
PART 1 - GENERAL

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| <u>1.1 Minimum Standards</u> | .1 | Materials shall be new and work shall conform to the minimum applicable standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada 2010 (NBC), National Fire Code of Canada 2010 (NFC), all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply. |
| <u>1.2 Shop Drawings, Samples and Product Data</u> | .1 | Submit for the Departmental Representative's review, copies of each shop drawing as per Section 01 33 00 - Submittal Procedures. |
| | .2 | 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 his responsibility for meeting all requirements of the Contract Documents. |
| | .3 | Do not commence manufacture or order materials before shop drawings are reviewed. |
| <u>1.3 Taxes</u> | .1 | Pay all taxes properly levied by law (including Federal, Provincial and Municipal). |
| <u>1.4 Fees, Permits and Certificates</u> | .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. |
| <u>1.5 Fire Safety Requirements</u> | .1 | Comply with the National Building Code of Canada 2010 (NBC) for fire safety in construction and the National Fire Code of Canada 2010 (NFC) for fire prevention, firefighting and life safety in building in use.
.1 Retain all fire safety documents and standards on site. |
| | .2 | Welding and cutting:
.1 Before welding, soldering, grinding and/or cutting work, obtain a permit as directed by the Departmental Representative and as addressed in NBC 2010 and NFC 2010. Store flammable liquids in approved CSA containers. No open flame shall be used unless authorised by the Departmental Representative.
.2 At least 1 week prior to commencing cutting, welding or soldering procedure, provide to Departmental Representative:
.1 Notice of intent, indicating devices affected, time and duration of isolation or bypass,
.3 A fire watcher shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 15m may be ignited by conduction or radiation. |
| | .3 | Where work requires interruption of fire alarms or fire suppression, extinguishing or protection systems: |
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1.5 Fire Safety Requirements (Cont'd)	.3	(Cont'd) .1 Provide watchman service; 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, to and protect all devices relating to: .1 Modification of fire alarms, fire suppression, extinguishing or protection systems; and/or, cutting welding, soldering or other construction activities which might activate fire protection systems.
1.6 Field Quality Control	.1	Carry out Work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification. .1 Submit lists of personnel involved in project and copy of professional trade licenses
	.2	Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers
	.3	Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.
1.7 Hazardous Materials	.1	Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS).
	.2	For work in occupied buildings give the Departmental Representative 1 week notice for work involving designated substances (Ontario Bill 208), hazardous substances and before painting, caulking, installing carpet or using adhesives.
1.8 Temporary Utilities	.1	Existing services required for the work, may be used by the Contractor without charge. Ensure capacity is adequate prior to Imposing additional loads. Connect and disconnect at own expense and responsibility.
	.2	Temporary services required for work may be available without charge where there is capacity to do so, and at the discretion of the Departmental Representative. Mechanical and Electrical connections in accordance with applicable codes. Connections and disconnection's to/from services shall be at the contractors expense and responsibility.
	.3	Notify the Departmental Representative and utility companies of intended interruption of services, obtain requisite permission.
	.4	Give the Departmental Representative 1 week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

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| <u>1.9 Removed Materials</u> | .1 | Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site. |
| | .2 | Remove and dispose equipment selected by Departmental representative. |
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| <u>1.10 Protection</u> | .1 | Protect finished work against damage until take-over. |
| | .2 | Protect adjacent work against the spread of dust and dirt beyond the work areas. |
| | .3 | Protect operatives and other users of site from all hazards. |
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| <u>1.11 Use of Site and Facilities</u> | .1 | Execute work with least possible interference or disturbance to the normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated. Refer to article 1.31 Scheduling below for work that must be done during "off hours". |
| | .2 | Maintain existing services to building and provide for personnel and vehicle access. |
| | .3 | Where security is reduced by work provide temporary means to maintain security. |
| | .4 | Where elevators, dumbwaiters, conveyors or escalators exist Contractor may use these at Departmental Representative's discretion. Protect from damage, safety hazards and overloading of existing equipment. |
| | .5 | Contractor to provide a construction trailer of sufficient size and fitted-up to accommodate construction meetings and drawing reviews. Arrange and pay all cost for land line or cellular telephone and internet service for duration of the contract. |
| | .6 | Sanitary facilities are to be provided by the contractor for the entire construction period. Provide Sanitary facilities as per the Ontario "Occupational Health and Safety Act and Regulations for Construction Projects". Keep the facilities clean. |
| | .7 | Contractor to provide waste dumpsters for collection of construction waste and make provision for periodic removal of waste from the site during construction. |
| | .8 | Closures: Protect work temporarily until permanent enclosures completed. |
| | .9 | No cameras are permitted on site and no photographs shall be taken. |
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| <u>1.12 Deliveries</u> | .1 | Provide schedule of deliveries to Departmental Representative at least five weekdays in advance, schedule to comply with security control measures. |
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| <u>1.13 Site Storage</u> | .1 | The Departmental Representative will assign storage space adjacent to the building site. Contractor shall obtain and pay for lockable weatherproof sheds for storage of tools, equipment and materials which shall be equipped and maintained by the Contractor. |
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<u>1.13 Site Storage (Cont'd)</u>	.2	Do not unreasonably encumber site with materials or equipment.
	.3	Move stored products or equipment, which interfere with operations of Departmental Representative or other contractors.
	.4	Obtain and pay for use of additional storage or work areas needed for operations.
<u>1.14 Cut, Patch and Make Good</u>	.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.
	.4	Install firestops and smoke seals in accordance with ULC-S115-2005 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.
<u>1.15 Sleeves, Hangers Hangers and Inserts</u>	.1	Co-ordinate setting and packing of sleeves and supply and Installation of hangers and inserts. Obtain Departmental Representative's approval before cutting into structure.
<u>1.16 Examination</u>	.1	Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.
	.2	Be aware of high complexity of the building structure and layout, mechanical and electrical system layout and congestion as well as building function and operation. Allow for 2 x 6hr session for all contractor's personnel employed on this project to get familiar with building layout and services affected by this contract location.
<u>1.17 Signs</u>	.1	Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etc., in both official languages or by the use of commonly-understood graphic symbols to the Departmental Representative's approval.
	.2	No advertising will be permitted on this project.
<u>1.18 Access and Egress</u>	.1	Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

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| <u>1.18 Access and Egress
(Cont'd)</u> | .2 | The building must remain operational during construction. The contractor shall agree to install proper site separation and identification in order to maintain "Time and Space" at all time throughout the life of the project and when PWGSC Building Operations staff requires access to equipment to operate the building, proper coordination must exist. | |
| <u>1.19 Scaffolds Work
Platforms</u> | .1 | Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations. | |
| | .2 | Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed. | |
| | .3 | Additions or modifications to scaffolding must be approved by Professional Engineer in writing. | |
| <u>1.20 Waste Management</u> | .1 | Comply with the Environmental Protection Act, Ontario Regulations O.Reg. 102/94 and O. Reg. 103/94 for waste management program on construction and demolition projects. | |
| | .2 | Waste management according to Section 01 74 21 Construction/Demolition Waste Management And Disposal. | |
| <u>1.21 Operations and
Maintenance Manuals</u> | .1 | Two (2) weeks prior to any scheduled training, submit to Departmental Representative six (6) copies of approved Operations Data and Maintenance Manual in both official languages, compiled as follows:
.1 Bind data in vinyl hard cover 3 "D" ring type loose leaf binders for 212 x 275mm size paper. Binders must not exceed 75 mm thick or be more than 2/3 full.
.2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.
.3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets. | |
| | .2 | Include following information plus data specified.
.1 Maintenance instruction for finished surface and materials.
.2 Copy of hardware and paint schedules.
.3 Description: Operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
.4 Maintenance: Use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
.1 Lubrication products and schedules.
.2 Trouble shooting procedures.
.3 Adjustment techniques.
.4 Operational checks.
.5 Supplier's names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number. | |
| | | .5 | Guarantees showing: |
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1.21 Operations and Maintenance Manuals (Cont'd)	.2	(Cont'd)
	.5	(Cont'd)
	.1	Name and address of projects.
	.2	Guarantee commencement date (date of Interim Certificate of Completion).
	.3	Duration of guarantee.
	.4	Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
	.5	Signature and seal of Guarantor.
	.6	Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
	.3	Spare parts: List all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address)
	.4	Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.
1.22 Records	.1	As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in. The Departmental Representative will provide two sets of clean white prints for this purpose.
1.23 Guarantees and Warranties	.1	Provide labour and material warranty for all material purchased and all services installed under this contract. Submit Letter of Warranty with O&M Manuals.
1.24 Clean up	.1	Clean up work area as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.
	.2	Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.
	.3	Wash and polish glass, mirrors, ceramic tile, aluminium, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware and washroom fixtures. Clean manufactured articles in accordance with manufacturer's directions.
	.4	Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.
1.25 Security Escort	.1	All personnel employed on this project shall always be escorted when accessing or working within the construction site areas during normal working hours. Personnel shall always be escorted in all areas outside of normal working hours.

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| <u>1.25 Security Escort
(Cont'd)</u> | .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 costs of the security escort will be paid for by the Departmental Representative. 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 8 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 eight hours per day for a late service request and of four hours for late cancellations. |
| | .5 | Contractors are not permitted access to occupied areas of the site and facilities outside of the construction zone. |
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| <u>1.26 Building Smoking Environment</u> | .1 | Smoking is not permitted in the Building. Obey smoking restrictions on building property. |
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| <u>1.27 Dust Control</u> | .1 | Provide dust tight screens or partitions to localise dust generating activities, and for protection of workers, finished areas of work and public. |
| | .2 | Where shafts are accessible to occupants during regular hours (e.g. occupied offices), plywood cover is to be affixed to wall to prevent access to shaft. |
| | .3 | Maintain and relocate protection until such work is complete. |
| | .4 | Protect all furnishings within work area with 0.102 mm thick polyethylene film during construction. Remove film during non- construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function. |
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| <u>1.28 Testing Laboratory Services</u> | .1 | Contractor will 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 authorised 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. |
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| <u>1.29 Scheduling</u> | .1 | On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When schedule has been reviewed by the Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without notifying Departmental Representative. |
| | .1 | Contract to be completed within 33 weeks of contract award |
| | .2 | Existing South Tower has to be shut down not earlier than 5 weeks after contract award. |
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| <u>1.29 Scheduling</u>
<u>(Cont'd)</u> | .1 | (Cont'd)
.3 Existing North Tower has to be shut down not earlier than 9 weeks after contract award.
.4 Complete all work except start-up and commissioning no later than 21 weeks after contract award.
.5 Complete commissioning of winterized cooling towers no later than 23 weeks after contract award. |
| | .2 | Carry out work during "regular hour" Monday to Friday from 07:00 to 16:00 hours, unless otherwise indicated. |
| | .3 | Carry out the following work during "off hours", as defined as Monday to Friday from 16:00 to 07:00 hours and anytime on Saturdays, Sundays, and statutory holidays:
.1 Work within an occupied area or requiring access via an occupied area (i.e. offices)
.2 Work within a ceiling space on an occupied floor.
.3 All shutdowns (water, fire protection, security, communication or power distribution systems.
.4 All work generating excess noise.
.5 All work involving street closures. |
| | .4 | Work in office area on 21 floor identify on drawing M03 shall be carried out from Friday 18:00 till Sunday 24:00 |
| | .5 | Give the Departmental Representative 48 hours notice for work to be carried out during "off hours". |
| | .6 | Give the Departmental Representative 7 days notice for any shutdowns. Do not proceed with the work without written approval. |
| <u>1.30 Cost Breakdown</u> | .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 |
| <u>1.31 Precedence</u> | .1 | Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual. |

PART 2 - PRODUCTS

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| <u>2.1 Not Used</u> | .1 | Not Used. |
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PART 3 - EXECUTION

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| <u>3.1 Not Used</u> | .1 | Not used. |
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PART 1 - GENERAL

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| <u>1.1 References</u> | .1 | Ministry of Transportation (MTO) Ontario Traffic Manual Book 7: Temporary Conditions. |
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| <u>1.2 Use of Site and Facilities</u> | .1 | There is no parking available for Contractor's personnel within or near the building. |
| | .2 | Keep facilities clean and return to original condition at completion of Work. |
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| <u>1.3 Protection of Public Traffic</u> | .1 | Comply with requirements of traffic policy in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment. |
| | .2 | Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to work. |
| | .3 | Provide and maintain competent signal flag operators, traffic signals, barricades and flares or lanterns as required to perform work and protect public.
.1 Place equipment in position to present minimum of interference and hazard to travelling public.
.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
.3 Do not leave equipment on travelled way overnight.
.4 Do not close any lanes of road without approval of Departmental Representative. Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in Part D of UTCD. |
| | .4 | Maintain access to property including overhead clearances for use by emergency response vehicles. |

PART 2 - PRODUCTS

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| <u>2.1 Not Used</u> | .1 | Not used. |
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PART 3 - EXECUTION

3.1 Not Used .1 Not Used

PART 1 – GENERAL

1.1 REGULATORY REQUIREMENTS

.1 An investigation into the presence of designated substances at the l' Esplanade Laurier Complex in support of the Cooling Towers Replacement Project 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 O.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) conducted, 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 Cooling Towers Replacement Project at the l' Esplanade Laurier complex.

.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 347/09, 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 347/09, 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 347/09, 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 staff carried out the initial fieldwork for the DSR on December 14, 2011.
- .2 The L' Esplanade Laurier complex consists of a west office tower linked to an east office tower by two concourse levels. There are two cooling towers serving the complex. These cooling towers are located on the roof of the east office tower. One of these cooling towers is located on the north of the east office tower, and is referred to as 'North Cooling Tower' herein. The other cooling tower is located on the south of the east office tower, and is referred to as 'South Cooling Tower' herein. The scope of the work proposed is understood to consist of the replacement of the North and South cooling towers.
 - .1 The scope of work for this survey and report involved a visual inspection of building materials and contents for the presence of suspected designated substances in the project areas on December 14, 2011.
 - .2 From the visual inspection performed on December 14, 2011, suspect materials were

- sampled and analyzed, where appropriate, for the above substances. On the basis of this inspection, a total of twenty-two (22) samples of suspected asbestos-containing material, and two (2) samples of suspected lead-containing paint were collected.
- .5 Bulk samples were then submitted for analysis to the Paracel Laboratories Ltd. (Paracel) (an accredited CALA lab) located at 300-2319 St. Laurent Boulevard, Ottawa, Ontario, K1G 4J8.
 - .6 The surveys were limited to those areas, which could be accessed by non-destructive means. The visual inspection and sampling was limited to readily accessible areas. Destructive testing for select areas of the roof was performed as part of the investigation. No other destructive testing was performed, but is recommended prior to any major demolition. Due to the nature of building construction, some inherent limitations exist as to the possible thoroughness of the designated substance survey. The survey did not include the demolition of floors, floor finishes, ceiling/decks or walls or other areas to examine concealed conditions.
 - .7 It is possible that the designated substances aforementioned are present in non-accessible areas and concealed spaces (i.e., wall and ceiling cavities), or additional confined spaces. No other areas outside the defined work boundaries have been assessed.
 - .8 Prior to beginning work, it must be confirmed with the Departmental Representative that no additional designated substances have been brought to the project area.
 - .9 In addition, the survey refers to PCBs and halocarbons, however, it does not refer to other substances that may be present in the day-to-day usage for specialized equipment or areas in buildings (i.e., lead shields, fume hoods, etc.). Other hazardous materials as viewed pertinent by the surveyors have also been considered.
 - .10 There is a possibility that materials, which could not be reasonably identified within the scope of this assessment or which were not apparent during previous site visits may exist. Should any designated substance or hazardous material be encountered or suspected in the course of demolition, 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:** Suspected

During the investigation, wood boards forming part of the exterior/interior of the North and South Cooling Towers was observed. It is suspected that this is Chromated Copper Arsenate (CCA) treated wood (pressure treated wood), that contains arsenic.

.3 **ASBESTOS: Identified**

1. 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.
2. Representative samples, taken on December 14, 2011 from the project areas have been analyzed for asbestos. Analytical results indicate that select caulking applications, a tar application and corrugated transite containing asbestos are present in the project area(s). The analytical results for samples collected on December 14, 2011 are shown in Table 1 below.

Table 1 - Asbestos Sample Results – December 14, 2011

Sample number	Material	Sample Location	Asbestos Type	Asbestos Content (%)
14182-01A	Roof membrane layer	North Cooling Tower	n/a	n/d
14182-01B			n/a	n/d
14182-01C		South Cooling Tower	n/a	n/d
14182-02A	Grey Caulking	Side of corrugated transite exterior of North Cooling Tower	Chrysotile	3.86%
14182-02B			Not Analyzed – Positive Stop	
14182-02C			Not Analyzed – Positive Stop	
14182-03A	Grey Caulking	On North Cooling Tower footings	n/d	n/a
14182-03B			n/d	n/a
14182-03C			n/d	n/a
14182-04A	Black Caulking	On North Cooling Tower metal siding	Chrysotile	8.83%
14182-04B			Not Analyzed – Positive Stop	
14182-04C			Not Analyzed – Positive Stop	
14182-05A	Canvas damper	Exhaust ducting, North Cooling Tower	n/d	n/a
14182-05B			n/d	n/a
14182-05C			n/d	n/a
14182-06A	Tar layer	On ducting running around roof area	n/d	n/a
14182-06B			n/d	n/a
14182-06C			n/d	n/a
14182-07A	Corrugated transite	South Cooling Tower	Chrysotile	30%
14182-08A	Black Tar	Pipe footings leading onto roof, South Cooling Tower	Chrysotile	2.39%
14182-08B			Not Analyzed – Positive Stop	
14182-08C			Not Analyzed – Positive Stop	

***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

It should be noted that during the investigation, a fireproofing material was observed applied to select columns on the interior walkway that surrounds the roof area of the East Office Tower (not directly associated with the North and South Cooling Towers). This material was not sampled as it is located outside of the scope of work for this project; however, should the scope of work extend to include these columns, bulk sampling and laboratory

analysis should be performed prior to any disturbance of this material.

.4 **BENZENE:** Not Identified

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

.6 **ETHYLENE OXIDE:** Not Identified

.7 **ISOCYANATES:** Not Identified

.8 **LEAD: Identified**

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

.1 According to the Hazard Products Act's *Surface Coating Materials Regulations* SOR/2005-109, as amended, allowable concentration of lead of surface coatings is 0.009 percent by weight (weight of lead to weight of paint), which is equivalent to 90 parts per million (ppm).

.2 Even at very 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.

.3 Representative paint samples, collected on December 14, 2011 from the building, have been analyzed for lead content. Analytical results indicate that paints in the building are considered to be 'lead-based' as per the aforementioned guideline. The results are shown in Table 2 below.

Table 2 - Lead Sample Results – December 14, 2011

Sample Number	Description	Location	Lead Content (ppm or µg/g)
14182-LP01	Red paint	Applied to steel support members for the North Cooling Tower	1,070
14182-LP02	Red paint	Applied to steel support members for the South Tower	182

n/d = none detected

Bold items represent detectable levels of lead, above the laboratory detection limit of 50 µg/g for paint chip samples.

.9 **MERCURY:** Not Identified

.10 **SILICA: Identified**

During the site investigation, concrete building materials were observed in the project areas. Free crystalline silica is presumed present in these materials.

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

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

No light ballasts or transformers were observed in the project area.

.13 **HALOCARBONS:** Not Identified

.14 **MOULD: Suspected**

Although not considered a Designated Substance, it should be noted that during the site investigation, the wooden exterior/interior lining of the Cooling Towers was observed to be water damaged, and suspected to be mould impacted as a result.

.15 **AVIAN FECAL MATTER: Identified**

Although not considered a Designated Substance, it should be noted that during the site investigation on the ground to the north side of the North Cooling Tower, minor accumulations of avian fecal matter and one dead bird were observed on the roof surface

.16 **OTHER HAZARDOUS MATERIALS/
SUBSTANCES: Identified**

During the site investigation, eight (8) barrels of propylene glycol were observed within the South Cooling Tower project area. These barrels were observed to be either empty or almost empty.

Many of the structural elements and walls of both Cooling Towers were covered by scale. This scale is likely from Cooling Tower operations and likely consists of precipitated mineral deposits.

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.

.1 The following criteria shall be utilized in determining the classification of asbestos work as indicated in *PWGSC DP 057, Annex C, Appendix 5* and "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations" *O.Reg 278/05, as amended*. These criteria are not exhaustive. When classification of the work is uncertain, refer to the Ontario Regulation:

Type 1 work generally includes installation or removal of a wetted non-friable ACM with a hand tool; disturbance of wetted non-friable ACM with a powered tool equipped with a High Efficiency Particulate Aerosol (HEPA) dust collection device; removal of less than one square meter of wetted drywall materials where joint filling materials contain asbestos; removal or replacement of less than 7.5 square meters asbestos-containing compressed mineral fibre-type ceiling tiles; collecting wetted samples of suspected friable asbestos material, and working close to friable sprayed asbestos, where

the material may be affected by the work activities.

Type 2 work generally includes the removal or replacement of more than 7.5 square meters asbestos-containing compressed mineral fibre-type ceiling tiles; entry into ceiling space, crawl spaces, pipe tunnels etc., where friable asbestos debris is present; minor removal of friable ACM; Type 2 removal is limited to a maximum per work period of 1m² of surface area; the repair of asbestos mechanical insulation (no limit is imposed as to the amount of repair permitted under Type 2 conditions); and any disturbance not classified as either Type 1 or 3.

Type 3 work generally includes more than minor removal or disturbance of friable ACM; the use of a power tool on non-friable ACM without a HEPA exhausted dust collection; the spray application of an encapsulate or sealer to friable asbestos surfacing materials; the disturbance of the ductwork and air handling equipment serving or passing through areas of buildings with sprayed asbestos fireproofing or insulation, and the repair, alteration or demolition of a boiler, furnace, kiln or similar equipment with asbestos-containing refractory.

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.

2. LEAD

If lead-containing materials are disturbed (i.e. during dry sanding, grinding, polishing and sawing operations), 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/m³) limit during the removal of paints and products containing any concentration of lead. The TWAEV represents the time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects.

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. It should be noted that the use of mechanically-powered tools or torches on lead-containing materials increases the concentration of airborne lead dust or fumes and thereby requiring more stringent respiratory protection and controlled work procedures.

.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.

.2 The work procedure outlined below can be used as a guide but where there is conflict with the exposure limits and respiratory protection required by "Designated Substances" Regulation O.Reg 490/09, the most stringent requirements of Regulation 490/09 must apply.

Type 1 Operations, as defined in the MoL guideline, applies to work that includes applying coatings containing lead by means of brush or roller; removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter; installing or removing lead or lead-alloy sheet materials; installing or removing lead packing, Babbitt metal or similar material; removing coating or materials containing lead using non-powered hand tools other than manual scraping or sanding and soldering materials containing lead. Type 1 work practices outline that where workers request a respirator, the employer must provide at minimum a half-face piece air purifying respirator with N-, R-, or P- series particulate filters and 95, 99 or 100% efficiency. Dust and waste must be cleaned up at least daily, and removed at completion of the operation.

Type 2 Operations, as defined in the MoL Guideline, applies to work that includes applying coating containing lead by means of spraying; removing coating or materials containing lead by scraping or sanding using non-powered tools; manual demolition of lead-painted plaster walls

or building components by striking a wall with a sledge hammer or similar tool and outdoor welding or high temperature cutting of lead-containing coating, other than during dismantling or demolishing. Type 2 work practices requiring a National Institute of Occupational safety and Health (NIOSH) Assigned Protection Factor (APF) of 10 outline that employers must provide workers at minimum a half-face piece respirator with N-, R-, or P- series particulate filters (dust, fume and mist) and 95, 99 or 100% efficiency (plus solvent protection during spray-coating applications). Type 2 work practices requiring a NIOSH APF of 25 outline that powered air purifying respirators with a hood or helmet, and any type of high efficiency filter shall be used at minimum. Supplied air respirators equipped with a hood or helmet and operated in a continuous flow mode are also acceptable.

Type 3 Operations, as defined in the MoL Guideline, applies to work that includes abrasive blasting of lead-containing coating; indoor or in confined space welding or high-temperature cutting of lead-containing coatings or materials; dry removal of lead-containing mortar using a drill or pneumatic device; removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter; removing or repairing a ventilation system where dust containing lead is present within the system; demolition or clean-up of a facility where lead-containing products were manufactured, removal of lead-containing dust using an air-mist extraction system; outdoor high-temperature cutting of material with lead-containing coating done in the course of dismantling or demolishing a machine, building, structure, or plant and burning of a surface with lead-containing coating; and any operation that may expose a worker to lead dust, fume or mist that is not a Type 1 or Type 2 operation. Type 3 work practices outline that warning signs, in sufficient numbers, must be posted to warn the public of the hazards. Before any indoor sandblasting operation is conducted, signs shall be posted at least at each entrance to the work area. For indoor or confined space burning, cutting or welding, local exhaust ventilation must be provided with sufficient velocity to capture fumes. Where local exhaust does not have HEPA filter, air must be discharged to the exterior. If local exhaust ventilation is not available, workers and all persons entering the work shall wear a positive pressure supplied air respirator. Type 3a work practices require a

NIOSH APF of 50 while Type 3b operations require a NIOSH APF of greater than or equal to 1,000. There are several respirator types assigned these APFs. Refer to MoL guideline for information on required respirator type.

.3 The disposal of construction waste containing lead is controlled by "General – Waste Management" O.Reg 347/09, 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. SILICA

.1 Silica occurs as crystalline material in cement. 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, masonry, mortar, drywall, plaster, and ceramic tiles 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.

.6 MOULD (NOT RECOGNIZED AS A DESIGNATED SUBSTANCE)

Although not considered a Designated Substance, it should be noted that the wooden exterior/interior lining of the Cooling Towers was observed to be water damaged, and suspected to be mould impacted. Given the exterior location of the wood elements, that the wood may also be pressure treated, and some of the wood is associated with corrugated asbestos-containing transite

conventional mould remediation here may be impractical. Prior to disturbance of, wood materials suspected to be mould impacted that Personal Protective equipment (PPE) such as protective coveralls and appropriate respiratory protection be utilized as required to reduce potential exposure to mould. Appropriate work procedures given in the document *Mould Guidelines for the Canadian Construction Industry CCA 82-2004* published by the Canadian Construction Association (CCA 82-2004) should be referenced. Disposal of waste should be performed in accordance with local, municipal, provincial, and/or federal jurisdictions having authority.

.7 AVIAN FECAL MATTER (NOT RECOGNIZED AS A DESIGNATED SUBSTANCE)

Although not considered a Designated Substance, it should be noted that during the site investigation on the ground to the north side of the North Cooling Tower, minor accumulations of avian fecal matter and one dead bird were observed on the roof surface. Due to the health threat of mycotic organisms inhabiting avian fecal matter, it is recommended that prior to disturbance avian/animal fecal matter be cleaned and removed following the appropriate work procedures given in the document *Mould Guidelines for the Canadian Construction Industry CCA 82-2004* published by the Canadian Construction Association (CCA 82-2004). Following clean-up, packaging and disposal of all avian/animal fecal matter impacted waste should be performed in such a manner as to avoid cross-contamination of unaffected areas. Disposal of waste should be performed in accordance with local, municipal, provincial, and/or federal jurisdictions having authority.

.8 OTHER HAZARDOUS MATERIALS/ SUBSTANCES

During the site investigation, eight (8) barrels of propylene glycol were observed within the South Cooling Tower project area. These barrels were observed to be either empty or almost empty. Handling of these barrels prior to their removal and disposal should adhere to the relevant requirements as given in the Material Safety Data Sheets (MSDSs) sheets for propylene glycol. Disposal of waste should be performed in accordance with local, municipal, provincial, and/or federal jurisdictions having authority.

PPE such as protective clothing and respiratory protection should be considered if disturbance of scale identified on cooling tower elements produces significant amounts of particulates.

4. CONTRACTORS DUTIES

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

The contractor shall also complete all reporting requirements to comply with applicable regulations (e.g., CEPA PCB Regulations).

When work will disturb items impacted by several designated substances/hazardous materials for which precautionary measures are required, the more stringent measures should be implemented.

END OF SECTION

PART 1 - GENERAL

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|-------------------------------------|---|
| <u>1.1 Administrative</u> | <ul style="list-style-type: none">.1 Attend project meetings throughout the progress of the work at the call of Departmental Representative..2 The Departmental Representative will provide physical space and make arrangements for meetings..3 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents..4 Departmental Representative will chair meeting and prepare and distribute minutes. |
| <u>1.2 Pre-Construction Meeting</u> | <ul style="list-style-type: none">.1 Within 5 days after award of Contract, at the request of the Departmental Representative, attend a meeting to discuss and resolve administrative procedures and responsibilities..2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance..3 Agenda to include:<ul style="list-style-type: none">.1 Appointment of official representative of participants in the Work..2 Schedule of Work: in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart..3 Schedule of submission of shop drawings, samples, and color chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures..4 Delivery schedule of specified equipment..5 Site security..6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements..7 Departmental Representative provided products..8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures..9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals..10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals..11 Monthly progress claims, administrative procedures, hold backs..12 Appointment of inspection and testing agencies or firms..13 Insurances, transcript of policies. |
| <u>1.3 Progress Meetings</u> | <ul style="list-style-type: none">.1 Attend bi-weekly project progress meetings throughout the progress of the Work at the call of Departmental Representative..2 Contractor, major subcontractors, Departmental Representative are to be in attendance. |
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| 1.3 Progress Meetings
(Cont'd) | .3 | Agenda to include the following: |
| | .1 | Review, approval of minutes of previous meeting. |
| | .2 | Review of Work progress since previous meeting. |
| | .3 | Field observations, problems, conflicts. |
| | .4 | Problems which impede construction schedule. |
| | .5 | Review of off-site fabrication delivery schedules. |
| | .6 | Corrective measures and procedures to regain projected schedule. |
| | .7 | Revision to construction schedule. |
| | .8 | Progress schedule, during succeeding work period. |
| | .9 | Review submittal schedules: expedite as required. |
| | .10 | Maintenance of quality standards. |
| | .11 | Review proposed changes for affect on construction schedule and on completion date. |
| | .12 | Other business. |

PART 2 - PRODUCTS

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| 2.1 Not Used | .1 | Not Used. |
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PART 3 - EXECUTION

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| 3.1 Not Used | .1 | Not Used. |
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PART 1 - GENERAL

- 1.1 Definitions
- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
 - .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity duration are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system
 - .3 Baseline: original approved plan (for project, work package, or activity) plus or minus approved scope changes.
 - .4 Construction Work Week: Monday to Sunday, inclusive, will provide seven day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission. There are seven days per work week.
 - .5 Duration: number of work periods (not including holidays or other non-working periods) required to complete activity or other project element. Usually expressed as workdays or work weeks.
 - .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
 - .7 Milestone: significant event in project, usually completion of major deliverable.
 - .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
 - .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.
 - .10 Week: Monday to Friday, inclusive, will provide five day week.
- 1.2 Requirements
- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
 - .2 Plan to complete Work in accordance with prescribed milestones and time frame.
 - .3 Limit activity duration to maximum of approximately 5 working days, to allow for progress reporting.
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| <u>1.3 Submittals</u> | <ul style="list-style-type: none">.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures..2 Submit to Departmental Representative within 5 weekdays of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress..3 Submit Project Schedule to Departmental Representative within 5 weekdays of receipt of acceptance of Master Plan. |
| <u>1.4 Project Milestones</u> | <ul style="list-style-type: none">.1 Project milestones from interim targets for Project Schedule. Mobilization on site completed within 50 weekdays of award of Contract date. |
| <u>1.5 Master Plan</u> | <ul style="list-style-type: none">.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT)..2 Departmental Representative will review and return revised schedules within 5 weekdays..3 Revise impractical schedule and resubmit within 5 weekdays..4 Accepted revised schedule will become Master Plan and be used as baseline for updates |
| <u>1.6 Project Schedule</u> | <ul style="list-style-type: none">.1 Develop detailed Project Schedule derived from Master Plan..2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:<ul style="list-style-type: none">.1 Award.2 Shop Drawings, Samples.3 Permits.4 Mobilization.5 Mechanical work.6 Electrical.7 Controls.8 Testing and Commissioning..9 Material deliveries..10 Supplied equipment long delivery items. |
| <u>1.7 Project Schedule</u> | <ul style="list-style-type: none">.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress..2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation. |
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<u>1.8 Project Meetings</u>	.1	Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
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PART 2 - PRODUCTS

<u>2.1 Not Used</u>	.1	Not Used.
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PART 3 - EXECUTION

<u>3.1 Not Used</u>	.1	Not used.
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PART 1 - GENERAL

- 1.1 Administrative
- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
 - .2 Do not proceed with Work affected by submittal until review is complete.
 - .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
 - .4 Where items or information is not produced in SI Metric units converted values are acceptable.
 - .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
 - .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .7 Verify field measurements and affected adjacent Work are co-ordinated.
 - .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
 - .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
 - .10 Keep one reviewed copy of each submission on site.
- 1.2 Shop Drawings and Product Data
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
 - .2 When indicated, submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
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1.2 Shop Drawings
and Product Data
(Cont'd)

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

- .10 (Cont'd)
- .3 Test reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .4 Certificates for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.
- .5 Manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .6 Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .7 Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .11 All Data to be job specific.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 Maintain blank area 75 mm x 75 mm for Departmental Representative's review stamp and comments.
- .15 Ensure submissions are capable of being copied or faxed without loss of legibility or detail.
- .16 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency or copies or electronic copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3 Samples

- .1 Submit for review samples in triplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address site office.

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| <u>1.3 Samples
(Cont'd)</u> | .3 | Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents. |
| | .4 | Where colour, pattern or texture is criterion, submit full range of samples. |
| | .5 | Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work. |
| | .6 | Make changes in samples which Departmental Representative may require, consistent with Contract Documents. |
| | .7 | Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified. |
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| <u>1.4 Certificates
and Transcripts</u> | .1 | Immediately after award of Contract, submit Workers' Compensation Board status. |

PART 2 - PRODUCTS

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| <u>2.1 NOT USED</u> | .1 | Not Used. |
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PART 3 - EXECUTION

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| <u>3.1 NOT USED</u> | .1 | Not Used. |
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PART 1 - GENERAL

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| <u>1.1 References</u> | .1 | Province of Ontario
.1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990,c .0.1-2010 Edition. |
| <u>1.2 Action and Informational Submittals</u> | .1 | Make submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Submit site-specific Health and Safety Plan: Within 5 weekdays after Award of Contract date 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 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative. |
| | .4 | Submit copies of reports or directions issued by Federal, Provincial and Municipal 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 weekdays after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 weekdays after receipt of comments from Departmental Representative and prior to commencing Work. |
| | .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 and ensure integration with Industry Canada Emergency Plan and Procedures. Departmental Representative will provide copy of Industry Canada Emergency Plan and Procedures. |
| <u>1.3 Filing of Notice</u> | .1 | File Notice of Project with Provincial authorities prior to beginning of Work. |
| <u>1.4 Safety Assessment</u> | .1 | Perform site specific safety hazard |
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| <u>1.5 Meetings</u> | .1 | Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work. |
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| <u>1.6 Project/Site Conditions</u> | .1 | Work at site may involve contact with designated substances. Refer to Section 01 14 25 - Designated Substances Report if applicable. |
| | | |
| <u>1.7 General Requirements</u> | nts.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. Relief from or substitution for any portion or provision of minimum Health and Safety Guidelines specified herein or reviewed site-specific Health and Safety Plan must be submitted to Departmental Representative in writing. Departmental Representative will respond in writing, either accepting or requesting improvements. |
| | | |
| <u>1.8 Responsibility</u> | .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. |
| | | |
| <u>1.9 Compliance Requirements</u> | .1 | Comply with Ontario Occupational Health and Safety Act and Regulations for Construction Projects. |
| | | |
| <u>1.10 Unforeseen Hazard</u> | ds.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. |
| | | |
| <u>1.11 Posting of Documents</u> | .1 | Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Ontario, and in consultation with Departmental Representative. |
| | | |
| <u>1.12 Correction of Non-Compliance</u> | .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. |
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<u>1.12 Correction of Non-Compliance (Cont'd)</u>	.3	Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.
<u>1.13 Powder Actuated Devices</u>	.1	Use powder actuated devices only after receipt of written permission from Departmental Representative.
<u>1.14 Work Stoppage</u>	.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

<u>2.1 Not used</u>	.1	Not used.
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PART 3 - EXECUTION

<u>3.1 Not Used</u>	.1	Not used.
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PART 1 – GENERAL

<u>1.1 Section Includes</u>	.1	Barriers.
	.2	Environmental Controls.
	.3	Traffic Controls.
	.4	Fire Routes.
<u>1.2 Related Sections</u>	.1	Section 01 00 10 - General Instructions.
	.2	Section 01 33 00 - Submittal Procedures.
	.3	Section 01 35 29.06 - Health and Safety Requirements
<u>1.3 References</u>	.1	Canadian General Standards Board (CGSB)
	.1	CGSB 1.189M-84, Primer, Alkyd, Wood, Exterior.
	.2	CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
	.2	Canadian Standards Association (CSA)
	.1	CSA-O121-M1978, Douglas Fir Plywood.
<u>1.4 Regulatory Requirements</u>	.1	Comply with applicable standards and regulations of all authorities having jurisdiction to ensure safe site operation.
	.2	Obtain and post permits as may be required by authorities having jurisdiction
<u>1.5 Installation and Removal</u>	.1	Provide temporary controls in order to execute Work expeditiously.
	.2	Remove from site all such work after use.
<u>1.6 Protection of Existing Roof Deck</u>	.1	At all roof areas designated for staging, storage or loading of materials, provide roof surface protection to ensure no damage to existing roof deck and/or associated components (ie: vents, hatches, swing-stage tracks, anchors etc.):
	.1	Coordinate all designated areas with the Departmental Representative prior to the initiating of any work.
	.2	At precast concrete insulated pavers, provide continuous plywood protection.
<u>1.7 Material Enclosures</u>	.1	Ensure roof areas designated for material storage are secured by means of fencing enclosure. Unless otherwise

specified in the contract, erection of temporary fencing is required to ensure materials are securely contained to the satisfaction of the Departmental Representative.

1.8 Hoarding Enclosures

- .1 Contractor shall be responsible for the design, fabrication, erection and subsequent removal of temporary enclosed work structures.
 - .1 Erect temporary site enclosures using 38 x 140 mm construction grade lumber framing at 600 mm centers and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.
 - .2 Apply plywood panels vertically flush and butt jointed.
 - .3 Erect and maintain pedestrian walkways complete with signs and electrical lighting as required by law.
 - .4 Paint the entire enclosure assembly (plywood, studs etc.) with fire retardant paint in selected colours with one coat primer to CGSB 1.189M. Maintain public side of enclosure in clean condition.

1.9 Guard Rails and Barricades

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors.
- .2 Provide as required by governing authorities.

1.10 Dust Tight Screens

- .1 Provide dust tight screens or partitions where may be required to localize dust generating activities.
- .2 Maintain and relocate protection until such work is complete.
- .3 Protect all furnishings within work area with a 0.102 mm thick polyethylene film during installation. Remove film during non-installation hours and leave premises in clean, unencumbered and safe manner for normal daytime function.

1.11 Access to Site

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.12 Fire Routes

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.13 Emergency Exits

- .1 Provide and maintain clear access from all Emergency Exit doors.

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| <u>1.14 Protection for Off-Site
and Public Property</u> | .1 | Protect surrounding private and public property from damage during performance of Work. |
| | .2 | Be responsible for damage incurred. |
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| <u>1.15 Protection of
Building Finishes</u> | .1 | Provide protection for finished and partially finished building finishes and equipment during performance of Work. |
| | .2 | Provide necessary screens, covers, and hoardings. |
| | .3 | Confirm with Departmental representative locations and installation schedule 3 days prior to installation. |
| | .4 | Be responsible for damage incurred due to lack of or improper protection. |

PART 2 - PRODUCTS

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| <u>2.1 Not Used</u> | .1 | Not Used. |
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PART 3 - EXECUTION

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| <u>3.1 Not Used</u> | .1 | Not Used. |
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END OF SECTION

PART 1 - GENERAL

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| <u>1.1 Cutting or Alterations</u> | <ul style="list-style-type: none">.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures..2 Submit written request in advance of cutting or alteration which affects:<ul style="list-style-type: none">.1 Structural integrity of elements of project..2 Integrity of weather-exposed or moisture-resistant elements.3 Efficiency, maintenance, or safety of operational elements..4 Visual qualities of sight-exposed elements..5 Work of Departmental Representative or separate contractor..3 Include in request:<ul style="list-style-type: none">.1 Identification of project..2 Location and description of affected Work..3 Statement on necessity for cutting or alteration..4 Description of proposed Work, and products to be used..5 Alternatives to cutting and patching..6 Effect on Work of Departmental Representative or separate contractor.7 Written permission of affected separate contractor..8 Date and time work will be executed. |
| <u>1.2 Materials</u> | <ul style="list-style-type: none">.1 Required for original installation..2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures. |
| <u>1.3 Preparation</u> | <ul style="list-style-type: none">.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching..2 After uncovering, inspect conditions affecting performance of Work..3 Beginning of cutting or patching means acceptance of existing conditions..4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage..5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water. |
| <u>1.4 Execution</u> | <ul style="list-style-type: none">.1 Execute cutting, fitting, and patching to complete Work..2 Fit several parts together, to integrate with other Work..3 Uncover Work to install ill-timed Work..4 Remove and replace defective and non-conforming Work..5 Remove samples of installed Work for testing. |
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| <u>1.4 Execution
(Cont'd)</u> | <p>.6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.</p> <p>.7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.</p> <p>.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.</p> <p>.9 Restore work with new products in accordance with requirements of Contract Documents.</p> <p>.10 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.</p> <p>.11 At penetrations of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping and smoke seal material, full thickness of the construction element. Refer to Section 07 84 00 - Firestopping.</p> <p>.12 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.</p> <p>.13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.</p> |
| <u>1.5 Waste Management
and Disposal</u> | <p>.1 Unless otherwise specified, all materials removed become the property of the Contractor. Remove from site.</p> <p>.2 Separate waste materials for reuse and recycling.</p> |

PART 2 - PRODUCTS

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| <u>2.1 Not Used</u> | .1 Not Used. |
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PART 3 - EXECUTION

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| <u>3.1 Not Used</u> | .1 Not Used. |
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PART 1 - GENERAL**1.1 Project Cleanliness**

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

1.2 Final Cleaning

- .1 When Work is Substantially Performed 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 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.
 - .5 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fittings, walls, and floors and ceilings.
 - .6 Clean lighting reflectors, lenses, and other lighting surfaces.
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| <u>1.2 Final Cleaning
(Cont'd)</u> | .7 | Vacuum clean and dust building interiors, behind grilles, louvres and screens. |
| | .8 | Inspect finishes, fitments and equipment and ensure specified workmanship and operation. |
| | .9 | Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment. |
| | .10 | Remove debris and surplus materials from crawl areas and other accessible concealed spaces. |
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| <u>1.3 Waste
Management and
Disposal</u> | .1 | Separate waste materials for reuse and recycling. |

PART 2 - PRODUCTS

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| <u>2.1 NOT USED</u> | .1 | Not Used. |
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PART 3 - EXECUTION

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| <u>3.1 NOT USED</u> | .1 | Not Used. |
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PART 1 - GENERAL

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| <u>1.1 Regulations</u> | .1 | Comply with the Environmental Protection Act, Ontario Regulations O. Reg. 102/04 and O. Reg. 103/94 for waste management programs on construction and demolition projects. |
| <u>1.2 Definitions</u> | .1 | Waste Audit (WA): Relates to projected waste generation. Involves measuring and estimating quantity and composition of waste, reasons for waste generation, and operational factors which contribute to waste. |
| | .2 | Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA. |
| <u>1.3 Waste Audit (WA)</u> | .1 | Conduct a "waste audit" to determine the waste generated during demolition or construction operations, prepare written "waste reduction workplan" and implement procedures to reduce, reuse and recycle materials to the extent possible. |
| <u>1.4 Waste Reduction Workplans (WRW)</u> | .1 | Within ten days of Award of Contract, submit for review by the Departmental Representative a detailed "Waste Reduction Workplan" for the project. Include procedures for disposal of demolition and construction waste materials. |
| <u>1.5 Source Separation Program</u> | .1 | Provide a "source separation program" to disassemble and collect in an orderly fashion the materials identified in the "waste audit" that were designated for "alternative disposal" from "general waste" stream. |
| <u>1.6 Construction Personnel Briefing</u> | .1 | All construction personnel shall be fully briefed on the waste management workplan and shall be required to conform to it for all aspects of the work. The contractor shall be responsible for the enforcement of this requirement. The Departmental Representative reserves the right to require the dismissal from the site personnel who fail to comply with the requirements of the waste management workplan. |
| <u>1.7 Storage Handling and Protection</u> | .1 | Place materials defined as hazardous or toxic in designated containers. |
| | .2 | Ensure emptied containers are sealed and stored safely. |

- 1.8 Records .1 Submit complete records of all removals from the site to the Departmental Representative for both "materials designated for alternative disposal" and "general waste" including:
- .1 Time and date of removal
 - .2 Description of material and quantities by weight in kilograms.
 - .3 Proof that materials have been received at an Approved Waste Processing Site or certified Waste Disposal Site as required.

- 1.9 Waste Management and Disposal .1 Separate waste materials for reuse and recycling.

PART 2 - Products

- 2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

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

PART 1 - GENERAL

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| <u>1.1 Submittals</u> | <ul style="list-style-type: none">.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures..2 Prepare instructions and data using personnel experienced in maintenance and operation of described products..3 Copy will be returned after final inspection, with Departmental Representative's comments..4 Revise content of documents as required prior to final submittal..5 Two weeks prior to substantial performance of the Work, submit to the Departmental Representative, six final copies of operating and maintenance manuals in English and French..6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work..7 Furnish evidence, if requested, for type, source and quality of products provided..8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense..9 Pay costs of transportation. |
| <u>1.2 Maintenance Manual</u> | <ul style="list-style-type: none">.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. Identify contents of each binder on spine..4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents..5 Arrange content by systems, under Section numbers and sequence of Table of Contents..6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment..7 Text: manufacturer's printed data, or typewritten data..8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.9 Provide drawing information on CD in dxf, dwg and pdf file formats. |
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| <u>1.3 Contents
Each Volume</u> | <ul style="list-style-type: none">.1 Table of Contents: provide title of project;<ul style="list-style-type: none">.1 Date of submission; names..2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties..3 Schedule of products and systems, indexed to content of volume..2 For each product or system:<ul style="list-style-type: none">.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. Provide logical sequence of instructions for each procedure, incorporating manufacturer's..6 Training: refer to Section 01 79 00 - Demonstration and Training. |
| <u>1.4 As built
and Samples</u> | <ul style="list-style-type: none">.1 Maintain, at site for Departmental Representative one record copy of:<ul style="list-style-type: none">.1 Contract Drawings..2 Specifications..3 Addenda. ..4 Change Orders and other modifications to Contract..5 Site and Supplemental Instructions..6 Reviewed shop drawings, product data, and samples..7 Field test records..8 Inspection certificates..9 Manufacturer's certificates..2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage..3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters..4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes..5 Keep record documents and samples available for inspection by Departmental Representative. |
| <u>1.5 Recording
Actual Site
Conditions</u> | <ul style="list-style-type: none">.1 Record information on set of black line opaque drawings, provided by Departmental Representative.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information. |
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| 1.5 Recording
Actual Site
Conditions
(Cont'd) | .3 | Record information concurrently with construction progress. Do not conceal Work until required information is recorded. |
| | .4 | Contract Drawings and shop drawings: mark each item to record actual construction, including: <ul style="list-style-type: none">.1 Measured depths of elements of foundation in relation to finish first floor datum..2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements..3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction..4 Field changes of dimension and detail.5 Changes made by change orders..6 Details not on original Contract Drawings..7 References to related shop drawings and modifications. |
| | .5 | Specifications: mark each item to record actual construction, including: <ul style="list-style-type: none">.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. |
| 1.6 Equipment
and Systems | .1 | Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts. |
| | .2 | Panel board circuit directories: provide electrical service characteristics, controls, and communications. |
| | .3 | Include installed colour coded wiring diagrams. |
| | .4 | Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions. |
| | .5 | Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions. |
| | .6 | Provide servicing and lubrication schedule, and list of lubricants required. |
| | .7 | Include manufacturer's printed operation and maintenance instructions. |
| | .8 | Include sequence of operation by controls manufacturer. |
| | .9 | Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance. |
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<u>1.6 Equipment and Systems (Cont'd)</u>	.10	Provide installed control diagrams by controls manufacturer.
	.11	Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
	.12	Include test reports as specified in 01 91 13 - General Commissioning (Cx) Requirements.
	.13	Additional requirements: as specified in individual specification sections.
<u>1.7 Materials and Finishes</u>	.1	Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
	.2	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.
<u>1.8 Spare Parts</u>	.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. Submit inventory listing to Departmental Representative. Include approved listings in Operations and Maintenance Manual.
	.5	Obtain receipt for delivered products and submit prior to final payment.
<u>1.9 Maintenance Materials</u>	.1	Provide maintenance and extra materials, in quantities specified in individual specification sections.
	.2	Provide items of same manufacture and quality as items in Work.
	.3	Deliver to site; place and store.
	.4	Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operations and Maintenance Manual.
	.5	Obtain receipt for delivered products and submit prior to final payment.

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| <u>1.10 Special Tools</u> | <ul style="list-style-type: none">.1 Provide special tools, in quantities specified in individual specification section..2 Provide items with tags identifying their associated function and equipment..3 Deliver to site; place and store..4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operations and Maintenance Manual. |
| <u>1.11 Storage, Handling and Protection</u> | <ul style="list-style-type: none">.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration..2 Store in original and undamaged condition with manufacturer's seal and labels intact..3 Store components subject to damage from weather in weatherproof enclosures..4 Store paints and freezable materials in a heated and ventilated room..5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative |
| <u>1.12 Warranties</u> | <ul style="list-style-type: none">.1 Before completion of work collect all manufacturer's warranties and deposit with Departmental Representative..2 Assemble warranty information in binder and submit upon acceptance of work. Organize binder as follows:<ul style="list-style-type: none">.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 week days after completion of applicable item of work..4 Verify that documents are in proper form, contain full information, and are notarized..5 Co-execute submittals when required..6 Retain warranties and bonds until time specified for submittal..7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Interim Completion determined.3 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, with Departmental Representative..4 Respond in a timely manner to written notification of required construction warranty repair work. |
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PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

<u>1.1 Description</u>	.1	Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative two days prior to date of interim completion.
	.2	Departmental Representative will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.
<u>1.2 Quality Control</u>	.1	When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.
<u>1.3 Submittals</u>	.1	Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
	.2	Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
	.3	Submit reports within one work 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.
<u>1.4 Condition for Demonstrations</u>	.1	Equipment has been inspected and put into operation.
	.2	Testing, adjusting, and balancing have been performed and equipment and systems are fully operational.
	.3	Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.
<u>1.5 Preparation</u>	.1	Verify that conditions for demonstration and instructions comply with requirements.
	.2	Verify that designated personnel are present.
<u>1.6 Demonstration and Instructions</u>	.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.

<u>1.6 Demonstration and Instructions (Cont'd)</u>	.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 need for additional data becomes apparent during instructions.
<u>1.7 Time Allocated for Instructions</u>	.1	Ensure adequate amount of time required for instruction of each item of equipment or system. Refer to Section 21 05 01 - Common Work Results - Mechanical.

PART 2 - PRODUCTS

<u>2.1 NOT USED</u>	.1	Not Used.
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PART 3 - EXECUTION

<u>3.1 NOT USED</u>	.1	Not Used.
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PART 1 - GENERAL

1.1 General

- .1 CX is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. CX is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the O&M manuals.
 - .3 Effectively train O&M staff.
- .2 Contractor shall arrange and pay for the services of the manufacturer's representative for Modular Cooling Tower by Tower Tech series TTXL, to assist the contractor 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 Commissioning process shall include, but is not be limited to:
 - .1 Cooling Towers and their components,
 - .2 Cooling Tower variable frequency drive 'VFD',
 - .3 Chemical treatment and filtration systems,
 - .4 EMCS system.
- .4 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
- .5 Acronyms:
 - .1 CX - Commissioning.
 - .2 EMCS - Energy Monitoring and Control Systems or BAS Building Automation System.
 - .3 O&M - Operation and Maintenance.
 - .4 PI - Product Information.
 - .5 PV - Performance Verification.
 - .6 TAB - Testing, Adjusting and Balancing.

1.2 Commissioning Overview

- .1 CX to be performed by independent company, employed and paid by the Contractor.
 - .1 Cooling Tower Manufacturer's representative for Modular Cooling Tower by Tower Tech series TTXL, must be included in commissioning process. Arrange for Cooling Tower Manufacturer's representative presence, pay all costs.
 - .2 CX to be a line item of Contractor's cost breakdown.
 - .3 CX activities supplement field quality and testing procedures described in relevant technical sections.
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<u>1.2 Commissioning Overview (Cont'd)</u>	.4	CX is conducted in concert with activities performed during stage of project delivery. CX identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. CX activities includes transfer of critical knowledge to facility operational personnel.
	.5	Departmental Representative will issue Interim Certificate of Acceptance when: .1 Completed CX documentation has been received, reviewed for suitability and approved by Departmental Representative. .2 Equipment, components and systems have been commissioned. (both South and North Tower) .3 O&M training has been completed.
<u>1.3 Non-conformance to Performance Verification Requirements</u>	.1	Should equipment, system components, and associated controls be incorrectly installed or malfunction during CX, correct deficiencies, re-verify equipment and components within the nono-functional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.Costs for
	.2	Cost 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.
<u>1.4 Pre CX-Review</u>	.1	Before Construction: .1 Review contract documents, confirm in writing to Departmental Representative the following. .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 DCC Representative Consultant. .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 DCC Representative Consultant 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.

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| <u>1.5 Conflicts</u> | .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. |
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| <u>1.6 Submittals</u> | .1 | Submittals: in accordance with Section 01 33 00- Submittal Procedures. |
| | .2 | Submit no later than 4 weeks after award of Contract: |
| | .1 | Name of Contractor's CX agent. |
| | .3 | Draft CX documentation. |
| | .4 | Preliminary CX schedule. |
| | .1 | Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of CX. |
| | .2 | Submit proposed CX procedures to Departmental Representative there not specified and obtain written approval at least 8 weeks prior to start of CX. |
| | .3 | Provide additional documentation relating to CX process required by Departmental Representative. |
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| <u>1.7 Commissioning Documentation</u> | .1 | Departmental Representative to review and approve CX documentation. |
| | .2 | Provide completed and approved CX documentation to Departmental Representative. |
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| <u>1.8 Commissioning Schedule</u> | .1 | Provide detailed CX schedule as part of construction schedule in accordance with 01 32 16.07 - Construction Progress Schedules Bar (GANTT) Chart. |
| | .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. |
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| <u>1.9 Commissioning Meetings</u> | .1 | Purpose of the meetings: to resolve issues, monitor progress, identify deficiencies related to CX. |
| | .2 | Convene CX meetings as follows: |
| | .1 | At 60% construction completion for first stage of the project. 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. |
| | .3 | Continue CX meetings on regular basis until project completion and as required during equipment start-up and functional testing period and until commissioning deliverables have been addressed. |
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<u>1.9 Commissioning Meetings (Cont'd)</u>	.4	Meeting will be chaired by Contractor who will record and distribute minutes.
	.5	Ensure all subcontractors and relevant manufacturer representatives are present at 60% and at subsequent CX meetings as required.
<u>1.10 Stating and Testing</u>	.1	Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.
<u>1.11 Witnessing of Starting and Testing</u>	.1	Provide 4 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.
<u>1.12 Manufacturer's Involvement</u>	.1	Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative .
	.1	Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
	.2	Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
	.2	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.
	.3	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.
<u>1.13 Procedures</u>	.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.
	.3	Visual inspection of quality of installation.
	.1	Start-up: follow accepted start-up procedures.
	.2	Operational testing: document equipment performance.
	.3	System PV: include repetition of tests after correcting deficiencies.
	.4	Post-substantial performance verification: to include fine-tuning.
	.4	Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.

<u>1.13 Procedures (Cont'd)</u>	.5	Document requires tests on approved PV forms.
	.6	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: <ul style="list-style-type: none">.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.<ul style="list-style-type: none">.1 Rejected equipment to be remove from site and replace with new.
	.7	Subject new equipment/systems to specified start-up procedures.
<u>1.14 Start up Documentation</u>	.1	Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
	.2	Start-up documentation to include: <ul style="list-style-type: none">.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.
<u>1.15 Operation and Maintenance of Equipment and Systems</u>	.1	After start-up, operate and maintain equipment and system. maintenance program and submit Departmental Representative for approval before implementation.
	.2	With assistance of manufacturer develop written maintenance program and submit to Departmental Representative for approval before implementation.
	.3	Operate and maintain systems for length of time required for commissioning to be completed.
	.4	After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.
<u>1.16 Test Results</u>	.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.
<u>1.17 Start of Commissioning</u>	.1	Notify Departmental Representative at least 4 days prior to start of CX.

1.17 Start of Commissioning (Cont'd)	.2	Start CX after elements of building affecting start-up and performance verification of systems have been completed.
1.18 Instruments/ Equipment	.1	Submit to Departmental Representative for review and approval: .1 Complete list of instruments proposed to be used. .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy
	.2	Provide the following equipment as required: .1 2-way radios. .2 Ladders. .3 Equipment as required to complete work.
1.19 Commissioning Performance Verification	.1	Carry out CX: .1 Under actual accepted simulated operating conditions, over entire operating range, in all modes. .2 On independent systems and interacting systems.
	.2	CX procedures to be repeatable and reported results are to be verifiable.
	.3	Follow equipment manufacturer's operating instructions.
	.4	EMCS trending to be available as supporting documentation for performance verification.
1.20 Witnessing Commissioning	.1	Departmental Representative to witness activities and verify results.
1.21 Authorities Having Jurisdiction	.1	Where specified start-up, testing or 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 weekdays of test and with CX report.
1.22 Commissioning Constraints	.1	Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete CX of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

<u>1.23 Extrapolation of Results</u>	.1	Where CX of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.
<u>1.24 Extent of Verification</u>	.1	Provide manpower and instrumentation to verify up to 100 % of reported results.
	.2	Number and location to be at discretion of Departmental Representative.
	.3	Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
	.4	Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
	.5	Perform additional commissioning until results are acceptable to Departmental Representative.
<u>1.25 Repeat Verifications</u>	.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.
<u>1.26 Sundry Checks and Adjustments</u>	.1	Make adjustments and changes which becomes apparent as CX proceeds.
<u>1.27 Deficiencies Faults, Defects</u>	.1	Correct deficiencies found during start-up Representative.
	.2	Report problems, faults or defects affecting CX to Departmental Representative in writing. Stop CX until problems are rectified. Proceed with written approval from Departmental Representative.
<u>1.28 Completion of Commissioning</u>	.1	Upon completion of CX leave systems in normal
	.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.

<u>1.29 Activities Upon Completion of Commissioning</u>	.1	When changes are made to baseline components or system settings established during CX process, provide updated CX form for affected item.
<u>1.30 Training</u>	.1	In accordance with Section 01 91 41 - Commissioning (CX) - Training.
<u>1.31 Maintenance Materials, Spare Parts, Special Tools</u>	.1	Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.
<u>1.32 Occupancy</u>	.1	Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.
<u>1.33 Performance Verification Tolerances</u>	.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.
<u>1.34 Departmental Representative's Performance Testing</u>	.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

<u>2.1 NOT USED</u>	.1	Not Used.
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PART 3 - EXECUTION

<u>3.1 NOT USED</u>	.1	Not Used.
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PART 1 - GENERAL

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| <u>1.1 Trainees</u> | <ul style="list-style-type: none">.1 Trainees: Departmental Representative will provide list of personnel to receive training..2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems. |
| <u>1.2 Instructors</u> | <ul style="list-style-type: none">.1 Departmental Representative will provide:<ul style="list-style-type: none">.1 Descriptions of systems..2 Instruction on design philosophy, design criteria, and design intent..2 Contractor and Cooling Tower Manufacturer's representative: to provide instruction on the following:<ul style="list-style-type: none">.1 Start-Up, operation, shut-down of equipment, components and systems for Modular Cooling Tower by Tower Tech series TTXL..2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices..3 Instructions on servicing, maintenance and adjustment of systems, equipment and components. |
| <u>1.3 Training Objectives</u> | <ul style="list-style-type: none">.1 Training to be detailed and duration to ensure:<ul style="list-style-type: none">.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions..2 Effective on-going inspection, measurements of system performance..3 Proper preventive maintenance, diagnosis and trouble-shooting..4 Ability to update documentation..5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives |
| <u>1.4 Training Materials</u> | <ul style="list-style-type: none">.1 Instructors to be responsible for content and quality..2 Training materials to include:<ul style="list-style-type: none">.1 "As-Built" Contract Documents..2 Operating Manual..3 Maintenance Manual..4 Management Manual..5 TAB and PV Reports..3 Departmental Representative will review training manuals..4 Training materials to be in a format that permits future training procedures to same degree of detail..5 Supplement training materials:<ul style="list-style-type: none">.1 Transparencies for overhead projectors..2 Multimedia presentations..3 Manufacturer's training videos..4 Equipment models. |
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- 1.5 Scheduling
- .1 Include in Commissioning Schedule time for training.
 - .2 Deliver training during regular working hours, training sessions to be 3 hours in length. Allow for 4 (four) Training Sessions.
 - .3 Training to be completed prior to acceptance of facility.
 - .4 Departmental Representative may request additional refresher session to be conducted on pre-agreed date prior to warranty period.
- 1.6 Responsibilities
- .1 Be responsible for:
 - .1 Coordinated training schedule with Departmental Representative and all parties involved including Cooling Tower Manufacturer's representative.
 - .2 Implementation of training activities,
 - .3 Coordination among instructors,
 - .4 Quality of training, training materials,
 - .2 Departmental Representative will evaluate training and materials.
 - .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.
- 1.7 Training Content
- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
 - .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Review of O&M documentation.
 - .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications. Training shall Include:
 - .1 Cooling Towers including VFD drives
 - .2 Chemical treatment and filtering System
 - .3 EMCS
 - .4 Piping and valves assembly.
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PART 2 - PRODUCTS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.