installed beneath rubber flooring in the three (3) freight elevators;
- 12"x12" vinyl floor tile, off-white with red flecks, and mastic (Samples 15743-395-08A-C) observed in the select lobbies of freight elevators.
- 12"x12" vinyl floor tile, beige with white streaks and mastic (Samples 15743-395-09A-C) observed in select elevator lobbies associated with the northwest freight elevator. It should be noted that the floor tile mastic contains less than 0.5% Chrysotile asbestos, which is less than the regulated limit of 0.5% asbestos, as per O.Reg 278/05 and PWGSC DP-057.
- 12"x12" vinyl floor tile, beige with pink streaks (Samples 15743-395-10A-C) observed in the select elevators lobbies of freight elevators.
- All other floor tiles in the immediate project areas appeared to be a newer installation and are not suspected to contain asbestos.

It should be noted that some ACMs may be concealed and thus not observed at the time of the survey (e.g. elevator brakes). The site survey did not include a destructive, intrusive investigation for concealed materials. As a result, DST cannot confirm materials that may not have been visible or apparent at the time of the site investigation.

Should any previously unidentified suspect ACMs be encountered as part of future work, these materials are to be treated as ACMs and handled accordingly, unless sampling proves otherwise. Materials that have not been analyzed, but are visibly similar to other materials identified as asbestos-containing, must be considered asbestos-containing unless proven otherwise by laboratory analysis.

Materials that are visually similar to materials confirmed to contain asbestos should be treated as asbestos-containing materials, unless proven otherwise by laboratory analysis.

.4 **BENZENE:** Not Identified

.5 **COKE OVEN EMISSIONS:** Not Identified

.6 **ETHYLENE OXIDE:** Not Identified

.7 **ISOCYANATES:** Not Identified

.8 **LEAD: Assumed**

Lead is a naturally occurring metal that can be found in various materials such as older paints, in soldered joints installed on piping up to the mid 1990s, and in older cast iron bell and spigot joints.

- .1 Even at low concentrations, there may be potential for exposure to very high levels of lead depending on the activities performed that disturb the lead-containing materials. At low lead concentrations, conducting a risk assessment to assess the potential for exposure

is required to determine the need to follow precautionary measures.

- .2 No lead samples were collected by DST during the site investigation on October 26, 2012 as all paints were in good condition at the time of the site investigation and sampling without matrix interference (i.e. removing paint without also removing non-paint substrate) would likely prove difficult. Older interior paint finishes throughout the project area are suspected to contain detectable concentrations of lead. All surface coating materials within the project areas shall be assumed to contain detectable concentrations of lead.

.9 **MERCURY: Identified**

Mercury is present in fluorescent light tubes and suspected to be present in mechanical switches in the project areas.

.10 **SILICA: Identified**

Free crystalline silica is assumed present in concrete materials, plaster, and drywall, throughout the project areas.

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

.12 **POLYCHLORINATED BIPHENYLS (PCBs): Suspected**

Although not a designated substance, polychlorinated biphenyls (PCBs) can generally be found within fluorescent light fixture ballasts. DST did not disassemble any of the light fixtures in the project areas to identify the presence of ballasts, as the light fixtures were energized at the time of site visit. In the event that suspected light fixture ballasts are encountered and require disturbance, please refer to the Environment Canada, Identification of Lamp Ballasts Containing PCBs, August 1991 report, for assistance with identification of potential PCB-containing ballasts

.13 **HALOCARBONS: Not Identified**

2.2 RECOMMENDATIONS

1. ASBESTOS

PWGSC's *DP 057, Asbestos Management* sets policy, establishes roles and responsibilities and provides a code of practice for the management of and working with asbestos-containing materials. All work must be done in accordance with this directive, as well as all other applicable legislation. Disturbance of all asbestos (whether friable or non-

friable) is regulated in Ontario by “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” *O.Reg 278/05, as amended*, which outlines the precautions required when performing work involving asbestos-containing materials. The regulation stipulates appropriate respiratory protection, work procedures and ventilation requirements that must be utilized during the disturbance of any asbestos-containing materials, or materials suspected to contain asbestos.

In the event of conflict between DP-057 and “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” *O.Reg 278/05, as amended*, the more stringent shall apply.

The removal or disturbance of one square metre or less of friable asbestos containing materials (e.g., various types of identified piping insulations) must be conducted using a minimum of Type 2 asbestos work procedures. The removal or disturbance of more than one square metre of friable asbestos-containing materials must be conducted using Type 3 asbestos work procedures. Type 3 asbestos abatement operations performed in occupied buildings require daily asbestos air monitoring outside of each asbestos work area, as per PWGSC DP-057. It should be noted that the removal of good condition asbestos containing pipe insulation and pipe fitting insulation can be conducted using Type 2 glove bag procedures, provided a proper seal can be maintained.

The removal or disturbance of non-friable Transite and black tar materials can be conducted using a minimum of Type 1 asbestos work procedures, provided the material is wetted and removed by means of non-powered hand-held tools. If these conditions cannot be met, then more stringent (Type 2 or Type 3) work procedures are required.

The “General – Waste Management” *O.Reg 347/90, as amended*, governs the disposal of waste containing asbestos. The waste must be disposed at a licensed waste disposal site.

2. LEAD

If lead-containing materials are disturbed then proper precautions, as outlined under “Designated Substances” *O.Reg 490/09, as amended*, of the Occupational Health and Safety Act, must be followed.

Under Ontario Regulation 490/09, as amended of the Occupational Health and Safety Act, regulatory limits have been established for occupational

exposure limits to airborne lead that may be present in a workplace. The Time Weighted Average Exposure Values to airborne lead dust or fumes should not exceed the Ministry of Labour's 0.05 milligram per cubic metre (mg/m^3) limit during the removal of paints and products containing any concentration of lead. The TWAEV represents the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects.

Contractors performing work that requires disturbance of lead-containing materials are responsible to ensure that the workers are not exposed to airborne lead dust levels in excess of the time-weighted average and Maximum Exposure Concentration for lead-containing paints.

.1 Ontario Ministry of Labour (MoL) has published the document entitled "*Guideline: Lead on Construction Projects*". This document classifies all disturbances of lead-containing materials as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, based on presumed airborne concentrations of lead generated during the work each of which will have defined work practices. Although this document is not a regulation, Ministry of Labour Inspectors use it as guidance during site inspections. Where there is conflict with the exposure limits and respiratory protection required by "Designated Substances" Regulation *O.Reg 490/09*, as amended, the most stringent requirements of Regulation *490/09* must apply.

.2 The disposal of construction waste containing lead is controlled by "General – Waste Management" *O.Reg 347/90, as amended*, under the *Ontario Environmental Protection Act*. The classification of the waste is dependent upon the result(s) of leachate test(s). The waste can be classified as "hazardous", "non-hazardous" or "registerable solid waste", depending on the results of the leachate test.

Prior to disposal, the concentration of leachable lead must be determined for waste materials with elevated lead contents following the Toxicity Characteristic Leaching Procedure (TCLP).

3. MERCURY

.1 Mercury is governed by "Designated Substances" *O.Reg 490/09*, as amended, under the Occupational Health and Safety Act. The regulation provides requirements for allowable exposure levels.

.2 In addition, mercury waste is considered a hazardous waste under "General – Waste Management" *O.Reg 347/09, as amended*, of the *Ontario Environmental Protection Act*. Fluorescent lamp tubes are considered hazardous material and should be recycled if removed from service. For information regarding the collection of fluorescent lamp tubes, please consult the PWGSC Representative.

SILICA

.1 Silica occurs as crystalline material in cement, plaster, and drywall. Crystalline silica is regulated under "Designated Substances" *O.Reg 490/09, as amended*, of the *Occupational Health and Safety Act* as a Designated Substance

.2 Silica dust can be generated through such processes as blasting, grinding, crushing, and sandblasting silica-containing material. Since silica is presumed present in concrete, ceiling tiles and drywall within the project area, appropriate respiratory protection and ventilation must be donned during the demolition, and modifications of these structures.

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

4. POLYCHLORINATED BIPHENYLS (PCBs):

It was not feasible during the survey to determine whether fluorescent light fixture ballasts observed in the project areas were free of PCBs. Therefore, if any fluorescent light ballasts are removed during this project, please refer to the Environmental Canada, *Identification of Lamp Ballasts Containing PCBs, August 1991* report in order to identify the ballast type. Ballasts for a typical 1.2 metre fluorescent light fixture made with PCBs contain approximately 23.6 grams of PCB.

.2 If any fluorescent light ballasts are removed during this project they must be sorted by a licensed electrician.

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

-Canadian Environmental Protection Act's (CEPA)
PCB Regulations
-Canadian Council of Ministers of the Environment's
*"Guidelines for the Management of Wastes
Containing Polychlorinated Biphenyls*
-Ontario Environmental Protection Act's O.Reg
362/90 "*Waste Management – PCB's*" (O.Reg 33/07,
French version)

All PCB-containing equipment that is removed from the site or placed into storage shall be appropriately reported in accordance with the requirements of the CEPA PCB Regulations.

5. CONTRACTORS DUTIES

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

END OF SECTION

Part 1 General

1.1 PRECONSTRUCTION MEETING

- .1 Within 10 days after award of Contract, the Departmental Project Manager request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 The Departmental Project Manager will establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

1.2 PROGRESS MEETINGS

- .1 During course of Work and weeks prior to project completion, Departmental Project Manager will schedule progress meetings monthly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act, R.S.O. 1990 Updated 2005.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 00 10 –General Instructions.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan .
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and or authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

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

1.6 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.

1.7 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Health and Safety Act, R.S.O.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C. .
- .4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 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.

1.10 HEALTH AND SAFETY CO-ORDINATOR

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

- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.11 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.

1.12 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.

1.13 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions "C", In Effect as Of: May 14, 2004.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Contractor to provide 'static carpet' type protection at project mechanical room doorways to control metal filings from leaving the area.
- .3 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site. Carry out work, this job during "off hours", Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 00 10 – General Instructions.
- .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.

1.3 STAINLESS STEEL CLEANING

- .1 General
 - .1 Employ a clean soft cloth to manually loosen contaminants when applying cleaning solutions. If scrubbing and scraping must be attempted, the softest utensil possible (soft bristle brush or plastic scraper, for example) should be tried in a small, hidden test area before proceeding. The following methods are effective for general cleaning:
 - .1 Glass Cleaner or other detergent/ammonia solution, followed by a rinse.
- .2 Fingerprints

- .1 Use glass cleaner with a soft cotton cloth to remove fingerprints. However, if that is not sufficient, there are a number of commercially available stainless steel cleaners that are very effective in addressing fingerprints, including:
 - .1 A heavy-duty, aerosol glass cleaner for non-conductive surfaces. Fortified formula contains powerful solvents, wetting agents, and ammonia to handle difficult cleaning tasks. Contains no phosphates or fluorocarbon repellants.
 - .1 Spray surface and wipe clean. Polish with a clean, dry cloth. Repeat as necessary.

.3 Stains

- .1 Use one, or combination in sequence, of the following cleaning components for areas of stain:
 - .1 Sodium Carbonate Paste, with a warm water rinse. Buff with clean, dry cloth or paper towel.
 - .2 Dilute Citric Acid, followed by a rinse. Buff with clean, dry cloth or paper towel.
 - .3 Tri-Sodium Phosphate (TSP), followed by a warm water rinse. Buff with clean, dry cloth or paper towel.
 - .4 Caustic Soda Solution (15% maximum), followed by a warm water rinse. Buff with clean, dry cloth or paper towel.

1.4 ARCHITECTURAL BRONZE POLISHING: MIRROR FINISH

- .1 For slight tarnishes, use a jeweler's cloth and wadding polish. For heavier tarnishes and stains, clean with a mixture of hot water, vinegar and salt. Use a washcloth to rub this into the item's surface and then dry the area well.
- .2 Polish by hand buffing or low speed buffing wheel on the brass surface, in the direction of the grain only, using cotton buff pads on an "offset machine, held sideways, creating a "flapping" action. Ensure to wear cotton gloves to protect the bronze from fingerprints.
- .3 Finish by light buffing with aluminum oxide buffing compounds using a peripheral wheel speed of 7,000 feet/min., until directional texture is no longer visible and surface is bright and reflective. Hand polish edges to blend with machine polished surfaces.
- .4 Remove any remaining compounds at the transition edge of bronze and stainless steel with cotton swabs and mild cleaning solutions.

1.5 FINAL CLEANING

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

- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .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 or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .14 Clean roofs, downspouts, and drainage systems.
- .15 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 00 10 – General Instructions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 00 10 – General Instructions 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .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.

1.3 FORMAT

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

- .1 Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of 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.
- .5 Typewritten Text: as required to supplement product data.
 - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 00 10 – General Instructions.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.5 RECORD DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 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 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.
- .3 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .4 Keep record documents and samples available for inspection by Departmental Representative.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.7 FINAL SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 00 10 – General Instructions, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 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 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 in Section 01 00 10 – General Instructions and 01 91 13 - General Commissioning (Cx) Requirements.
- .15 Additional requirements: as specified in individual specification sections.

1.9 MATERIALS AND FINISHES

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

1.10 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.

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

1.11 DELIVERY, STORAGE AND HANDLING

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

1.12 WARRANTIES AND BONDS

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

- .8 Conduct joint 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 roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .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 9 month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

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

- .1 Type of product/material.
- .2 Model number.
- .3 Serial number.
- .4 Contract number.
- .5 Warranty period.
- .6 Inspector's signature.
- .7 Construction Contractor.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 00 10 – General Instructions

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure 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.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Section 14 02 40 - Elevators: hours of instruction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .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 Owner'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.

END OF SECTION

Part 1 General

1.1 ACRONYMS

- .1 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

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 BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be 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.
- .4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.

1.3 COMMISSIONING OVERVIEW

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .5 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 elevator and related mechanical and electrical systems are 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.
- .6 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 SUBMITTALS

- .1 Submittals: in accordance with Section 01 00 10 General Instructions.
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative 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 Refer to Section [01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 00 10 General Instructions
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: Section 01 00 10 General Instructions and Section 01 31 19 Project Meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

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

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

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

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Departmental Representative.
 - .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.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from 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.

1.15 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.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

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

1.17 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

- .1 Notify Departmental Representative 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.

1.19 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.

1.20 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.

1.21 WITNESSING COMMISSIONING

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

1.22 AUTHORITIES HAVING JURISDICTION

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

1.23 EXTENT OF VERIFICATION

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

1.24 REPEAT VERIFICATIONS

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

1.25 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.

1.26 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 writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.27 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.

1.28 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.29 TRAINING

- .1 In accordance with Section [01 79 00 - Demonstration and Training.

1.30 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.31 OCCUPANCY

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

1.32 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.

1.33 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.

1.34 OWNER'S PERFORMANCE TESTING

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 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)

1.2 GENERAL

- .1 Provide a fully functional modernized elevators and related mechanical, electrical and life safety systems.
 - .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 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
 - .6 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .7 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.

1.3 DEVELOPMENT OF 100% CX PLAN

- .1 Cx Plan to be 95% completed before added into Project Specifications.
- .2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:
 - .1 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 Departmental Representative and obtain written approval.

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

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Departmental Representative will select Cx Team consisting of following members:
 - .1 Departmental Representative Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 Departmental Representative Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.

- .3 Protection of health, safety and comfort of occupants and O&M personnel.
- .4 Monitoring of Cx activities, training, development of Cx documentation.
- .5 Work closely with members of Cx Team.
- .3 Departmental Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
- .4 Construction Team: contractor, 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.

1.6 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
- .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
- .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
- .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
- .5 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 Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Architectural and structural:
 - .1 Vertical transportation systems:
 - .1 Passenger elevators C and D.
 - .2 Freight elevators A, B and E.
 - .2 Doors, windows, related hardware:
 - .1 Special doors in laboratories as identified herein:
 - .2 Door hardware.
 - .2 Commission mechanical systems and associated equipment:
 - .1 HVAC and exhaust systems:
 - .1 HVAC systems.
 - .2 General exhaust systems.
 - .3 Exhaust systems and related systems.
 - .2 Fire and life safety systems:
 - .1 Wet pipe sprinkler systems.
 - .2 Fire Extinguishers
 - .3 Seismic restraint and control measures.
 - .4 EMCS:
 - .3 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Voice communications systems.
 - .3 Electronic data and communications information systems.
 - .2 Lighting systems:
 - .1 Lighting equipment.
 - .2 Emergency lighting systems, including battery packs.
 - .3 Fire exit emergency signage.

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:

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

1.9 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed 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 Departmental Representative Design Quality Review Team:
 - .10 Tests performed by Owner/User
 - .11 Training Plans.
 - .12 Cx Reports.
 - .13 Prescribed activities during warranty period.
- .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
- .5 Departmental Representative to participate.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.

- .2 Departmental Representative to use approved check lists.
- .3 Departmental Representative will monitor some 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 Departmental Representative and does not form part of Cx specifications.
- .6 Departmental Representative will monitor some of these inspections and tests.
- .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - MECHANICAL:
 - .1 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
 - .2 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 Departmental Representative prior to start of 30 day Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period and 30day test period.
 - .6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
- .3 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. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.
 - .4 Low voltage systems: these include:
 - .1 Clock, communications, low voltage lighting control systems and data communications systems.
 - .2 Special systems such as Simultaneous Translation systems, MPs Call systems, Messenger Call systems, Division Bell systems.

1.11

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, following equipment, systems:
- .3 Departmental Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to witness and certify reported results using approved PI and PV forms.
 - .4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.
 - .5 Departmental 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.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

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

1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

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

- .5 Emergency lighting systems.
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative, Contractor, and Cx Manager to co-operate to complete inventory data sheets and provide assistance to Departmental Representative in full implementation of MMS identification system of components, equipment, sub-systems, systems.
- 1.14 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.
- 1.15 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.
- 1.16 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.
- 1.17 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.
- 1.18 CX SCHEDULES**
 - .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28 days 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: 3 months 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 14 days before start of integrated system Cx.
 - .12 Identification of deferred Cx.
 - .13 Implementation of training plans.

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- .14 Cx stair shaft pressurization systems: before issuance of occupancy certificate.
 - .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.
 - .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 Departmental Representative will monitor progress of Cx against this schedule.
- 1.19 CX REPORTS**
- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
 - .2 Include completed and certified PV reports in properly formatted Cx Reports.
 - .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative
- 1.20 ACTIVITIES DURING WARRANTY PERIOD**
- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
- 1.21 TESTS TO BE PERFORMED BY OWNER/USER**
- .1 None is anticipated on this project.
- 1.22 TRAINING PLANS**
- .1 Refer to Section 01 79 00 Demonstration and Training.
- 1.23 FINAL SETTINGS**
- .1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.
- Part 2 Products**
- 2.1 NOT USED**
- .1 Not Used.
- Part 3 Execution**
- 3.1 NOT USED**
- .1 Not Used.

END OF SECTION

Part 1 General

1.1 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .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.

1.2 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.

1.3 PERFORMANCE VERIFICATION (PV) FORMS

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

1.4 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.

1.5 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 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.

1.6 LANGUAGE

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION