
1.1 DESCRIPTION OF WORK

- .1 In general, work under this contract consists of:
 - .1 Renovation and addition to an operational airport terminal building located in Wabush, NL.
 - .2 To demolish the interior of the existing airport in phases as noted on the drawings. Demolition and removal effect Civil, Architectural, Structural, Mechanical and Electrical.
 - .3 The intent is that during deconstruction and construction the airport is to remain fully operational.
 - .4 Hazmat Abatement is part of this work of this contract. Existing surveys of Asbestos included, refer to Section 02 82 00.02
 - .5 Construction Phasing Plans are included within the documents, Phases 1 to 4 inclusive, identifying the various phases and descriptions for each phase, see drawings.
 - .6 Phasing plans identify Architectural, Mechanical, Electrical, Civil and Structural modifications.
 - .7 Contractor responsible for all temporary moves, hook-ups, connections and hoarding to ensure clear working areas and open areas for the working airport. The phasing also defines the secure area of the airport.
 - .8 Portions of the contract, provided by the Departmental Representative, this contract to coordinate and ensure all corrections, substrates etc. are provided as per the documents.
 - .9 Portions of the contract, materials are supplied by the Departmental Representative, receiving, storage and installation is within the work of this contract. Refer to the documents.
 - .10 Ensure all fire exists are properly marked and emergency lighting are modified to suit each phase.
 - .11 Security area to be tightly monitored and protected during deconstruction / construction period of all phases.
- .2 Site of Work is at:
2 Airport Rd
Wabush, NL
A0R 1B0

1.2 FAMILIARIZATION WITH SITE

- .1 Before submitting a bid, it is recommended that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.
- .2 Obtain prior permission from the Departmental Representative before carrying out such site inspection.

1.3 CODES AND STANDARDS

- .1 Perform work in accordance with the 2010 National Building Code and latest version of Canada and any other applicable code of provincial or local authority having jurisdiction,
-

including all amendments up to bid closing date, provided that in any case of conflict or discrepancy, the more stringent requirement shall apply.

- .2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

1.4 INTERPRETATION OF DOCUMENTS

- .1 Supplementary to the Order of Precedence article of the General Conditions of the Contract, the Division 01 sections take precedence over the technical specification sections in other Divisions of the Specification Manual.

1.5 TERMS

- .1 Unless specifically stated otherwise, the term 'Architect', 'Engineer' or 'Departmental Representative' where used in the Specifications and on the Drawings shall mean the 'Departmental Representative' as defined in the General Conditions of the Contract.

1.6 SETTING OUT WORK

- .1 Set grades and lay out work in detail from control points and grades established by a surveyor currently licensed and registered in the Province of Newfoundland and Labrador, grades as provided by the General Contract of this phase.
- .2 Provide devices needed to lay out and construct work.
- .3 Supply stakes and other survey markers required for laying out work.

1.8 COST BREAKDOWN

- .1 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. Required forms will be provided for application of progress payment.
- .2 List items of work numerically following the same division/section number system of the specification manual and thereafter sub-divide into major work components and building systems as directed by Departmental Representative.
- .3 Upon approval, cost breakdown will be used as basis for progress payment.

1.7 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each of the following:
 - .1 Contract Drawings
 - .2 Specifications

- .3 Addenda
- .4 Reviewed Shop Drawings
- .5 List of outstanding shop drawings
- .6 Change Orders
- .7 Other modifications to Contract
- .8 Field Test Reports
- .9 Copy of Approved Work Schedule
- .10 Health and Safety Plan and other safety related documents
- .11 Building Permits and other work permits
- .12 Hot Work Permits
- .13 Other documents as stipulated elsewhere in the Contract Documents.

1.8 PERMITS

- .1 In accordance with the General Conditions, obtain and pay for building permit, certificates, licenses and other permits as required by municipal, provincial and federal authorities.
- .2 Provide appropriate notifications of project to municipal and provincial inspection authorities.
- .3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.
 - .1 Authority Having Jurisdiction:
Town of Wabush
PO Box 190, 15 Whiteway Drive
Wabush, NL A0R 1B0
(709) 282-5696
- .4 Submit to Departmental Representative, copy of application forms and approval documents received from above referenced authorities.

1.9 ROUGHING-IN

- .1 Be responsible for obtaining manufacturer's literature and for correct roughing-in and hook-up of equipment, fixtures and appliances.

1.10 CUTTING, FITTING AND PATCHING

- .1 Ensure that cutting and patching required by all trades is included in total bid price submitted for the work.
 - .2 Execute cutting including excavation, fitting and patching required to make work fit properly.
 - .3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work. This includes patching of openings in existing work resulting from removal of existing services.
-

- .4 Do not cut, bore, or sleeve load-bearing members, except where specifically approved by Departmental Representative.
- .5 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .6 Fit work airtight to pipes, sleeves ducts and conduits.

1.11 CONCEALMENT

- .1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.12 LOCATION OF FIXTURES

- .1 Location of equipment, fixtures and outlets, shown or specified shall be considered as approximate. Actual location shall be as required to suit conditions at time of installation and as is reasonable.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative when impending installation conflicts with other new or existing components. Follow directives for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.13 EXISTING SERVICES

- .1 Work involves breaking into or connecting to existing services, carry out work at times directed by departmental representative, with minimum of disturbance to pedestrian & vehicular traffic. Work is completed in phases, ensure Electrical / Mechanical is coordinated throughout the duration of the project with respect to the phases as noted.
 - .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
 - .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service of the Air Terminal. This includes disconnection of electrical power and communication services to any of the existing tenant's operational areas. Adhere to approved schedule and provide notice to affected parties.
 - .4 Provide temporary services as noted when directed by Departmental Representative to maintain critical building and tenant systems.
-

- .5 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .6 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .7 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction over service. Record locations of maintained, re-routed and abandoned service lines.

1.14 LANGUAGE FOR NOTATIONS

- .1 Any items supplied and installed under this contract which have operating instructions on them such as door hardware, washroom accessories, push button activation controls powered hand dryers, mechanical equipment such as water coolers, etc., and which can be expected to be used by the building occupants, must have such operating instructions in English.
- .2 Factory embossed or recessed symbols illustrating equipment operation is an acceptable alternate to lettering.
- .3 Items supplied with factory - embossed or recessed lettering in one official language with an applied sticker or decal representing the second official language is not acceptable unless the Departmental Representative gives prior approval before any such items are ordered.
- .4 Internationally recognized colour coding such as red and blue center pieces for plumbing brass is acceptable.
- .5 No extra costs will be paid for re-stocking or re-ordering of materials and equipment due to Contractor's failure to fully meet signage requirements specified herein.
- .6 Ensure that all trades are made aware of above requirements.

END

1.1 SUBMITTALS

- .1 Upon acceptance of bid and prior to commencement of work, submit to Departmental Representative the following work management documents:
 - .1 Work Schedule as specified herein.
 - .2 Shop Drawing Submittal Schedule specified in section 01 33 00
 - .3 Waste Management Plan specified in section 01 74 21
 - .4 Environmental Procedures specified in section 01 35 43
 - .5 Health and Safety Requirement specified in section 01 35 29.06
 - .6 Hot Work Procedures specified in section 01 35 24
 - .7 Lockout Procedures specified in section 01 35 25

1.2 WORK SCHEDULE

- .1 Upon acceptance of bid submit:
 - .1 Work Schedule within 21 calendar days of contract award.
 - .2 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.
 - .3 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
 - .4 Work schedule content to include as a minimum the following:
 - .1 Bar (GANTT) Charts, indicating all work activities, tasks and other project elements, their anticipated durations, planned dates for achieving key activities and major project milestones supported with;
 - .2 Written narrative on key elements of work illustrated in bar chart, providing sufficient details to demonstrate a reasonable implementation plan for completion of project within designated time.
 - .3 Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
 - .4 Schedule work in cooperation with the Departmental Representative. Revise Work Schedule items identified by Departmental Representative during review of schedule.
 - .5 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.
 - .6 Ensure that all subtrades and subcontractors are made aware of the work restraints and operational restrictions specified.
 - .7 Schedule Updates:
 - .1 Submit when requested by Departmental Representative.
-

- .2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.
- .3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.
- .8 Departmental Representative will make interim reviews and evaluate progress of work based on approved schedule. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.
- .9 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to tenant or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.3 PROJECT PHASING

- .1 Be aware that the Air Terminal Building must be kept operational for the full duration of work of this contract. Building services must also be maintained at all times during the Facility's operational hours and as specifically defined in operational restrictions specified in this section.
- .2 Contractor Phasing plan of work for implementing the modifications to the Terminal Building to have been reviewed and confirmed by the Departmental Representative. Contractor may modify and submit a new phasing schedule if time frame for operation for the overall project could be improved; amended plan has to be approved by the Departmental Representative.
- .3 All areas beyond phased construction areas to stay fully operational.
- .4 The exterior main frame of the building will remain as is, with exception the addition on the west side of the building, and new glazing/entrance units noted on the documents.
- .5 The existing building envelope is to remain as is. Portions may be modified with the provisions of louvers, entrances, overhead doors, windows and main doors, which means modification will occur.
- .6 The existing roofing membrane to stay as is, this contract adds an addition which the new roofing system will tie into the existing.
- .7 The existing tenant spaces must remain operational; accessibility and product delivery cannot be compromised.
- .8 The existing mechanical and electrical rooms and components must remain operational. Replacement / modification of mechanical / electrical switchgear, etc., timing must be confirmed by Departmental Representative to ensure minimal amount of downtime for turnover.
- .9 The loading areas must be accessible at all times during operational hours.
- .10 The secure area must remain a high priority during the construction and deconstruction of the project and must be strictly monitored.
- .11 All temporary hook-ups and moves are the responsibility of the Contractor. The contractor must figure out the phasing and sequencing of equipment hook-ups to

successfully complete the work as indicated on the drawings and/or specifications and the cost for these temporary and final hook-ups are to be included in the bid price.

- .12 Include in work dust free temporary partitions, to align with the Construction Phasing of the Project; refer to Section 01 56 00.
- .13 Ensure that temporary partitioning reflects all existing requirements, during the construction process, emergency lighting, travel distances, etc., to the requirements of NBCC and local authority having jurisdiction.

1.4 SEQUENCING OF PROJECT

- .1 Submit a detailed phasing and construction bar chart to Departmental Representative within 10 days of award of the contract based on the suggested phasing in the documents. Submit a revised copy with each progress claim. The Departmental Representative reserves the right to withhold payment on this claim until the updated schedule is received.
- .2 The proposed work sequencing scheme included is a guide only. The bidder may wish to combine, change, or add any phases he deems necessary to complete the project in the shortest time frame possible but maintaining the highest quality of work. This sequencing must be coordinated with Departmental Representative to ensure the continuous operation of the Terminal building.
- .3 Correct, revise, update and otherwise maintain schedule during progress of construction, a minimum of once monthly. Supply each corrected, revised and updated schedule to the Departmental Representative and Subcontractor and include a revised copy with each progress claim. The Departmental Representative reserves the right to withhold payment on this claim until the updated schedule is received.

1.5 SPECIAL PROCEDURES

- .1 Schedule any construction or deconstruction causing noise, dust fumes etc. during off hours and clean up immediately. Coordinate time with Departmental Representative.
 - .2 Ensure protection of property in, or on the building, including equipment, furniture, and other similar furnishing, hardware, trim and supplies, whether fixed to building or not.
 - .3 Take all precautions that no structural damage is caused to the building by this construction. All damage to be made good at this contractor's cost.
 - .4 Do not interrupt mechanical or electrical services of the existing building. For the temporary close-down to make connections to new Work, obtain approval in writing from the Departmental Representative. Give seven (7) working days' notice in writing of intention to interrupt mechanical or electrical services in existing building in ANY area. Ensure that in the event there is an electrical shutdown, a representative of the Contractor is to remain on-site to ensure no damage occurs to building equipment.
 - .5 Should existing services be accidentally uncovered and disrupted or damaged, make complete restoration immediately, and ensure adequate protection to avoid further disruption until alternative means of providing permanent continuation of the services are made.
-

- .1 Make payment for the work specified in the foregoing at no additional cost to the Departmental Representative if, in the opinion of the Departmental Representative, such work could have been foreseen at time of bidding and which has been caused by lack of proper care and protection.
- .2 Payment for work specified in the foregoing will be paid for as changes in the Work at standard rates established in the industry if, in the opinion of the Departmental Representative, such Work could not have been foreseen at time of bidding.
- .3 Unless otherwise specified, restore services on which Work performed to original condition.
- .6 Coordination is to be maintained between all on-site personnel with all phasing, equipment locations, removals, etc. Coordinate with Departmental Representative.
- .7 Cap off and remove unused utility services encountered during work after approval is given by the utilities concerned or jurisdictional authorities, whichever may apply. Relocation, removal, protection and capping of existing utility services shall be performed only by the applicable utility and of other services by licensed mechanics.

1.6 OPERATIONAL RESTRICTIONS

- .1 The Contractor must perform the work with utmost regard to the safety and convenience of the occupants and users of the Air Terminal Building. All work activities in the facility must be planned and scheduled with this in mind. The Contractor will not be permitted to disturb any operational portion thereof without ensuring safe and direct passage through disturbed or otherwise affected areas.
 - .2 Be aware that the existing Air Terminal is occupied 24 hours a day, 365 days per year. Any work near to this building must preserve the spaces within as undisturbed unless the relocation of staff is essential to complete the Work.
 - .3 The restricted secure area noted on the drawings must remain secure during the construction and deconstruction periods.
 - .4 Contractor to meet with the Departmental Representative on a weekly basis to identify intended work areas, activities and scheduling for the coming week.
 - .5 It is not anticipated that any parts of the work of this contract must be carried out during "Off-Hours", ie. outside the daily operational hours of the occupants of the Facility. If it becomes apparent that 'Off Hours' working will be essential for the completion of the Work, the Departmental Representative must be notified at least 14 days prior to the expected Off Hours work.
 - .6 Departmental Representative reserves the right to stop certain daytime work activities, if the nature of that activity generates excessive noise or dust and have Contractor re-schedule that particular work to be performed during the Off-Hour period.
 - .7 Air Terminal Circulation Maintained during Construction.
 - .1 Ensure that entrances, roadways, fire exits and other circulation routes are maintained free and clear providing safe and uninterrupted passage for Air Terminal users and staff at all times during the entire work.
-

- .2 Provide temporary walkways, and accesses when required due to nature of work. Such circulation routes must be constructed to barrier free requirements unless approved otherwise by Departmental Representative.
 - .3 Maintain fire escape routes accessible and fire fighting access open all times for the duration of the project.
 - .4 Do not under any circumstances block fire exit doors. Do not leave construction materials or debris in corridors, building entrances and exits.
 - .8 Safety Signage:
 - .1 Provide on site, and erect as required during progress of work, proper signage in English, mounted on self-supporting stands, warning the building occupants of construction activities in progress and alerting need to exercise caution in proceeding through disturbed areas of the facility, and directing building occupants through any detours which may be required.
 - .2 Signage to be professionally printed and mounted on wooden backing, coloured and to express messages as directed by the Departmental Representative.
 - .3 Generally maximum size of sign should be in the order of 1.0 square meters. Number of signs required will be dependent on number of areas in facility under renovation at any one time.
 - .4 Include costs for the supply and installation of these signs in the bid price.
 - .9 Dust and Dirt Control:
 - .1 Refer to Section 01 74 11 for dust control and cleaning requirements.
 - .2 Effectively plan and implement dust control measures and cleaning activities as an integral part of all construction activities. Review all measures with the Departmental Representative before undertaking work, especially for major dust generating activities.
 - .3 Do not allow demolition debris and construction waste to accumulate on site and contribute to the propagation of dust.
 - .4 As work progresses, maintain construction areas in a tidy condition at all times. Remove gross dust accumulations by cleaning and vacuuming immediately following the completion of any major dust generating activity.
 - .5 Immediately remove all debris and dust from within occupied areas as generated by work therein during a given work shift.
 - .6 Disconnect and seal-off ductwork of HVAC servicing the construction area to stop spread of dust into other areas of Air Terminal. All existing HVAC systems to be provided with new filters once construction is completed prior to substantial performance.
 - .7 Avoid situations and practices which results in dust and dirt being brought from the construction areas or from the exterior and tracked inside the building
 - .8 Stop workers with soiled footwear from entering building.
 - .9 Inform workers and make them sensitive to the need for dust and dirt control. Stringently enforce rules and regulations, immediately address non-compliance.
 - .10 Keep access doors to work areas closed at all times. Use only designated doors for entry or egress.
 - .10 Work in Occupied Areas:
 - .1 Where work may be carried out in an occupied area beyond the boundaries of the enclosed construction phased areas, perform such work at times to be agreed with the Departmental Representative.
-

- .2 Ensure that all dust, dirt, debris, construction waste, materials, tools and equipment are completely removed at the end of each work shift. Clean and reinstate area ready for immediate use.
- .3 Provide temporary dust barriers around immediate work areas and place fabric drop sheets over workstations, equipment and other furnishings located immediately adjacent to such work.
- .4 Conduct work in such a way as to minimize the creation of dust and to avoid contaminating areas beyond the immediate location.
- .5 Discuss and obtain Departmental Representative's approval beforehand on the type and extent of dust barriers, protective devices and measures needed.
- .6 Clean such areas as well as those corridors and routes used to gain entry and access.
- .11 Cleaning of Occupied Areas used by Contractor:
 - .1 Clean lobbies, corridors and other circulation routes used by workers to gain access to work by conducting cleaning, vacuuming and washing of floors, walls and other soiled surfaces.
 - .2 Meager attempts at controlling dust and ineffective unprofessional cleaning procedures will not be tolerated.
 - .3 Failure to provide effective dust control, allowing construction dust and dirt to escape beyond construction areas and contaminate occupied areas and building circulation areas will result in Contractor being ordered to immediately provide professional cleaning services without delay to remedy the situation and conduct all cleaning to the extent as determined by Departmental Representative. Alternatively, Departmental Representative may, at certain times and at own discretion, obtain the services of an independent building cleaning agency when cleaning being provided by Contractor is ineffective or tardy in response. Costs of such services will be charged against Contractor in the form of financial penalties or holdback assessments against the Contract.
- .12 Ensure that all sub-trades are made aware of and abide by the contents of this section and in particularly the work restrictions specified herein in regards to the Air Terminal's operational requirements.

1.7 PROJECT MEETINGS

- .1 Schedule and administer project meetings, held on a minimum bi-weekly basis, for entire duration of work and more often when directed by Departmental Representative as deemed necessary due to progress of work or particular situation.
 - .2 Prepare agenda for meetings.
 - .3 Notify participants in writing 4 days in advance of meeting date.
 - .1 Ensure attendance of all subcontractors.
 - .2 Departmental Representative will provide list of other attendees to be notified.
 - .4 Hold meetings at project site or where approved by Departmental Representative.
 - .5 Preside at meetings and record minutes.
 - .1 Indicate significant proceedings and decisions. Identify action items by parties.
-

- .2 Distribute to participants by mail or by facsimile within 3 calendar days after each meeting.
- .3 Make revisions as directed by Departmental Representative.
- .4 Departmental Representative will advise whether submission of minutes by Email is acceptable. Decision will be based on compatibility of software among participants.

1.8 WORK COORDINATION

- .1 The Contractor is responsible for coordinating the work of the various subcontractors and predetermining where the work of such subcontractors interfaces with each other.
 - .1 Designate one person from own employ having overall responsibility to review contract documents and shop drawings, plan and manage such coordination.
- .2 The Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required.
 - .1 Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.
 - .2 Develop coordination drawings when deemed required illustrating potential interference between the Work of various trades and distribute to all affected parties including structural trade.
 - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
 - .2 Coordination drawings to identify all building elements, services lines, rough-in points and indicate from where various services are coming.
 - .3 Review coordination drawings at purposely called meetings. Have subcontractors sign-off on drawings and publish minutes of each meeting.
 - .4 Plan and coordinate work in such a way to minimize quantity of service line offsets.
 - .5 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submission of shop drawings and ordering of prefabricated equipment or pre-built components shall only occur once coordination meeting for such items has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.
- .4 Work Cooperation:
 - .1 Ensure cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.
 - .2 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.
- .5 No extra costs to the Contract will be considered by the Departmental Representative as a result of Contractor's failure to effectively coordinate all portions of the Work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the Contractor to be resolved at own cost.

END

1.1 NOT USED

1.2 SUBMITTAL GENERAL REQUIREMENTS

- .1 Submit to Departmental Representative for review requested submittals specified in various sections of the specifications including shop drawings, samples, permits, compliance certificates, test reports, work management plans and other data required as part of the work.
 - .2 Submit with reasonable promptness and in orderly sequence so as to allow for Departmental Representative's review and not cause delay in Work. Failure to submit in ample time will not be considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.
 - .3 Do not proceed with work until relevant submissions have been reviewed.
 - .4 Present shop drawings, product data, samples and mock-ups in SI Metric units.
 - .5 Where items or information is not produced in SI Metric units, provide soft converted values.
 - .6 Review submittals prior to submission. Ensure that necessary requirements have been determined and verified and that each submittal has been checked and coordinated with requirements of Work and Contract Documents.
 - .1 Submittals not stamped, signed, dated and identified as to specific project will be returned unexamined by Departmental Representative and considered rejected.
 - .7 Verify field measurements and affected adjacent Work are coordinated.
 - .8 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .9 Contractor's responsibility for errors, omissions or deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
 - .10 Submittal format: paper originals as noted or PDF format as noted.
 - .11 Make changes or revision to submissions which Departmental Representative may require, consistent with Contract Documents and resubmit as directed by Departmental Representative. When resubmitting, identify in writing of any revisions other than those requested.
 - .12 Keep one reviewed copy of each submittal document on site for duration of Work.
 - .13 Each shop drawing shall be accompanied by a "Document and Shop Drawing Submittal Form; fully filled out by the General Contractor, Shop Drawings will be returned if this form does not accompany the shop drawing submission.
-

1.3 SUBMITTAL FORMAT

- .1 The term "shop drawings" means fabrication drawings, erection drawings, diagrams, illustrations, schedules, performance charts, technical product data, brochures, specifications, test reports installation instructions and other data which are to be provided by Contractor to illustrate compliance with specified materials and details of a portion of work.
 - .2 Submit 8 prints of shop drawings for each requirement requested in specification sections and as Departmental Representative may reasonably request. One copy will be returned for contractor to copy for own use and maintenance manuals or submit PDF copy of shop drawing as outlined below:
 - .1 If submitting PDF Shop Drawings or Product Data:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.
 - .3 Submit 8 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product. One copy will be returned for contractor to copy for own use and maintenance manuals or submit PDF copy of data sheets or brochures as outlined below:
 - .1 If submitting PDF Shop Drawings or Product Data:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.
 - .4 Submit 8 copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative. One copy will be returned for contractor to copy for own use and maintenance manuals or submit PDF copy of test reports as outlined below:
 - .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.
-

-
- .3 If submitting Shop Drawings or Product Data by email:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.

 - .5 Submit 8 copies of certificates for requirements requested in specification
 - .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 or submit PDF copy of test reports as outlined below.
 - .2 Certificates must be dated after award of project contract complete with project
 - .3 If submitting Shop Drawings or Product Data by email:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.

 - .6 Submit 8 copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative or submit PDF copy of test reports as outlined below.
 - .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.
 - .2 If submitting Shop Drawings or Product Data by email:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.
-

-
- .7 Submit 8 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative or submit PDF copy of test reports as outlined below.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .2 If submitting Shop Drawings or Product Data by email:
 - .1 One (1) copy only is required.
 - .2 Submissions must be in 8 ½" X 11" or 11" X 17" format
 - .3 Submissions larger than 11" X 17" must be submitted in hard copy
 - .4 One (1) copy will be reviewed, revised in "RED" notations and stamped as "Reviewed", "Reviewed as Modified", "Not Reviewed", "Reviewed for Architectural Characteristics" or "Revise and Resubmit".
 - .5 Contractors upon receipt of reviewed shop drawings or product data shall print number of copies in colour as required to distribute to office, suppliers, subcontractors, site personnel and Authorities Having Jurisdiction.
 - .8 Shop Drawings Format:
 - .1 Opaque white prints or photocopies of original drawings or standard drawings modified to clearly illustrate work specific to project requirements. Maximum sheet size to be 1000 x 707 mm.
 - .2 Product Data from manufacturer's standard catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products, to be original full colour brochures, clearly marked indicating applicable data and deleting information not applicable to project.
 - .3 Non or poorly legible drawings, photocopies or facsimiles will not be accepted and returned not reviewed.
 - .9 Shop Drawings Content:
 - .1 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where items or equipment attach or connect to other items or equipment, confirm that all interrelated work have been coordinated, regardless of section or trade from which the adjacent work is being supplied and installed.
 - .2 Supplement manufacturer's standard drawings and literature with additional information to provide details applicable to project.
 - .3 Delete information not applicable to project on all submittals.
 - .4 Equipment installation/start-up data: include manufacturer's recommended installation instructions, pre-start and start-up checklists for those pieces of equipment and systems designated to be commissioned as specified in Section 01 91 00.
 - .10 Allow 14 calendar days for Departmental Representative's review of each submission.
 - .11 Adjustments or corrections made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, advise Departmental Representative in writing prior to proceeding with Work.
-

- .12 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections and comments are made, fabrication and installation may proceed upon receipt of shop drawings. If shop drawings are rejected and noted to be Resubmitted, do not proceed with that portion of work until resubmission and review of corrected shop drawings, through same submission procedures indicated above.
 - .13 Be advised that costs and expenses incurred by Departmental Representative to conduct more than one review of incorrectly prepared shop drawing submittal for a particular material, equipment or component of work may be assessed against the Contractor in the form of a financial holdback to the Contract.
 - .14 Accompany each submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and project number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .15 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and project number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized Representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Cross references to particular details of contract drawings and specifications section number for which shop drawing submission addresses.
 - .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.
 - .16 After Departmental Representative's review, distribute copies.
-

- .17 The review of shop drawings by the Departmental Representative or by an authorized Consultant or designate is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Correctional Services Canada or the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of the construction and Contract Documents.
- .18 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 SAMPLES

- .1 Submit for review samples as specified in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples to Departmental Representative's office or to other address as directed. Do not drop off samples at construction site except for pre-approved circumstances previously approved by Departmental Representative.
- .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 will result in a cost increase to the Contract notify Departmental Representative in writing 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.

END

R. 076412.001

REQUEST FOR INFORMATION

Spec Section 01 33 00

General Contractor _____

Phone Number: _____ **Fax No.** _____

General Contractor Project Representative _____

Sub-Contractor _____

Phone Number: _____ **Fax No.** _____

Sub-Contractor Project Representative _____

Description of Request:

Specification Reference _____

Drawing Reference _____

Subsequent Discussion with / Direction to Contractor _____

Response Contained in Contract Documents (Internal Use) ☐ Yes ☐ No

Contractor's Signature _____ **Date** _____

R. 076412.001

DOCUMENT AND SHOP DRAWING SUBMITTAL FORM

Spec Section 01 33 00

General Contractor _____

Phone Number _____ **Fax Number** _____

General Contractor Project Representative _____

Sub-Contractor _____

Phone Number _____ **Fax Number** _____

Sub-Contractor Project Representative _____

Items _____

Number of Copies _____

Supplier _____

Manufacturer _____

Specification Reference _____

Drawing Reference _____

Specified Options Indicated ☐ Yes ☐ No

In Conformance with Plans and Specs Confirmed by Contractor ☐ Yes ☐ No

(If No, explain) _____

Contractor's Signature _____ **Date** _____

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 56 00 Temporary Barriers and Enclosures.

1.2 GENERAL PROTECTION

- .1 Work of this Contract must not disrupt the daily operations of the Air Terminal, except as permitted by Departmental Representative, and shall be carried out in such a way to ensure that security is maintained at all times
- .2 Abide by all rules and procedures specified herein and with all directives given by the Departmental Representative.
- .3 Provide temporary protection for safe handling of public, personnel, pedestrians and vehicular traffic: Refer to Section 01 56 00 - Temporary Barriers and Enclosures.
- .4 Provide barricades and lights where directed by Departmental Representative.

1.3 DEFINITIONS

- .1 Departmental Representative: means the person as defined in the General Conditions of the Contract for projects managed by Public Works and Government Services Canada (PWGSC).
 - .2 Construction Zone: means the area as shown on the contract drawings and as agreed with the Departmental Representative where the Contractor will be allowed to work. This area may or may not be isolated from the security area as noted.
 - .3 Construction Employee: means any person working for the General Contractor or subcontractor(s), commercial vehicle or equipment operator, material supplier and personnel from testing, inspection or regulatory agencies who needs to circulate on the Air Terminal property as part of the Work.
 - .4 Contraband: means any of the following:
 - .1 An intoxicant, including alcoholic beverages, drugs and narcotics;
 - .2 A weapon or a component thereof, ammunition for a weapon, and any other object that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization;
 - .3 An explosive or a bomb or a component thereof;
 - .4 Any other item to pose a risk to the security of the Air Terminal or to the safety of persons, when that item is possessed without prior authorization from the Departmental Representative.
 - .5 Commercial Vehicle: means any motor vehicle used to transport materials, equipment and tools to the site as required for construction purposes.
-

- .6 CPIC Security Clearance: means a personal background check made through the RCMP Canadian Police Information Centre.
- .7 Perimeter: means the fenced or walled area of the Air Terminal that restrains the movement of the general public.
- .8 In general, Contractor's work activities and movement is limited to the sites of the proposed construction (or other size as agreed with the Departmental Representative) and the roads and walkways required to provide Work of this contract.

1.4 PRELIMINARY PROCEEDINGS

- .1 Prior to commencement of work, the Contractor shall meet with the Departmental Representative to:
 - .1 Discuss the nature and extent of all activities involved in the work of this contract.
 - .2 Security rules and procedures in force at the Air Terminal Building and directives to be followed by Contractor and all construction employees during the entire course of the Work.
- .2 The Departmental Representative will coordinate a pre-construction meeting between Contractor, the Departmental Representative and Air Terminal security personnel who will provide details on site security requirements.
- .3 The Contractor shall:
 - .1 Ensure that all construction employees are aware of the security requirements.
 - .2 Ensure that a copy of the security requirements is prominently displayed at the work site at all times.
 - .3 Cooperate with Air Terminal staff in ensuring that security requirements and procedures are stringently followed by all construction employees.
- .4 Any infraction of site security requirements by the Contractor or by a construction employee could result in the immediate removal of the offending party or person from the site.

1.5 WORKER SECURITY CLEARANCE

- .1 CPIC security clearance must be obtained for all construction employees who need to circulate within the Air Terminal property during the course of the Work.
 - .1 Application forms will be provided by the Departmental Representative.
 - .2 Have forms filled out by each worker.
 - .2 Submit to the Departmental Representative:
 - .1 A list of the names with date of birth of all construction employees;
 - .2 Completed security clearance form for each person.
 - .3 No person will be able to work at the Air Terminal Building without a valid CPIC Security Clearance pertinent to the place of the Work and a recent picture identification, such as a provincial driver's permit, to show proof of identity.
-

- .4 Allow two (2) weeks for processing of security clearances.
- .5 Be aware that facial photographs of security cleared construction employees may be taken as deemed required by the Departmental Representative.
 - .1 Photo ID cards may also be issued to each construction employee to be donned while on site. ID cards will be left at the designated security entrance to be picked by each person upon arrival at the Air Terminal and must be prominently displayed on the person's clothing at all times.
- .6 Security Clearance will be denied and entry into the Air Terminal Work area will be refused to any person which the Departmental Representative has reason to believe may be a security risk to the operations of the Air Terminal.
 - .1 Also, a person will be subject to the immediate removal from the site if he/she:
 - .1 Appears to be under the influence of alcohol, drugs or narcotics.
 - .2 Behaves in an unusual / disorderly manner.
 - .3 Is found in possession of contraband.
- .7 Facilitate security clearance application process:
 - .1 Provide copy of security clearance form to all workers including those of subcontractors.
 - .2 Provide a list of names and birth dates for all persons who require security clearance to the Departmental Representative.
 - .3 Coordinate and expedite submissions from the various subcontractors.
 - .4 Brief and assist applicants in preparing and submitting the required application form and related documentation.
 - .5 Review application form of each applicant for completeness before submission.
 - .6 Have each worker keep a copy of their completed application form in case the initial submission gets lost.
 - .7 Submit documentation in an organized manner with transmittal letter clearly identifying the project for which worker security clearance is being requested.
 - .8 Send submission(s) to the approved mailing address provided by the Departmental Representative.

1.6 VEHICLES

- .1 The Departmental Representative may limit at any time the number and type of vehicles allowed within the Air Terminal parking lot or site area.
 - .2 All unattended vehicles on the property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the Departmental Representative or an employee of the company that owns the vehicle. Failure to comply with the above will result in an immediate shutdown of the jobsite and a stoppage of the work for an indefinite period of time at the general contractor's expense.
 - .3 Drivers of vehicles simply delivering materials to the site do not require security clearance but shall remain inside their vehicle for the entire duration that the vehicle is on the property. This is of particular importance for vehicles entering the secure perimeter area in which case the vehicle must be escorted by staff or Commissionaires while in that area.
-

Drivers who expect to make multiple deliveries to the site will be required to obtain security clearance.

- .4 If trailers are permitted by the Departmental Representative to be left on site, or within the fenced primary construction site compound, these trailer doors and windows will be locked at the close of business daily. All windows will be securely locked when left unoccupied.
- .5 Construction personnel and commercial vehicles will not be admitted to the fenced primary construction site after normal working hours, unless approved by the Departmental Representative.
- .6 The Departmental Representative will designate a location where construction employee vehicles may be parked during work shifts.
- .7 All other areas are prohibited and vehicles are subject to being removed with towing costs borne by their Departmental Representative.

1.7 MOVEMENT OF EQUIPMENT, VEHICLES AND PERSONNEL

- .1 Subject to the requirements of good security, the Departmental Representative will permit the Contractor and construction employees as much freedom of action and movement in the work areas of the site as is possible.
 - .2 Notwithstanding the above clause, in areas of airport not closed to aircraft traffic:
 - .1 Obtain Departmental Representative's approval on scheduling of Work.
 - .2 Control movements of equipment and personnel as directed by Departmental Representative.
 - .3 Provide qualified field personnel at locations designated by Departmental Representative to relay signals from airport traffic control tower to equipment and personnel wishing to cross live traffic areas.
 - .4 Immediately obey signals from airport traffic control tower.
 - .5 Be aware that commercial vehicles will only be allowed to enter or leave the secure perimeter.
 - .6 For access to certain areas of the Air Terminal, personnel requiring access must be escorted by member of security staff or Commissionaire while inside the secure perimeter of the facility.
 - .3 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspections by the Air Terminal's security staff to ensure that established security requirements and procedures are followed.
 - .4 Contractor shall provide 24 hours advance notice to the Departmental Representative of the arrival of heavy equipment such as excavator, cranes, concrete trucks etc. to the site.
 - .5 Commercial vehicles will only be allowed access onto the Air Terminal property when their contents are certified by the Contractor, or his representative, as being strictly necessary to the execution of the work.
 - .6 Vehicles shall be refused access to the Air Terminal property if, in the opinion of the
-

Departmental Representative, they contain any article which jeopardizes the security of the facility.

- .7 Private vehicles of construction employees will NOT be allowed inside the secure perimeter area, except for delivery or collection of tools, materials or personnel required for that day's planned work.
- .8 Prior approval to be obtained from Departmental Representative in regards to site offices, telephone, internet connection, wireless, two-way radios and any devices which may potentially be considered a security risk to the Air Terminal.
- .9 Off Hours Site Access: Construction personnel and commercial vehicles will not be permitted access to the secure area, unless preapproved by the Departmental Representative.

1.8 KEYS AND SECURITY HARDWARE

- .1 Security Hardware Keys:
 - .1 Arrange and ensure that keys for security door hardware are delivered directly by the hardware Supplier/Installer to the Air Terminal's Departmental Representative.
 - .2 Construction Keys:
 - .1 Supply and install construction cylinders on all new doors and keep such doors locked during the entire construction period.
 - .2 Instruct construction employees on the care and safekeeping of keys assigned to them to ensure safe custody of construction keys.
 - .3 Construction cylinders shall only be removed and be replaced with operational cylinders at such time as deemed appropriate by the Departmental Representative. The Departmental Representative will, in conjunction with the lockset manufacturer:
 - .1 Prepare an operational keying schedule.
 - .2 Accept the operational keys and cylinders directly from the lockset manufacturer.
 - .3 Arrange for removal and return of the construction cylinders and install the operational cylinders in all locks.
 - .4 Upon putting operational security keys into use, an approved security escort designated by the Departmental Representative will thereafter obtain specific keys and open those doors as required by Contractor to access work areas.
 - .5 Contractor shall issue instructions to all construction employees advising them that all security keys must always remain with the security escort.
 - .6 Turn over to Departmental Representative all security hardware removed as part of the work. This includes all items intended for disposal as well as those for temporary safekeeping until ready for reinstallation as part of the work.
-

1.9 SMOKING RESTRICTIONS

- .1 Smoking is prohibited within the Air Terminal building and in the adjacent areas, as per the NL Smoke Free Environment Act. Smoking is only permitted in areas where designated by Departmental Representative.

1.10 SHIPMENTS

- .1 All shipments of materials, equipment and tools shall be clearly marked, addressed to the attention of the project title and Contractor's name to avoid confusion with the Air Terminal's own shipments.
- .2 Contractor to have designated employee(s) receive and take possession of all deliveries and shipments.
- .3 Under no circumstances will Air Terminal personnel accept delivery of materials, equipment and tools designated for use by the Contractor in the Work.'

1.11 TOOLS AND EQUIPMENT

- .1 Make a complete list of all tools and equipment brought on site for use in the work. Provide copy of the list to the Departmental Representative.
 - .1 Tools which are actuated by the use of explosive cartridges, such as nail guns, are not permitted on site. (Please note that nail guns operated entirely by compressed air are permitted).
 - .2 Maintain and update list during the entire course of the Work.
 - .3 Keep all tools and equipment under constant supervision. This is of particular importance for power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope/ ladders as well as all types of jacking devices.
 - .4 Store all tools and equipment overnight and when not in use in lockable tool boxes and place in approved and secure locations.
 - .5 Lock tool boxes when not in use. Keys shall remain in the possession of employees designated by Contractor.
 - .6 Scaffolding: Store and securely lock scaffolding components when not erected. When erected, secure against unauthorized disassembly in a manner approved by the Departmental Representative.
 - .7 Immediately report to the Departmental Representative any missing tools and equipment.
-

- .8 Tool Check: Be aware that security personnel will conduct tool/equipment checks during the course of the Work against the list provided by Contractor. Frequency of checks to be as follows:
 - .1 At commencement and completion of the project.
 - .2 Weekly basis when the construction period is greater than 1 week.
- .9 Controlled items: entry and use of certain tools and equipment may be controlled at the Air Terminal building. The Departmental Representative will determine and advise which items are to be controlled.
 - .1 Controlled items will be given to the Contractor at the beginning of each workday in quantities as required for 1 day's work.
 - .2 All controlled items must be returned to security personnel at the end of each day including used blades, cartridges etc.
- .10 When propane or natural gas is used as fuel for construction heaters, the Contractor shall provide an employee to supervise that work site during non-working hours.

1.12 CONTRABAND

- .1 Weapons, ammunition, explosives, and narcotics are considered contraband and are strictly prohibited on the Air Terminal property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Departmental Representative.
- .3 Contractor shall be vigilant with all construction employees and suppliers in ensuring that no contraband items are brought on site. Advise all persons that the discovery of contraband will result in the cancellation of their security clearance and their immediate removal from the site. Serious infractions may result in the removal of the Contractor or subcontractor from the property for the duration of the Contract.
- .4 Presence of arms and ammunition found in vehicles owned by Contractor, subcontractors, suppliers and construction employees will result in the immediate cancellation of security clearance for the driver of that vehicle.
- .5 All vehicles and persons entering the Air Terminal property may be subject to search. Where suspected, on reasonable grounds, that a construction employee is in possession of contraband, security may order that person to be searched.

1.13 UNSERVICEABLE AREAS

- .1 Mark off areas made unserviceable by Work of this Contract by providing highly visible danger markings by day and red lights by night.
-

- .2 Open flames and flammable fuels are not permitted.
- .3 Park equipment not in use and stockpile materials so that stockpile tops are below 50 to 1 ratio from ends of useable landing strip and below 20 to 1 ratio from sides of aircraft traffic areas.
 - .1 Mark tops with red lights as directed by Departmental Representative.

1.14 TRENCHING

- .1 Obtain Departmental Representative's written permission to undertake trenching on pavements open to aircraft traffic which cannot be completed, backfilled and sealed within one (1) working day.

1.15 UNDERGROUND FACILITIES

- .1 Departmental Representative will stake or indicate location of underground facilities such as cables, pipes, ducts and other services and utilities.
- .2 Notify Departmental Representative of work areas 48 hours minimum in advance of operations to allow sufficient time for underground facilities and service to be located.

1.16 STOPPAGE OF WORK

- .1 The Departmental Representative may, at any given time during the course of this contract, stop Contractor and workers from entering the Air Terminal building or order their immediate departure from the site due to an emergency security situation occurring at the facility.
 - .1 Should this occur, Contractors Superintendent shall obtain the name of the Air Terminal staff member issuing the order, note the date and time the notification was given, and immediately obey the order as quickly as possible.
- .2 The Contractor shall advise the Departmental Representative within 24 hours of receipt of such notification from the Air Terminal.

1.17 COMPLETION OF THE WORK

- .1 Upon completion of the work and/or prior to takeover and occupancy of the facility, remove all materials, waste, tools and equipment that are not specified to remain as part of the work.

END

PART - GENERAL

1.1 COORDINATION

- .1 Prior to start of work Departmental Representative will arrange for briefing of all Contractor's personnel by Airport Authority on procedures for movement of equipment and personnel, and work on, or adjacent to active runways, taxiways or parking aprons.
- .2 All Contractors' personnel authorized to use airport for accessing the work site will be issued a special area visitor's pass. This pass must be kept on ones person at all times during working hours.
 - .1 All Contractor's personnel will be escorted by Airport Authority Commissionaire.
- .3 The Contractor must be prepared to evacuate all personnel and equipment from operational surfaces and runway strip on 30 minutes notice to move. Contractor to coordinate with airport operations staff to ensure evacuated areas are approved by Departmental Representative as made safe for air operations within required timeline.
- .4 Any breach in security fence for construction will be under the direct supervision of the Airport Authority Commissionaire. Under no circumstances shall airside security fencing be incomplete outside the hours of 8:00 am to 5:00 pm. Contractor is responsible to replace, or install temporary security fence (as per Federal Regulations) if work in not complete or as directed by Departmental Representative.

1.2 PROTECTION

- .1 Do not disrupt airport operations except as permitted by Departmental Representative .
- .2 Provide temporary protection to permit safe passage of all personnel, vehicles and aircraft in vicinity of Work.
- .3 Provide barricades and signs, lighted by night or during poor visibility and flags by day where directed by the Departmental Representative. These provisions shall prevent airport personnel from inadvertently crossing into construction areas and construction personnel from crossing into operational areas.
- .4 Provide containers for debris and clean-up is performed as work progresses and at a daily rate to prevent FOD (Foreign Object Damage to Aircraft). Be diligent in preventing refuse, from Work on this project, from being windblown across the airport.
- .5 Provide wetting down of surfaces and areas to prevent FOD or dusting hazards (such as ingestion into the aircraft engine or visibility to aircraft risks).

1.3 CLOSURE OF AIRSIDE FACILITIES

- .1 Carry out work requiring interruption of airport operations at time directed, with minimum of disturbance to airport operations.
- .2 Submit schedule to, and obtain approval from Departmental Representative of interruptions or closure of active airport facilities. Adhere strictly to approved schedule.

1.4 COORDINATION OF MOVEMENT IN OPERATIONAL AREAS

- .1 Brief Departmental Representative every day prior to starting work in area adjacent to or on active airport facilities.
- .2 Obtain Departmental Representative's approval on scheduling of Work.
- .3 Control movements of equipment and personnel as directed by Departmental Representative .
- .4 Obey signals from Airport Authority Commissionaire immediately

1.5 FLIGHT SAFETY

- .1 Prior to permitting personnel to cross active runways, taxiway, parking aprons, or working within 60 m of active facility, establish contact with control tower and obtain specific clearances. Once established on airport, maintain radio contact on work site with the Flight Service Station (FSS) at all times.
- .2 Obey all instructions promptly and explicitly.
- .3 Prior to starting work obtain necessary closure of adjacent facilities .
- .4 During working hours, supply flagmen at crossings of active facilities.
- .5 All Contractor's vehicles used on the airport must be equipped with an orange rotary beacon or must be escorted by a vehicle equipped with a beacon

1.6 UNSERVICEABLE AREAS

- .1 Mark off areas made unserviceable for aircraft by work of this Contract by providing plainly visible danger markings by day and red lights by night. Open flames in flammable fuels not permitted.
- .2 Coordinate demolition of unserviceable areas in accordance with Phasing Plan over course of construction.
- .3 Park equipment not in use and stockpile materials in areas approved by Departmental Representative so that equipment:
 - .1 Tops are below a 50 (horizontal) to 1 (vertical) ratio from ends of useable landing strip
 - .2 Is below 20 (horizontal) to 1 (vertical) ratio from sides of aircraft traffic areas.
 - .3 Is outside limits of pullback zones as indicated on Drawings.
- .4 Where directed, mark equipment tops with red lights.

1.7 CLEANING FOD

- .1 Foreign Object Damage (FOD) can occur anytime a foreign object comes in contact with an aircraft. Foreign objects are anything foreign to the airfield, including but not limited to: construction dust, hats, rags, pen caps, paper, rocks or mud from vehicle tires, etc.
- 2 Foreign Object Damage (FOD) control procedures will be enforced by the Departmental Representative at all times in the construction and operational area. Keeping active taxiways and aprons adjacent to the work clean during the Work will be the responsibility of the Contractor.

- .3 Maintain at the construction site a Departmental Representative approved, sufficiently sized and powered:
 - .1 Street sweeper tractor with power broom or similar vehicle, fitted with a non-metallic motorized rotary sweeper broom, minimum width 2.4m, for FOD control and clean-up of adjacent operational surfaces affected by construction activities. Site FOD sweeps shall be conducted at the end of each working day and when directed by the Departmental Representative .
 - .2 Water truck capable of supplying enough water for dust control as well as construction needs.
- .4 Where access routes cross active runways, taxiways or parking aprons, keep crossings free of FOD mud and debris at all times. Broom clean immediately .
- .5 Routinely inspect and clean equipment as necessary to remove rocks, dirt and mud that may accumulate. Inspection and cleaning of equipment shall occur before equipment enters the airfield and before equipment transitions from airfield soil surfaces to runway, ramp or associated concrete or asphalt surfaces.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END

PART 1 - GENERAL

1.1 REFERENCES

- .1 Export and Import of Hazardous Waste and Hazardous Recycle Material Regulations (Canadian Environmental Protection Act 1999 c. 15.31)
- .2 National Fire Code of Canada, latest edition.

1.2 DEFINITIONS

- .1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets the hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): A Canada-wide system designed to give employers and workers information about hazardous materials used in the workplace. Under WHMIS, information on hazardous materials is to be provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by a combination of federal and provincial laws.

END

1.1 NOT USED

1.2 REFERENCES

- .1 Fire Protection Standards issued by Fire Protection Services, Labour Program Division of Service Canada:
 - .1 Fire Commissioner of Canada FC 301, Standard for Construction Operations (08.2011).
 - .2 Fire Commissioner of Canada FC 302, Standard for Welding and Cutting (08.2011).
- .2 FCC standards may be viewed at:
 - .1 <http://www.hrsdc.gc.ca/en/lp/lo/fp/standards/commissioner.shtml>
 - .2 Fire Protection Services

1.3 DEFINITIONS

- .1 Hot Work defined as:
 - .1 Welding work
 - .2 Cutting of materials by use of torch or other open flame devices
 - .3 Grinding with equipment which produces sparks.
 - .4 Use of open flame torches such as for roofing work.

1.4 SUBMITTALS

- .1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within 14 calendar days of acceptance of bid.
- .2 Submit in accordance with section 01 33 00.

1.5 FIRE SAFETY REQUIREMENTS

- .1 Implement and follow fire safety measures during Work. Comply with following:
 - .1 National Fire Code.
 - .2 Fire Protection Standards FCC 301 and FCC 302.
 - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.
 - .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.
-

1.6 HOT WORK AUTHORIZATION

- .1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot Work on site.
- .2 To obtain authorization submit to Departmental Representative:
 - .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
 - .2 Description of the type and frequency of Hot Work required.
 - .3 Sample Hot Work Permit to be used.
- .3 Upon review and confirmation that effective fire safety measures will be implemented and followed during performance of hot work, Departmental Representative will give authorization to proceed as follows:
 - .1 Issue one written "Authorization to Proceed" covering the entire project for Duration of work or;
 - .2 Subdivide the work into pre-determined, individual activities, each activity requiring a separately written authorization to proceed.
- .4 Requirement for individual authorization will be based on:
 - .1 Nature or phasing of work;
 - .2 Risk to Facility operations;
 - .3 Quantity of various trades needing to perform hot work on project or;
 - .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.
 - .5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.
 - .6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of the Facility. Follow Departmental Representative's directives in this regard.

1.7 HOT WORK PROCEDURES

- .1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.
 - .2 Hot Work Procedures to include:
 - .1 Requirement to perform hazard assessment of site and immediate work area beforehand for each hot work event in accordance with Safety Plan'
 - .2 Use of a Hot Work Permit system with individually written permit issued by Contractor's Superintendent to specific worker or subcontractor granting permission to proceed with Hot Work.
 - .3 Permit required for each Hot Work event.
 - .4 Designation of a person on site as a Fire Safety Watcher responsible to conduct a fire safety watch for a minimum duration of 30 minutes immediately following the completion of the Hot Work.
 - .5 Compliance with fire safety codes, standards and occupational health and safety regulations specified.
-

- .6 Site specific rules and procedures in force at the site as provided by the Departmental Representative.
- .3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Label document as being the Hot Work Procedures for this contract.
- .4 Procedures shall clearly establish responsibilities of:
 - .1 Worker performing hot work,
 - .2 Person issuing the Hot Work Permit,
 - .3 Fire Safety Watcher,
 - .4 Subcontractor(s) and Contractor.
 - .5 Brief all workers and subcontractors on Hot Work Procedures and of Permit system. Stringently enforce compliance.

1.8 HOT WORK PERMIT

- .1 Hot Work Permit to include the following:
 - .1 Project name and project number;
 - .2 Building name and specific room or area where hot work will be performed;
 - .3 Date of issue;
 - .4 Description of hot work type needed;
 - .5 Special precautions to be followed, including type of fire extinguisher needed;
 - .6 Name and signature of permit issuer.
 - .7 Name of worker to which the permit is issued.
 - .8 Permit validity period not to exceed 8 Hours. Indicate start time/date and termination time/date.
 - .9 Worker's signature with time/date of hot work completion.
 - .10 Stipulated time period of safety watch.
 - .11 Fire Safety Watcher's signature with time/date.
- .2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.
- .3 Each Hot Work Permit to be completed in full, signed and returned to Contractor's Superintendent for safe keeping on site.

1.9 FIRE PROTECTION AND ALARM SYSTEMS

- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut-off, unless approved by Departmental Representative.
 - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.

- .3 Costs incurred, from the fire department, Facility Departmental Representative, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.10 EVACUATION PROCEDURES

- .1 Provide an evacuation plan from each of the construction Phasing Areas, in case of an emergency.
- .2 This plan to be reviewed by the Departmental Representative and the Local Fire Protection Services.
- .3 Include in the plan, fire captain's responsible for various sectors, muster stations, etc.
- .4 This plan to be reviewed/modified as the project progresses.

1.11 DOCUMENTS ON SITE

- .1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.
- .2 Upon request, make available to Departmental Representative or to authorized safety Representative for inspection.

END

PART 1 - GENERAL

1.1 NOT USED

1.2 REFERENCES

- .1 CSA C22.1-12, Canadian Electrical Code, Part I (22nd edition), Safety Standard for Electrical Installations
- .2 CAN/CSA C22.3 No. 1-10, Overhead Systems.
- .3 CAN/CSA C22.3, No. 7-10, Underground Systems.
- .4 CCOHS: Canadian Centre for Occupational Health and Safety, Regulations made under Part II of the Canada Labour Code.

1.3 DEFINITIONS

- .1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.
 - .2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment has been isolated.
 - .3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).
 - .4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.
 - .5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.
 - .6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.
-

1.4 COMPLIANCE REQUIREMENTS

- .1 Comply with the following in regards to isolation and lockout of electrical facilities and equipment:
 - .1 Canadian Electrical Code
 - .2 Federal and Provincial Occupational Health and Safety Acts and Regulations.
 - .3 Regulations and code of practice as Applicable to mechanical equipment or other machinery being de-energized.
 - .4 Procedures specified herein.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.5 SUBMITTALS

- .1 Submit copy of proposed lockout procedures and sample of lockout permit to Departmental Representative for review, within 14 calendar days of acceptance of bid.
- .2 Submit in accordance with section 01 33 00.

1.6 ISOLATION OF EXISTING SERVICES

- .1 Obtain Departmental Representative's written authorization prior to working on existing live or active electrical equipment and before proceeding with isolation of such item.
 - .2 To obtain authorization, submit to Departmental Representative the following documentation:
 - .1 Written request to isolate the particular service or facility and;
 - .2 Copy of Contractor's Lockout Procedures.
 - .3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, as follows:
 - .1 Fill-out standard form in current use at the Air Terminal as provided by Departmental Representative or;
 - .2 Where no form exist, make written request indicating:
 - .1 The equipment, system or service to be isolated and it's location;
 - .2 Duration of isolation period (ie: start time & date and completion time & date).
 - .3 Voltage of service feed to system or equipment being isolated.
 - .4 Name of person making the request.
 - .4 Do not proceed with isolation until receipt of written notification from Departmental Representative granting the Isolation Request and authorizing to proceed with the work.
 - .1 Note that Departmental Representative may designate another person to grant the Isolation Request.
-

- .5 Conduct safe, orderly shut down of equipment or facility. De-energize, isolate and lockout power and other sources of energy feeding the equipment or facility.
- .6 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require isolation of existing services.
- .7 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Air Terminal Manager. Minimize impact and downtime, follow Departmental Representative's directives in this regard.
- .8 Conduct hazard assessment as part of the process in accordance with health and safety requirements.

1.7 LOCKOUTS

- .1 De-energize, isolate and lockout electrical facility, mechanical equipment and machinery from all potential sources of energy prior to working on such items.
- .2 Develop and implement clear and specific lockout procedures to be followed as part of the Work.
- .3 Prepare typed written Lockout Procedures describing safe work practices, procedures, worker responsibilities and sequence of activities to be followed on site by workforce to safely isolate an active piece of equipment or electrical facility and effectively lockout and tagout it's sources of energy.
- .4 Include as part of the Lockout Procedures a system of lockout permits managed by Contractor's Superintendent or other qualified person designated by him/her as being "in-charge" at the site.
 - .1 A lockout permit shall be issued to specific worker providing a Guarantee of Isolation before each event when work must be performed on a live equipment or electrical facility.
 - .2 Duties of person managing the permit system to include:
 - .1 Issuance of permits and lockout tags to workers.
 - .2 Determining permit duration.
 - .3 Maintaining record of permits and tags issued.
 - .4 Making a Request for Isolation to Departmental Representative when required as specified above.
 - .5 Designating a Safety Watcher, when one is required based on type of work.
 - .6 Ensuring equipment or facility has been properly isolated.
 - .7 Collecting and safekeeping lockout tags returned by workers as a record of the event.
- .5 Clearly establish, describe and allocate responsibilities of:
 - .1 Workers.
 - .2 Person managing the lockout permit system.

- .3 Safety Watcher.
- .4 Subcontractor(s) and General Contractor.
- .6 Generic procedures, if used, must be edited and supplemented with pertinent information to reflect specific project requirements.
 - .1 Incorporate site specific rules and procedures in force at site as provided by Facility Manager through the Departmental Representative.
 - .2 Clearly label the document as being the Lockout procedures applicable to work of this contract.
- .7 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.
- .8 Use industry standard lockout tags.
- .9 Provide appropriate safety grounding and guards as required.

1.8 CONFORMANCE

- .1 Brief all workers and subcontractors on requirements of this section. Stringently enforce use and compliance.

1.9 DOCUMENTS ON SITE

- .1 Post Lockout Procedures on site in common location for viewing by workers.
- .2 Keep copies of Request for Isolation forms and lockout permits and tags issued to workers on site for full duration of Work.
- .3 Upon request, make available to Departmental Representative or to authorized safety Representative for inspection.

END

PART 1 - GENERAL

1.1 NOT USED

1.2 SUBMITTALS

- .1 Submit to Departmental Representative copies of the following documents, including updates:
 - .1 Site Specific Health and Safety Plan.
 - .2 Building Permit, compliance certificates and other permits obtained.
 - .3 Reports or directions issued by Federal, Provincial or other authority having jurisdiction.
 - .4 Accident or Incident Reports.
 - .5 MSDS data sheets.
 - .6 Name of Contractor's Representative designated to perform health and safety supervision on site, and support documentation specified in the Safety Plan.
- .2 Upon request by Departmental Representative, submit reports and other documentation as stipulated to be produced and maintained by Federal and Provincial Occupational Health and Safety Regulations and as specified herein.
- .3 Submit above documents in accordance with the submittal procedures specified in Section 01 33 00.

1.3 COMPLIANCE REQUIREMENTS

- .1 Comply with the Occupational Health and Safety Act for the Province of Newfoundland and Labrador, and the Regulations made pursuant to the Act.
 - .2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.
 - .3 Observe and enforce construction safety measures required by:
 - .1 National Building Code of Canada;
 - .2 Provincial Worker's Compensation Board;
 - .3 Municipal statutes and ordinances.
 - .4 In event of conflict between any provisions of above authorities the most stringent provision will apply.
 - .5 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Public Works & Government Services Canada
Ottawa, Ontario, K1A 0S9
Tel: (819) 956-4800 (1-800-635-7943)
Publication No. L31-85/2000 E or F)
-

- .6 Maintain Workers Compensation Coverage for duration of Contract. Submit Letter of Good Standing to Departmental Representative upon request.

1.4 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, of property and for protection of persons circulating adjacent to work operations to extent that they may be affected by conduct of the Work.
- .2 Enforce compliance by all workers, sub-contractors and other persons granted access to work site with safety requirements of Contract Documents, applicable Federal, Provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.5 SITE CONTROL AND ACCESS

- .1 Control work site and entry points to construction areas.
- .1 Delineate and isolate construction areas from other areas of Facility by use of appropriate means.
- .2 Post notices and signage at entry points and at other strategic locations identifying entrance onto site to be restricted to authorized persons only.
- .3 Signage must be professionally made, with bilingual messages or display internationally understood graphic symbols.
- .2 Approve and grant access to site only to workers and authorized persons.
- .1 Immediately stop non-authorized persons from circulating in construction areas and remove from site.
- .2 Provide site safety orientation to all persons before granting access. Advise of site conditions, hazards and mandatory safety rules to be observed on site.
- .3 Secure site at night time to extent required to protect against unauthorized entry.
- .4 Ensure persons granted access to site wear appropriate personal protective equipment (PPE) suitable to work and site conditions.
- .1 Provide such PPE to authorized persons who require access to perform inspections or other approved purposes.

1.6 PROTECTION

- .1 Carry out work placing emphasis on health and safety of the Public, Facility personnel, construction workers and protection of the environment.
- .2 Erect safety barricades, lights and signage on site to effectively delineate work areas, protect pedestrian and vehicular traffic around and adjacent to work and to create a safe working environment.
- .1 Erect fences and temporary lighting as required.
-

- .3 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.7 FILING OF NOTICE

- .1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.
 - .1 Departmental Representative will assist in locating address for Filing Notice of Project if needed.

1.8 PERMITS

- .1 Post on site permits, licenses, compliance certificates specified in section 01 10 10.
- .2 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain his/her approval to proceed before carrying out that portion of work.

1.9 HAZARD ASSESSMENTS

- .1 Conduct site specific health and safety hazard assessment before commencing project and during course of the work. Identify risks and hazards resulting from site conditions, weather conditions and work operations.
 - .1 Perform on-going assessments addressing new risks and hazards as work progresses including when new subtrade or subcontractor arrives on site.
 - .2 Also, conduct assessment when the scope of work has been changed by Change Order and when potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety Representative.
- .2 Record results in writing and address in Health and Safety Plan.
- .3 Keep copy of all assessments on site.

1.10 PROJECT/SITE CONDITIONS

- .1 There are no known project related health, environmental or safety hazards at site which need to be managed if encountered during course of work
- .2 Above clause shall not be construed as being definitive and potential health, and safety hazards may be encountered during work.

1.11 HEALTH AND SAFETY MEETINGS

- .1 Attend pre-construction health and safety meeting conducted by Departmental Representative. Have following persons in attendance:
 - .1 Site Superintendent.
 - .2 Contractor's designated Health and Safety Site Supervisor.
-

- .3 Departmental Representative will advise of date, time and location.
- .2 Conduct health and safety meetings and tool box briefings on site. Hold on a regular and pre-scheduled basis during entire work in accordance with requirements and frequency as stipulated in provincial occupational health and safety regulations.
 - .1 Keep workers informed of potential hazards and provide safe work practices and procedures to be followed.
 - .2 Take written minutes and post on site.

1.12 HEALTH & SAFETY PLAN

- .1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work.
 - .1 Submit copy to Departmental Representative within 14 calendar days of acceptance of bid.
 - .2 Submit updates as work progresses.
- .2 Health and Safety Plan shall contain three (3) parts with following information:
 - .1 Part 1 - Hazards: List of individual health risks and safety hazards identified by hazard assessment process.
 - .2 Part 2 - Safety Measures: engineering controls, personal protective equipment and safe work practices used to mitigate hazards and risks listed in Part 1 of Plan.
 - .3 Part 3a: Emergency Response: standard operating procedures, evacuation measures and emergency response in the occurrence of an accident, incident or emergency.
 - .1 Include response to all hazards listed in Part 1 of Plan.
 - .2 Evacuation measures to complement the Facility's existing Emergency Response and Evacuation Plan. Obtain pertinent information from Departmental Representative.
 - .3 List names and telephone numbers of officials to contact including:
 - .1 General Contractor and all Subcontractors.
 - .2 Federal and Provincial Departments as stipulated by laws and regulations and local emergency resource organizations, as needed based on nature of emergency or accident.
 - .3 Officials from PWGSC and site Facility Management. Departmental Representative will provide list.
 - .4 Part 3b - Site Communications:
 - .1 Procedures used on site to share work related safety issues between workers, subcontractors, and General Contractor.
 - .2 List of critical tasks and work activities, to be communicated with the Facility Manager, which has risk of affecting tenant operations, or endangering health and safety of Facility personnel and the general public. Develop list in consultation with the Departmental Representative.

- .3 Prepare Health and Safety Plan in a three column format, addressing the three parts specified above, as follows:
- | Column 1 | Column 2 | Column 3 |
|--------------------|-----------------|--|
| Part 1 | Part 2 | Part 3a/3b |
| Identified Hazards | Safety Measures | Emergency Response & Site Communications |
- .4 Develop Plan in collaboration with subcontractors. Address work activities of all trades. Revise and update Plan as Sub-contractors arrive on site.
- .5 Implement and enforce compliance with requirements of Plan for full duration of work to final completion and demobilization from site.
- .6 As work progresses, review and update Plan. Address additional health risks and safety hazards identified by on-going hazard assessments.
- .7 Post copy of Plan, and updates, on site.
- .8 Submission of the Health and Safety Plan, and updates, to the Departmental Representative is for review and information purposes only. Departmental Representative's receipt, review and any comments made of the Plan shall not be construed to imply approval in part or in whole of such Plan by Departmental Representative and shall not be interpreted as a warranty of being complete and accurate or as a confirmation that all health and safety requirements of the Work have been addressed and that it is legislative compliant. Furthermore, Departmental Representative's review of the Plan shall not relieve the Contractor of any of his legal obligations for Occupational Health and Safety provisions specified as part of the Work and those required by provincial legislation.

1.13 SAFETY SUPERVISION AND INSPECTIONS

- .1 Designate one person to be present on site at all times, responsible for supervising health and safety of the Work.
- .1 Person to be competent in Occupational Health and Construction Safety as defined in the Provincial Occupational Health and Safety Act.
- .2 Assign responsibility, obligation and authority to such designated person to stop work as deemed necessary for reasons of health and safety.
- .3 Conduct regularly scheduled informal safety inspections of work site on a minimum bi-weekly basis.
- .1 Note deficiencies and remedial action taken in a log book or diary.
- .4 Conduct Formal Inspections on a minimum monthly basis.
- .1 Use standardized safety checklist forms.
- .2 Prepare written report of each inspection. Document deficiencies, remedial action needed and assign responsibility for rectification to appropriate subcontractor or worker.
- .3 Distribute monthly reports to subcontractors for their pursuance.
- .4 Follow-up and ensure appropriate action and corrective measures are taken.

- .5 Cooperate with Facility's Health and Safety Site Coordinator responsible for the entire site, should one be designated by Departmental Representative.
- .6 Keep inspection reports on site.

1.14 TRAINING

- .1 Ensure that all workers and other persons granted access to site are competently trained and knowledgeable on:
 - .1 Safe use of tools and equipment.
 - .2 How to wear and use personal protective equipment (PPE).
 - .3 Safe work practices and procedures to be followed in carrying out work.
 - .4 Site conditions and minimum safety rules to be observed on site, as given at site orientation session.

1.15 MINIMUM SITE SAFETY RULES

- .1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements to be obeyed by all persons granted site access:
 - .1 Wear personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear and eye protection.
 - .2 Immediately report unsafe activity or condition at site, near-miss accident, injury and damage.
 - .3 Maintain site in tidy condition.
 - .4 Obey warning signs and safety tags.
 - .5 Smoking is not permitted on the Departmental Representative's property.
 - .2 Brief workers on site safety rules and on disciplinary measures to be taken by Departmental Representative for violation or non compliance of such rules. Post rules on site.
 - .3 The following actions or conduct by Contractor, workers and subcontractors will be considered as non conformance with the health and safety requirements of the contract for which a Non-Compliance Notification will be issued to the General Contractor by the Departmental Representative:
 - .1 Failure to follow the minimum site safety rules specified above.
 - .2 Negligence resulting in serious injury or major property damage.
 - .3 Deliberate non-compliance with Federal and Provincial Acts and Regulations.
 - .4 Falsification of information in Workers Compensation Reports, safety reports and other health and safety related documents submitted to Departmental Representative or to Authority having jurisdiction.
 - .5 Possession of firearms on site.
 - .6 Possession of non-prescriptive illegal drugs or alcohol.
-

- .7 Action, or lack thereof, resulting in the issuance of Warnings, Fines or Stop Work Orders from a Provincial Authority having jurisdiction.
- .8 Violation of other specified health and safety rules and requirements as determined by Departmental Representative.
- .4 See elsewhere in this section for details on Non-Compliance Notifications and resulting disciplinary measures.

1.16 ACCIDENT REPORTING

- .1 Investigate and report the following incidents and accidents:
 - .1 Those as required by Provincial Occupational Safety and Health Act and Regulations.
 - .2 Injury requiring medical aid as defined in the Canadian Dictionary of Safety Terms-1987, published by the Canadian Society of Safety Engineers (C.S.S.E) as follows:
 - .1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.
 - .3 Property damage in excess of \$10,000.00,
 - .4 Interruption to Facility operations with potential loss to a Federal Dept. in excess of \$5000.00,
 - .5 Those which require notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable law or regulations.
- .2 Send written report to Departmental Representative for all above cases.

1.17 TOOLS AND EQUIPMENT SAFETY

- .1 Routinely check and maintain tools, equipment and machinery for safe operation.
- .2 Conduct checks as part of site safety inspections. When requested, submit proof that checks and maintenance have been carried out.
- .3 Tag and immediately remove from site items found faulty or defective.

1.18 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets for all products delivered to site. Post on site. Submit copy to Departmental Representative upon receipt.
- .3 Where work is within or immediately adjacent to occupied areas, also post copy of data sheets in a public location accessible to Facility personnel.

1.19 BLASTING

- .1 Blasting or other use of explosives is not permitted

1.20 POWDER ACTUATED DEVICES

- .1 Use of powder actuated fastening devices is not permitted.

1.21 POSTING OF DOCUMENTS

- .1 Post on site safety documentation as stipulated by Authorities having jurisdiction and as specified herein. Place in a common visible location.

1.22 SITE RECORDS

- .1 Maintain on site a copy of all health and safety documentation and reports specified to be produced as part of the work and received from authorities having jurisdiction.
- .2 Upon request, make available to Departmental Representative and to other authorized safety representative for review. Provide copy when directed by Departmental Representative.

1.23 NON COMPLIANCE

- .1 Immediately address and correct health and safety violations and non-compliance issues.
- .2 Be responsible to fully brief workers and subcontractors on the operation and importance of Health & Safety Compliance.

END

1.1 REFERENCES

- .1 The following reference documents form a part of this specification and are available from Newfoundland and Labrador Department of Environment and Conservation or Fisheries and Oceans Canada:
 - .1 Drainage and Erosion at Construction Sites, National Research Council of Canada
 - .2 Fisheries and Oceans Canada: Guidelines for a Stationary Type Screen at Water Intakes to Prevent Losses of Juvenile Salmon and Trout.
 - .3 Project Environmental Protection Plan (EPP) where applicable.

1.2 DEFINITIONS

- .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

1.3 FIRES

- .1 Fires and burning of rubbish on site not permitted.

1.4 HAZARDOUS MATERIAL HANDLING

- .1 Store and handle hazardous materials in accordance with applicable federal and provincial laws, regulations, codes and guidelines. Store in location that will prevent spillage into the environment
- .2 Label containers to WHMIS requirements and keep MSDS data sheets on site for all hazardous materials.
- .3 Maintain inventory of hazardous materials and hazardous waste stored on site. List items by product name, quantity and date when storage began.
- .4 Store and handle flammable and combustible materials in accordance with National Fire Code.
- .5 Transport hazardous materials in accordance with federal Transportation of Dangerous Goods Regulations and applicable Provincial regulations.

1.5 DISPOSAL OF WASTES

- .1 Do not bury rubbish and waste materials on site. Dispose in accordance with project waste management requirements specified in section 01 74 21.
- .2 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, paints, thinners, oil or fuel into waterways, storm or sanitary sewers or waste landfill sites.
- .3 Dispose of hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.

1.6 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump or drain water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with governing regulations and requirements.
- .4 Provide control devices such as filter fabrics, sediment traps and settling ponds to control drainage and prevent erosion of adjacent lands. Maintain in good order for duration of work.

1.7 SITE AND PLANT PROTECTION

- .1 Minimize stripping of topsoil and vegetation.
- .2 Protect Lawn Trees, shrubs and lawn where required.

1.8 WORK IN OR ADJACENT TO WETLANDS OR WATERCOURSES

- .1 Do not operate construction equipment in or adjacent to watercourses, or alter or draw water from a watercourse or wetland without first obtaining necessary permits or approvals.
- .2 Do not use watercourse beds or banks for borrow material.
- .3 Do not dump excavated fill, waste material or debris in watercourse.
- .4 Design and construct temporary crossings to minimize erosion to watercourse or wetland.
- .5 Do not skid logs or construction materials across watercourses or wetland.
- .6 Avoid spawning beds when constructing temporary crossings of watercourses.
- .7 Do not blast under watercourses or wetland within 100 m of spawning beds without obtaining necessary permits or approvals.
- .8 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourses and wetlands.
- .9 Do not refuel any type of equipment within 100 meters of a water body. Maintain equipment in good working condition with no fluid leaks, loose hoses or fittings.
- .10 The Contractor is responsible for the protection of natural watercourses and wetlands from damage due to siltation runoff from the construction site.

1.9 WILDLIFE PROTECTION

- .1 Should nests of migratory birds in wetlands be encountered during work, immediately notify Departmental Representative for directives to be followed.
 - .1 Do not disturb nest site and neighboring vegetation until nesting is completed.
 - .2 Minimize work immediately adjacent to such areas until nesting is completed.
 - .3 Protect these areas by following recommendations of Canadian Wildlife Service.
-

1.10 POLLUTION CONTROL

- .1 Prior to the commencement of construction activities, prepare an environmental protection plan, which addresses procedures to follow in the event of a pollution incident and ensure all staff are aware of these procedures. Provide copy of contingency plan to the Departmental Representative.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads and around entire construction site.
- .5 Have appropriate emergency spill response equipment and rapid clean-up kit on site located adjacent to hazardous materials storage area. Provide personal protective equipment required for clean-up.
- .6 Immediately report any environmental emergency, such as a spill of a contaminant, to environmental emergencies at 709-772-2083 or 1-800-563-9089.
- .7 Report, spills of petroleum and other hazardous materials as well as accidents having potential of polluting the environment to Federal and Provincial Department of the Environment.
 - .1 Notify Departmental Representative and submit a written spill report to Departmental Representative within 24 hours of occurrence.

1.11 PERMITS AND APPROVALS

- .1 Obtain copies of any permits or approvals issued by approval agencies. Review and comply with all conditions contained in permit or approval.
- .2 Where permits or approvals are required and not obtained at time of bidding, be responsible for obtaining permits or approvals. The Activity Designation Regulations made under the Newfoundland Environment Act list all activities which require an approval from the Newfoundland Department of Environment and Climate Change.
- .3 Ensure all staff and subcontractors are aware of all terms and conditions of any permit/approval issues.

1.12 SEDIMENT CONTROL FENCE

- .1 Provide and maintain sediment control fence where required or as directed, prior to construction. Co-ordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.
 - .2 Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric pre-stapled to wood posts spaced as indicated.
 - .3 Attach fence with roofing nails and roofing tins. Provide wood strapping along top of fence as shown.
 - .4 Excavate 150 mm x 150 mm trench along length of fence or as indicated by Project Documents. Lay fabric bottom in trench and backfill with selected excavated material.
-

1.13 SEDIMENT CONTROL BERMS

- .1 Provide and maintain sediment control berms where required or as directed, prior to construction. Co-ordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.
- .2 Geotextile: non-woven, needle-punched polyester filter fabric.
- .3 Construct sediment control berms to the cross sections indicated on the Project Documents.

1.14 MAINTENANCE OF BERMS AND SILT FENCE

- .1 Maintain siltation control features throughout the construction period. Repair damage to original condition.
- .2 Inspect sediment and erosion control structures and make necessary repairs before and after every rainfall event.

1.15 EROSION AND SEDIMENT CONTROL PLAN

- .1 Contractor to provide Erosion and Control Plan to Local Authority having jurisdiction. This submission must be stamped and signed by a geotechnical engineer registered to practice in Newfoundland/Labrador.

END

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society of Heating Refrigeration and Air-Conditioning. (ASHRAE)
 - .1 ASHRAE/IESNA Standard 90.1-1999 Energy Standard for Buildings Except Low-Rise Residential.
 - .2 ASHRAE/IESNA Standard 52.2-1999 Method of Testing General Ventilation Air-cleaning Devices for Removal Efficiency by Particle Size.
- .2 Green Seal Environmental Standards
 - .1 GS-11 (Paint)
 - .2 GS-03 (Anti-Corrosive Coatings)
- .3 Sheet Metal and Air Conditioning Contractors National Association (SMACNA) – IAQ Guidelines for Occupied Buildings under Construction.

1.2 CONSTRUCTION IAQ MANAGEMENT PLAN

- .1 Contractor to provide and reinforce the five steps of IAQ Management Plan. During construction the IAQ Plan will implement the five Design Approaches of SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007.
 - .1 HVAC Protection, this involves preventing construction dust from entering into the ductwork spaces. This is achieved by either maintaining factory covers on equipment where possible or using polyethylene covers.
 - .2 Materials specified for the project. Provide concerted effort to avoid using materials with high volatile organic compounds.
 - .3 Ventilate using 100% outside air, or by installing a physical barrier, when installing materials that possess VOC's.
 - .4 Maintain an efficient and consistent housekeeping schedule. This involves the removal of construction dust and debris on a regular basis.
 - .5 The return side of the HVAC system should be dampered off and sealed airtight, with coverings that should resist expected pressure differentials.
- .2 Project is phased, as noted within documents; where work space is adjacent to retail shopping, Contractor to ensure all fumes/odours from methods/materials are exhausted to the exterior.

END

PART 1 - GENERAL

1.1 GENERAL

- .1 Due to nature of this Facility, and client operations therein, security regulations pertaining to airside requirements will be in place during the work resulting in need for:
 - .1 Control and limit movement of construction workers at the site.
 - .2 Escort and continuous supervision of workers by security personnel.
 - .3 Workers will be required to obtain and wear a pass, issued by the Airport Authority .
 - .4 Specific rules and regulations as specified in this section and as directed by the Departmental Representative to be stringently followed.
- .2 It is the Contractor's responsibility to:
 - .1 Submit necessary documentation required and obtain security clearances for all workers .
 - .2 Be familiar with and abide by security rules and regulations .
 - .3 Brief all workers and subcontractors in respect of the security regulations and ensure that they abide by all rules and directives.
 - .4 Ensure all staff involved with work attend required construction meetings .
- .3 The Departmental Representative will coordinate a pre-construction meeting between Contractor, Facility Management and Security Personnel who will provide details and directives on control and movement on site.
- .4 Any infraction of site security regulations on the part of the Contractor, members of work force or any Subcontractor in his employ, could result in:
 - .1 Financial penalties in the form of progress payment reduction or holdback assessments being levied against the Contractor.
 - .2 Immediate removal of offending party from the site.

1.2 CONTRACTORS PERSONEL

- .1 Submit an organization chart to the Departmental Representative prior to commencing work on site. Chart to identify and give contact information for the following individuals:
 - .1 Site Superintendent/Foreman .
 - .2 QC Personnel
 - .3 Safety Officer
 - .4 Trade Supervisor
 - .5 All Subcontractor Managers

1.3 SECURITY PERSONNEL

- .1 Airside vehicles may be required to display an Operator's Permit (AVOP) issued by a Departmental Representative .
- .2 At all times must the contractor maintain communication with a Commissionaire possessing a Restricted Operator Certificate radio license - Aeronautical (ROC-A).
- .3 Contractor vehicles and equipment must maintain a functioning beacon light and indicator flag
- .4 Contractor is responsible to insure crew limit movement within the boundaries established by the Departmental Representative for each work phase;
- .5 Maintain security control list of workers authorized to be on site as determined by Contractor and the Departmental Representative;
- .6 Ensure Commissionaires are present on site for all airside work.
- .7 Escort and supervision of workers by Commissionaires is required at all times regardless as to whether work shifts are in the daytime or during Facility off hours.
- .8 Ensure workers are fitted and wear approved safety hard hat, safety footwear and other personnel protective equipment appropriate to work in accordance with applicable Occupational Health and Safety requirements specified.

1.4 SECURITY CLEARANCE REQUIREMENTS

- .1 Restricted area defined as: the entire airside site.
- .2 Escort and supervision functions specified herein is required for the project even after workers may have obtained security clearance.

1.5 SECURITY PASSES

- .1 Visitor or worker ID Tags are required for all personnel requiring access to airside. Airside is the operational area of the airport contained within the security fence perimeter .
- .2 ID Tags will be provided by the Facility Security, issued to Contractor for distribution to authorized workers and placed on the Security Control List specified below.
- .3 All persons while airside, must display the ID Tag issued to him regardless of daytime or night time work.
- .4 Be responsible to obtain ID Tags before airside work commences, including those required by subcontractors, and continually control their distribution and use by workers. Submit request for tags as early as possible prior to commencement of work.
- .5 For the duration of this contract, anyone not in possession of the ID Tag will not be allowed access airside within approval from the Departmental Representative .
- .6 At end of project, return to Departmental Representative all tags issued to workers and to

subcontractors.

.1 The Departmental Representative may levy a financial penalty in the form of a holdback assessment against the Contract for each pass not returned regardless of the reason the pass is not returned.

.7 Immediately report any lost, stolen or destroyed ID Tags to the Departmental Representative.

1.6 SECURITY CONTROL LIST

.1 Provide a list of employee names from workforce and from subcontractors who will be present at site during the course of airside work.

.2 List to include each person's name, address and telephone number.

.3 Submit copy of list to Departmental Representative and to Security Commissionaire for control of workers.

.4 Update list as work progresses.

.5 Verify each worker can provide proof of identity upon demand, when requested by Facility's Security Personnel, Departmental Representative or by Facility Management.

1.7 SITE SECURITY

.1 When Work must be carried out during off hours or beyond the work hours previously agreed upon at start of work, provide notice within 48 hours beforehand to allow airside security coordination to be arranged for by Departmental Representative.

.2 Contractor is required to ensure that airside fencing is complete and secure for any airside work that may be performed outside of daylight hours.

.3 At no time shall the contractor or subcontractors stock pile or leave equipment or vehicles unattended within 3000mm of the airside security fencing.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END

PART 1 - GENERAL

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code of Canada 2010 (NBC 2010) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

END

PART 1 - GENERAL

1.1 INSPECTION

- .1 Give timely notice requesting inspection of Work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.
- .2 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.
- .3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed.
- .4 Pay costs to uncover and make good work disturbed by inspections and tests.

1.2 TESTING

- .1 Tests on materials, equipment and building systems as specified in various sections of the Specifications is the responsibility of the Contractor except where stipulated otherwise.
 - .1 Provide all necessary instruments, equipment and qualified personnel to perform tests.
- .2 At completion of tests, submit two sets of fully documented tests reports to the Departmental Representative. Submit in accordance with Section 01 33 00.
 - .1 Obtain additional copies for inclusion of a complete set in each of the maintenance manuals specified in Section 01 78 00.
- .3 Unspecified tests may also be made by Departmental Representative, at the discretion of the Departmental Representative. The costs of these tests will be paid for by the Departmental Representative.
- .4 Departmental Representative is to be involved in providing independent testing for concrete, reinforcing, structural steel connections, etc.
- .5 Where tests or inspections reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests and inspections incurred by Departmental Representative as required to verify acceptability of corrected work.

1.3 REJECTED WORK

- .1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.
- .2 Make good damages to new and existing construction and finishes resulting from removal or replacement of defective work.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Temporary utilities.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.3 POWER AND LIGHTING

- .1 Power supply is available and will be provided for construction usage at no cost.
 - .1 Make arrangements for the use of such services through the Departmental Representative.
 - .2 Departmental Representative will designate and approve each location of existing power source to which connections can be made to obtain temporary power service.
 - .3 Connect to existing power supply in accordance with Canadian Electrical Code.
- .2 Provide and pay all costs to supply and install temporary cabling, panelboards, switching devices and other equipment as required to connect into power source, provide adequate ground fault protection and extend power supply from existing source to work areas. Perform work and make all connections in accordance with the Canadian Electrical Code, in compliance with the federal and provincial Occupational Health and Safety Regulations and to lockout requirements specified in section 01 35 25.
- .3 Provide and maintain temporary lighting to conduct work. Ensure illumination level is not less than 162lx in all locations.
- .4 Electrical power and lighting systems installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage. Replace lamps which have been used over period of 3 months.

1.4 WATER SUPPLY

- .1 Water supply is available in existing building and on site and will be provided for construction usage at no cost. Make arrangements for the use and transportation of such services to work area through the Departmental Representative.
 - .2 Permanent water supply system installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage.
-

1.5 HEATING AND VENTILATING

- .1 Supply, install and pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted.
 - .2 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
 - .3 Maintain minimum temperature of 15 degrees C, or higher where specified, as soon as finishing work is commenced and maintain until acceptance of structure by Departmental Representative.
 - .1 Maintain ambient temperature and humidity levels as required for comfort of office personnel.
 - .4 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
 - .7 Prior to Substantial Performance ensure all filters in operating equipment have been replaced and all existing new ducts have been completed, vacuumed and cleaned throughout.
 - .5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
 - .6 Submit bid assuming existing and new equipment and systems will not be used for temporary heating and ventilating.
 - .7 Upon acceptance of bid, Departmental Representative may permit use of permanent system providing agreement can be reached on:
 - .1 Conditions of use, special equipment, protection and maintenance.
-

- .2 Saving on Contract price.
- .3 Provisions relating to warranties on equipment.

1.6 FIRE SUPPRESSION SYSTEMS

- .1 Maintain existing fire suppression systems in each phase.
- .2 Ensure the flow and pressure in the mains and branches remain as per original building requirements, prior to work by this contract.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA):
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods for Concrete Construction.
 - .2 CSA-O121- 08(R2013), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 SCAFFOLDING

- .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

1.5 HOISTING

- .1 Provide, operate and maintain hoists, cranes, genie lifts required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

1.6 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.7 OFFICES

- .1 Provide office heated to 22 C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
-

- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. Departmental Representative to direct location of these offices.
- .4 Coordinate location with Departmental Representative, where to place the offices.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.
- .3 Location as per the Departmental Representative.

1.9 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Location to be confirmed with Departmental Representative.

1.10 PARKING

- .1 Confirm with the Departmental Representative re location for parking for construction workers.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.3 TEMPORARY HOARDING

- .1 Weather Tight Closures (Exterior – if required)
 - .1 Provide weather tight closures to its entirety or in its parts against the elements to maintain environment required for work as noted in the specification.
 - .2 Design enclosures to withstand wind pressure and snow loading to NBC 2010.
 - .3 Description of Enclosure:
 - .1 Air/Vapour barrier.
 - .2 12.7 mm board (plywood, chip board, etc.)
 - .3 150 mm metal or wood stud at 406 mm o.c.
 - .4 Batt Insulation to R-15
 - .5 6mil polyethylene to metal stud.
 - .6 Full height partitions floor to u/s deck.
 - .7 Seal roof flashing with wall.
 - .2 Interior Enclosures (Refer to Construction Phasing Plan)
 - .1 150 mm metal or wood stud at 406 mm o.c. to under side of deck
 - .2 12.7 mm plywood sheathing painted white to 2440 mm AFF, painted white
 - .3 Provide white plastic polyethylene, 6 mil thickness, double sheeted, from top of plywood to u/s metal deck.
 - .4 Seal all plumbing penetrations, electrical outlets, and other sources of potential air leaks into or out of the construction area.
 - .5 Maintain fire access, re travel and exit requirements, and emergency and exit lights with the temporary partitioning layout.
 - .6 Relocate as required to accommodate work
 - .7 Maintain protection until work complete.
 - .8 Ensure the partitions backing on any food preparation area, to have a scrubbable, clean surface finish, with all joints and terminations sealed. Ensure it is to Department of Health standards of the local jurisdiction.
 - .9 Ensure all enclosed areas are properly vented to the exterior.
 - .10 Provide fire-resistant rated tarps or protective barriers where no work is being performed within requirements of local authority having jurisdiction.
-

1.4 CONSTRUCTION FENCING

- .1 Provide construction fencing to encompass the new addition planned for the west side of the building in the loading area. Fence to consist of the following:
 - .1 1525 mm galvanized chain link fence
 - .2 T-shaped iron supports at 1525 mm o.c.
 - .3 Allow for double gate for vehicle travel
 - .4 Approvable location of entrance gates to be determined by both Departmental Representative and General Contractor.
 - .5 Do not impede delivery for the other loading bays.

1.5 GUARD RAILS AND BARRICADES

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

1.6 ACCESS TO SITE/BUILDING

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

1.7 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.8 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles, during all phases of the construction period.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.10 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
 - .2 Provide necessary screens, covers, and hoardings.
 - .3 Be responsible for damage incurred due to lack of or improper protection.
-

END

.1 GENERAL

- .1 Use new material and equipment unless otherwise specified.
- .2 Within seven (7) days of written request by Departmental Representative, submit following information for any materials and products proposed for supply:
 - .1 Name and address of manufacturer.
 - .2 Trade name, model and catalogue number.
 - .3 Performance, descriptive and test data.
 - .4 Compliance to specified standards.
 - .5 Manufacturer's installation or application instructions.
 - .6 Evidence of arrangements to procure.
 - .7 Evidence of manufacturer delivery problems or unforeseen delays.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.2 PRODUCT QUALITY

- .1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.
- .2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions of the Contract.

1.3 ACCEPTABLE MATERIALS AND ALTERNATIVES

- .1 Acceptable Materials: When materials specified include trade names or trade marks or manufacturer's or supplier's name as part of the material description, select and only use one of the names listed for incorporation into the Work.
 - .2 Alternative Materials: Submission of alternative materials to trade names or manufacturer's names specified must be done during the bidding period following procedures indicated in the Instructions to Bidders.
 - .3 Substitutions: After contract award, substitution of a specified material will be dealt with as a change to the Work in accordance with the General Conditions of the Contract.
-

1.4 MANUFACTURERS INSTRUCTIONS

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturers instructions, so that Departmental Representative will designate which document is to be followed.

1.5 AVAILABILITY

- .1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per clause 1.1.2 above.

1.6 WORKMANSHIP

- .1 Ensure quality of work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
- .2 Remove unsuitable or incompetent workers from site as stipulated in the General Conditions of the Contract.
- .3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.
- .4 Coordinate work between trades and subcontractors. See section 01 14 10 in this regard.
- .5 Coordinate placement of openings, sleeves and accessories.

1.7 FASTENINGS – GENERAL

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use noncorrosive fasteners, anchors and spacers for securing exterior work and in humid areas.
 - .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.
 - .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
 - .4 Fastenings which cause spalling or cracking of material to which anchorage is made, are not acceptable.
-

- .5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See section on Health and Safety Requirements in this regard.

1.8 FASTENINGS – EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and, use resilient washers with stainless steel.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable. Provide same degree of protection to materials supplied by Departmental Representative.
- .2 Store packaged or bundled materials in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work. Provide additional cover where manufacturer's packaging is insufficient to provide adequate protection.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Immediately remove damaged or rejected materials from site.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

END

1.1 SUBMITTALS

- .1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Engineer or separate contractor.
- .2 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed Work, and products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on Work of Engineer or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

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

1.3 PREPARATION

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

1.4 EXECUTION

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

END

1.1 GENERAL

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.2 MATERIALS

- .1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 CLEANING DURING CONSTRUCTION

- .1 Maintain work site & work areas in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
 - .2 Keep building entrances, corridors, stairwells and tenant occupied areas of building in a clean dust free condition at all times. Conduct thorough cleaning of these areas at end of each workshift when used by workers or affected by the Work.
 - .3 Provide on-site suitable containers for collection of waste materials and debris.
 - .4 Use separate collection bins, clearly marked as to purpose, for source separation and recycling of waste and debris in accordance with waste management requirements specified.
 - .5 Remove waste materials, and debris from site on a minimum weekly basis.
 - .6 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
 - .7 Immediately clean all dust, dirt, smears, scuffs and soiled surfaces in lobbies, corridors, and within tenant occupied areas resulting from the Work.
 - .1 Perform cleaning, dusting and washing operations, carpet vacuuming (including shampooing if deemed required by Departmental Representative) and floor washing as necessary to thoroughly clean all soiled surfaces.
 - .8 Remove snow and ice from access doors used by workforce.
-

1.4 FINAL CLEANING

- .1 In preparation for acceptance of the completed work perform final cleaning.
- .2 Remove grease, dust, dirt, stains, labels, fingerprints, marks and other foreign materials, from interior and exterior finished surfaces. Clean and polish surfaces including glass, mirrors, hardware, wall tile, stainless steel, chrome, baked enamel, plastic laminate, mechanical and electrical fixtures.
- .3 Replace items with broken pieces, scratches or disfigured.
- .4 Clean lighting reflectors, lenses, and other lighting surfaces.
- .5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .6 Wax, seal, shampoo or prepare floor finishes as recommended by manufacturer.
- .7 Inspect finishes, fitments and equipment. Ensure specified workmanship and operation.
- .8 Broom clean and wash exterior paved surfaces and walks; rake clean other surfaces of grounds.
- .9 Remove debris and surplus materials from crawl areas, roof areas and other accessible concealed spaces.
- .10 Clean equipment, washroom and kitchen fixtures to a sanitary condition. Replace filters of mechanical equipment.

END

1.1 NOT USED

1.2 GENERAL

- .1 Carry out work placing maximum emphasis on the areas of:
 - .1 Waste reduction;
 - .2 Diversion of waste from landfill and;
 - .3 Material Recycling.
- .2 To be read in conjunction with Section 02 41 00 – Demolition.

1.3 WASTE MANAGEMENT

- .1 Prior to commencement of work, prepare Waste Management Workplan/PWGSC Forms.
- .2 Workplan to include:
 - .1 Waste audit.
 - .2 Waste reduction practices.
 - .3 Material source separation process.
 - .4 Procedures for sending recyclables to recycling facilities.
 - .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site.
 - .6 Training and supervising workforce on waste management at site.
- .3 Workplan to incorporate waste management requirements specified herein and in other sections of the Specifications.
- .4 Develop Workplan in collaboration with all subcontractors to ensure all waste management issues and opportunities are addressed.
- .5 Submit copy of Workplan to Departmental Representative for review and approval.
 - .1 Make revisions to Plan as directed by Departmental Representative.
- .6 Implement and manage all aspects of Waste Management Workplan for duration of work.
- .7 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

1.4 WASTE AUDIT

- .1 At project start-up, conduct waste audit of:
 - .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
 - .2 Projected waste resulting from product packaging and from material leftover after installation work.
-

- .2 Develop written list. Record type, composition and quantity of various salvageable items and waste anticipated, reasons for waste generation and operational factors which contribute to waste.

1.5 WASTE REDUCTION

- .1 Based on waste audit, develop waste reduction program.
- .2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.
- .3 Identify materials and equipment to be:
 - .1 Protected and turned over to Departmental Representative when indicated.
 - .2 Salvaged for resale by Contractor.
 - .3 Sent to recycling facility.
 - .4 Sent to waste processing/landfill site for their recycling effort
 - .5 Disposed of in approved landfill site.
- .4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:
 - .1 Use of a central cutting area to allow for easy access to off-cuts;
 - .2 Use of off-cuts for blocking and bridging elsewhere.
 - .3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into work whenever possible avoiding unnecessary waste.
- .5 Develop other strategies and innovative procedures to reduce waste such as minimizing the extent of packaging used for delivery of materials to site etc...

1.6 MATERIAL SOURCE SEPARATION PROCESS

- .1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at site.
 - .2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.
 - .1 Use suitable containers for individual collection of items based on intended purpose.
 - .2 Locate to facilitate deposit but without hindering daily operations of existing building tenants.
 - .3 Clearly mark containers and stockpiles as to purpose and use.
-

- .3 Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
 - .1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
 - .1 Reinstallation into the work where indicated.
 - .2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
 - .3 Sending as many items as possible to locally available recycling facility.
 - .4 Segregating remaining waste and debris into various individual waste categories for disposal in a "non-mixed state" as recommended by waste processing/landfill sites.
- .4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.
- .5 Send leftover material resulting from installation work for recycling whenever possible.
- .6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.
- .7 Isolate and store existing materials and equipment identified for re-incorporation into the Work. Protect against damage.

1.7 WORKER TRAINING AND SUPERVISION

- .1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.
- .2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:
 - .1 Oversee and supervise waste management during work.
 - .2 Provide instructions and directions to all workers and subcontractors on waste reduction, source separation and disposal practices.
 - .3 Post a copy of Plan in a prominent location on site for review by workers.

1.8 CERTIFICATION OF MATERIAL DIVERSION

- .1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of building materials and quantity of waste diverted from landfill.
 - .2 Submit data at pre-determined project milestones as determined by Departmental Representative.
-

- .3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.9 DISPOSAL REQUIREMENTS

- .1 Burying or burning of rubbish and waste materials is prohibited.
- .2 Disposal of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers is prohibited.
- .3 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .4 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .5 Transport waste intended for landfill in separated condition, following rules and recommendations of Landfill Operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.
- .6 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .7 Sale of salvaged items by Contractor to other parties not permitted on site.

END

1.1 NOT USED

1.2 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Coordinate and perform, in concert with subcontractors, an inspection and check of all Work. Identify and correct deficiencies, defects, repairs and perform outstanding items as required to complete work in conformance with Contract Documents.
 - .1 Notify Departmental Representative in writing when deficiencies from Contractor's inspection have been rectified and that Work is deemed to be complete and ready for Departmental Representative's inspection of the completed work.
- .2 Departmental Representative's Inspection: Accompany Departmental Representative during all substantial and final inspections of the Work.
 - .1 Address defects, faults and outstanding items of work identified by such inspections.
 - .2 Advise Departmental Representative when all deficiencies identified have been rectified.
- .3 Note that Departmental Representative will not issue a Certificate of Substantial Performance of the work until such time that Contractor performs following work and turns over the specified documents:
 - .1 Project record as-built documents;
 - .2 Final Operations and Maintenance manuals (4 copies);
 - .3 Maintenance materials, parts and tools;
 - .4 Compliance certificates from applicable authorities;
 - .5 Reports resulting from designated tests;
 - .6 Demonstration and training complete with user manuals;
 - .7 Manufacturer's Guarantee certificates.
 - .8 Testing, adjusting and balancing of equipment and systems complete with submission of test reports.
 - .9 Commissioning of equipment and systems specified.
- .4 Correct all discrepancies before Departmental Representative will issue the Certificate of Completion.

END

PART 1 - GENERAL

1.1 LIFE SAFETY CERTIFICATION

- .1 Submission of Certificates of Life Safety:
 - .1 Certificate of final inspection report from electrical utility or inspection.
 - .2 Certificate of verification of fire alarm system.
 - .3 Certificate from the Provincial Fire Marshal's office and IAO of final inspection of sprinkler system.
 - .4 Certificate of verification of the emergency lights/exit light system.
 - .5 Potable water test.
 - .6 Backflow preventer certificate.

1.2 PROJECT RECORD DOCUMENTS

- .1 Departmental Representative will provide two (2) white print sets of contract drawings and two (2) copies of Specifications Manual specifically for "as-built" purposes.
 - .2 Maintain at site one set of the contract drawings and specifications to record actual as-built site conditions.
 - .3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Departmental Representative upon request.
 - .4 As-Built Drawings:
 - .1 Record changes in Red ink on the prints. Mark only on one set of prints and at completion of work, neatly transfer notations to second set (also by use of red ink).
 - .2 Submit both sets to Departmental Representative prior to application for Certificate of Substantial Performance.
 - .3 Submit a 'CD' in CAD format of all the drawings and x-references of the full construction document package.
 - .4 Stamp all drawings with "As-Built Drawings". Label and place Contractor's signature and date.
 - .5 Show all modifications, substitutions and deviations from what is shown on the contract drawings or in specifications.
 - .6 Record following information:
 - .1 Depths of various elements of Foundation in relation to floor level & survey datum.
 - .2 Horizontal and vertical location of exterior underground utilities and appurtenances referenced to permanent surface improvements.
 - .3 Horizontal and vertical location of various elements in relation to Geodetic Datum;
 - .4 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure
 - .5 Field changes of dimension and detail;
 - .6 Location of all capped or terminated services and utilities.
 - .7 Chases for mechanical, electrical and other services;
-

- .8 Ceiling and floor elevations;
- .9 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
- .10 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .11 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .12 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.3 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 Provide servicing and lubrication schedule, and list of lubricants required.
- .3 Include manufacturer's printed operation and maintenance instructions.
- .4 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .5 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .6 Additional requirements: As specified in individual specification sections.

1.4 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.5 SPARE PARTS

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

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to the Project Manager. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.7 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to location as directed; place and store.
-

- .4 Receive and catalogue all items. Submit inventory listing to the Project Manager. Include approved listings in Maintenance Manual.

1.8 STORAGE, HANDLING AND PROTECTION

- .1 Follow Indoor Air Quality (IAQ) Plan requirements
- .2 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .3 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .4 Store components subject to damage from weather in weatherproof enclosures.
- .5 Store paints and freezable materials in a heated and ventilated room.
- .6 Remove and replace damaged products at own expense and to satisfaction of the Project Manager.

1.9 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

1.10 OPERATING & MAINTENANCE MANUALS

- .1 Format:
 - .1 Organize data in the form of an instructional manual.
 - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219mm x 279mm 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.
 - .2 Contents - Each Volume:
 - .1 Table of Contents: provide title of project;
 - .1 Date of submission; names, addresses, and telephone numbers of Departmental Representatives and Contractor with name of responsible parties;
 - .2 Schedule of products and systems, indexed to content of volume.
 - .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - .3 Number of copies required:
 - .1 Upon review and acceptance by Departmental Representative, submit 4 final copies. Interim copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.
 - .2 Upon review and acceptance, provide a 'CD' of the entire operation and maintenance manual.
 - .4 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Certificate of Substantial Performance of the work.
 - .5 Binding:
 - .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
 - .2 Use vinyl, hard covered, three "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
 - .3 Where multiple binders are needed, correlate data into related consistent groupings.
 - .4 Identify contents of each binder on spine.
 - .5 Organize and divide data following same numerical system as the section numbers of the Specification Manual.
 - .6 Dividers: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each individual product and system and give description of product or component.
 - .7 Type lists and notes. Do not hand write.
 - .8 Drawings, diagrams and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.
-

-
- .6 Manual Contents:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
 - .3 List of maintenance materials.
 - .4 List of spare parts.
 - .5 List of special tools.
 - .6 Original or certified copy of warranties and product guarantees.
 - .7 Copy of approval documents and certificates issued by Inspection Authorities.
 - .8 Copy of reports and test results performed by Contractor as specified.
 - .9 Product Information (PI Data) on materials, equipment and systems as specified in various sections of the specifications. Data to include:
 - .1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
 - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 Installation details.
 - .5 Operating instructions.
 - .6 Maintenance instructions for equipment.
 - .7 Maintenance instructions for finishes.
 - .7 Shop drawings:
 - .1 Include complete set of reviewed shop drawings into each copy of the operations and maintenance manual.
 - .2 Fold and bind material professionally in a manner that corresponds with the specification section numbering system.
 - .3 When large quantity of data is submitted, place into separate binders of same size as O&M binders.
 - .8 Equipment and Systems Data:

The following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:

 - .1 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 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.
 - .4 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .5 Servicing schedule.
-

- .6 Manufacturer's printed operation and maintenance instructions.
- .7 Sequence of operation by controls manufacturer.
- .8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .9 Provide installed control diagrams by controls manufacturer.
- .10 Provide Contractor's coordination drawings, with installed piping diagrams.
- .11 Include test and balancing reports.

END

1.1 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel prior to date of final inspection.
- .2 Departmental Representative will provide a list of Departmental Representative's personnel to receive instructions,
- .3 Cooperate with Departmental Representative in coordinating time and attendance of Departmental Representative's personnel with manufacturer's training Representative(s).

1.2 QUALITY CONTROL

- .1 Ensure that only personnel from own forces, Subcontractors or Suppliers competent and fully knowledgeable in the particular material component, equipment or system installation are used to provide training and demonstrations.
- .2 When specified in individual Sections, obtain the manufacturers 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.
- .3 Upon request, provide evidence to Departmental Representative of individual Trainer's knowledge and qualifications.

1.3 SUBMITTALS

- .1 Submit schedule of time, date and complete list of equipment and systems for which demonstration and training sessions will be provided. Submit schedule a minimum of two (2) weeks prior to designated dates, for Departmental Representative's approval.
- .2 Submit report within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed. Provide time and date of when each demonstration was actually given, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

- .1 Prior to carrying out demonstration and training, ensure that equipment has been inspected and tested, is fully operational, has been performance verified and TAB has been carried out.
 - .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.
 - .3 Contractor to keep records of all personnel who attend training and demonstration sessions. Lists to be submitted to Departmental Representative on completion of training
-

1.5 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

1.6 DEMONSTRATION & INSTRUCTIONS

- .1 Include the following items within the demonstration and training:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each piece of equipment.
 - .2 Instruct Personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
 - .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
 - .5 Maintain a record of Personnel who have attended training sessions in the form of sign-in sheets to be submitted to the Departmental Representative.
 - .6 Make a video recording of the training sessions to be submitted to the Departmental Representative in playable DVD format.
 - .7 Provide other specific training and instructions as specified in trade sections.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Observe the allocated time period specified in trade sections. Provide additional time when required to ensure all personnel fully understand all aspects of the information and instructions being provided. Allow for questions by participants.

END

PART 1 – GENERAL

1.1 GENERAL

- .1 Commissioning shall be carried out in accordance with the requirements as stipulated in the Commissioning Plan. See Appendix.

1.2 COSTS OF COMMISSIONING

- .1 Include all costs associated with the commissioning process in the contract price (static and functional testing, startup, training, etc).
- .2 General contractor shall ensure that all subtrades are aware of commissioning requirements and have included all commissioning costs in the Contract Price.

1.3 PRIME CONTRACTOR TEAM MEMBERS

- .1 Arrange for the participation of all necessary subcontractors and their specialists personnel in providing the commissioning services.

1.4 COMMISSIONING PLAN

- .1 A complete copy of the Commissioning Plan will be provided with the tender documents.
- .2 The Commissioning Plan, as issued with the tender documents has been developed specifically for this project and no changes to the technical or contractual requirements are expected.
- .3 The forms presented in the Appendices will be filled out as commissioning progresses. Responsibility for this work is outlined in the Commissioning Plan.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

- 1.1.1 Provide all labour, materials, products, equipment and services for commissioning of all building systems to ensure building is operating according to requirements of Contract Documents.
- 1.1.2 Third party commissioning authority has been retained by the Owner. The contractor shall meet the requirements of the specifications to enable successful completion of the commissioning.

1.2 REFERENCES

- 1.2.1 CSA Z320-11 Building Commissioning
- 1.2.2 ASHRAE Guideline 0-2013 The Commissioning Process
- 1.2.3 ASHRAE Guidelines 1-19 Guidelines for Commissioning of Specific Systems
- 1.2.4 National Building Code Latest version of National Building Code

1.3 COMMISSIONING SUMMARY

- 1.3.1 Perform commissioning activities in accordance with requirements of Contract Documents. Activities include, but are not limited to following:
 - 1.3.1.1 Commissioning process shall be performed by Contractor, in accordance with Contract Documents. Contractor shall fully cooperate with Commissioning Authority. Commissioning shall be demonstrated to satisfaction of Commissioning Authority. Commissioning work will be divided into the following phases:
 - 1.3.1.1.1 Stage 1: Commissioning performed by Contractor on all building items, components, equipment and systems unless otherwise stated. It includes, without limitation, activities such as static verifications and paperwork, startup, testing and verification, air and water testing adjusting and balancing, 100% issue free dry run completion of functional performance testing (Performance Verification), official testing in the presence of the commissioning authority, and training of Owner's authorized representative(s) or other personnel designated by Consultant or Commissioning Authority regarding each building system.
 - 1.3.1.1.2 Stage 2: Commissioning performed by Contractor after Substantial Performance, which includes without limitation activities such as fine tuning of building systems through all seasonal occupancy, or other

operational conditions to achieve requirements of Contract Documents during 12 months following Substantial Performance to end of Work.

- 1.3.1.2 Commissioning includes systematic testing, documentation of system in all scope of operations and providing performance data. Provide complete description of all systems operation as well as equipment and material information. Perform additional testing as requested by Consultant or Commissioning Authority to verify results without any extra cost to Owner.
- 1.3.1.3 Documentation of system includes system monitoring which includes tabulating at least for 21 Days of operation all significant system parameters. (such as, Room Temperatures, Heating Water Temperatures and/or similar items) Process may involve measurement of those parameters during operation and assessment of results by comparing design values against actual performance values.
- 1.3.1.4 CSA Z320-11 (Building Commissioning). The Contractor shall make themselves familiar with the requirements and expectations outlined in this Commissioning document.

1.4 OWNER'S VALUATION OF COMMISSIONING WORK

- 1.4.1 Completion of the commissioning requirements as described in this section shall carry a value equal to 5% of the total mechanical and electrical contract amount. These requirements shall be clearly identified as a line item in the Contractor's schedule of values and may be drawn against upon on successful completion of the related commissioning tasks.
- 1.4.2 The total amount equal to 5% of the construction budget will be sub-divided as follows for evaluation during the course of the project:

Project Documentation:	25%
Commissioning Meetings:	15%
Performance Verification:	50%
Training:	10%
- 1.4.3 The Consultant discuss commissioning progress with the Commissioning Authority prior to approving payment certificates containing Commissioning payments.
- 1.4.4 The Owner's Project Manager will withhold payment of a portion of funds in proportion to unfinished commissioning work, as detailed by the Commissioning Authority.

1.5 DEMONSTRATION AND TRAINING

- 1.5.1 Instructions - Mechanical:
-

- 1.5.1.1 Thoroughly instruct Owner's authorized representative(s) in safe operation of systems and equipment after installation of Work. Coordinate with Consultant and arrange commissioning program and schedule for instruction times. Submit a training schedule to Consultant, minimum 2 weeks prior to start of training.
 - 1.5.1.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Consultant on specialized portions of installation, such as refrigeration machines and automatic controls.
 - 1.5.1.3 Submit a complete record of instructions as part of maintenance instructions and data book given to Consultant. For each instructional period, supply following data:
 - 1.5.1.3.1 date.
 - 1.5.1.3.2 system or equipment involved.
 - 1.5.1.3.3 names of persons giving instructions.
 - 1.5.1.3.4 names of persons being instructed.
 - 1.5.1.3.5 other persons present.
 - 1.5.1.4 Carry out instructional period during a continuous period agreed with Consultant.
 - 1.5.1.5 Permit Consultant and authorized representative(s) usage of systems prior to Substantial Performance for purpose of testing and learning operational procedures. This usage shall not affect warranties and no claim for damage shall be made against Consultant for any injury or breakage to any part or parts of above due to aforementioned tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or quality of performance of any kind.
 - 1.5.1.6 At end of training, obtain and submit to Consultant, signature of Owner's authorized representative(s) stating they understand system and equipment installation, operation and maintenance requirements.
 - 1.5.1.7 Obtain and submit to Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.
 - 1.5.1.8 Only exception to foregoing requirements for acceptance of equipment and systems, will be 'fine tuning' which may be performed prior to Completion of Contract.
 - 1.5.1.9 In conjunction with foregoing requirements, Contractor shall arrange necessary inspections and obtain written approval and acceptance of equipment and systems
-

requiring approval by authorities having jurisdiction, and subsequent correction of those unacceptable items to satisfaction of such authorities.

1.5.2 Instructions - Electrical:

- 1.5.2.1 Thoroughly instruct Owner's authorized representative(s) in safe operation of systems and equipment after installation of Work. Coordinate with Consultant and arrange commissioning program and schedule for instruction times. Submit a training schedule to Consultant, minimum 2 weeks prior to start of training.
 - 1.5.2.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Consultant on specialized portions of installation, such as inverters, motor control centres, switchgears, transformers, etc.
 - 1.5.2.3 Submit a complete record of instructions as part of maintenance instructions and data book given to Consultant. For each instructional period, Supply following data:
 - 1.5.2.3.1 date.
 - 1.5.2.3.2 system or equipment involved.
 - 1.5.2.3.3 names of persons giving instructions.
 - 1.5.2.3.4 names of persons being instructed.
 - 1.5.2.3.5 other persons present.
 - 1.5.2.4 Carry out instructional period during a continuous period agreed with Consultant.
 - 1.5.2.5 Permit Consultant and authorized representative(s) usage of systems prior to Substantial Performance for purpose of testing and learning operational procedures. This usage shall not affect warranties and no claim for damage shall be made against Consultant for any injury or breakage to any part or parts of above due to aforementioned tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or quality of performance of any kind.
 - 1.5.2.6 At end of training, obtain and submit to Consultant, signature of Owner's authorized representative(s) stating they understand system and equipment installation, operation and maintenance requirements.
 - 1.5.2.7 Obtain and submit to Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.
-

1.5.2.8 Only exception to foregoing requirements for acceptance of equipment and systems, will be 'fine tuning' which may be performed prior to Completion of Contract.

1.5.2.9 In conjunction with foregoing requirements, Contractor shall arrange necessary inspections and obtain written approval and acceptance of equipment and systems requiring approval by authorities having jurisdiction, and subsequent correction of those unacceptable items to satisfaction of such authorities.

1.5.3 Instructions - Envelope:

1.5.3.1 Thoroughly instruct the Owner's authorized representative(s) in the safe operation of systems and equipment after installation of the work. Coordinate with the Commissioning Authority and Consultant to arrange a commissioning program and schedule for instruction times. Submit a training schedule to Commissioning Authority and Consultant, minimum 2 weeks prior to start of training.

1.5.3.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Owner's authorized representative(s) on specialized portions of the installation, such as Automatic Doors.

1.5.3.3 Submit a complete record of instructions as part of maintenance instructions and data book given to the Commissioning Authority and Consultant. For each instructional session, supply following data:

1.5.3.3.1 date.

1.5.3.3.2 system or equipment involved.

1.5.3.3.3 names of persons giving instructions.

1.5.3.3.4 names of persons being instructed.

1.5.3.3.5 other persons present.

1.5.3.3.6 carry out instructional session during a continuous period agreed on with the Commissioning Authority and Consultant.

1.5.3.4 Permit Commissioning Authority, Consultant and authorized representative(s) usage of systems prior to Substantial Performance for the purpose of testing and learning operational procedures. This usage shall not affect warranties and no claim for damage shall be made against the Commissioning Authority and Consultant for any injury or breakage to any part or parts of the above due to aforementioned tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or quality of performance of any kind.

- 1.5.3.5 At the end of training, obtain and submit to Commissioning Authority and Consultant, signature of the Owner's authorized representative(s) stating they understand the system and equipment installation, operation and maintenance requirements
- 1.5.3.6 Obtain and submit to Commissioning Authority and Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.
- 1.5.3.7 The only exception to the foregoing requirements for acceptance of equipment and systems will be 'fine tuning' which may be performed prior to Completion of Contract.
- 1.5.3.8 In conjunction with the foregoing requirements, the Contractor shall arrange the necessary inspections and obtain written approval and acceptance of equipment and systems requiring approval by authorities having jurisdiction, and subsequent correction of those unacceptable items to the satisfaction of such authorities.

1.6 OPERATION AND MAINTENANCE

- 1.6.1 Contractor shall not be reimbursed for repairs or replacements performed in connection with provisions of Warranty.

1.7 RECONSTRUCTION

- 1.7.1 Provide necessary renovation and reconstruction of existing facilities as required in Contract Documents.

END

PART 1 – GENERAL

1.1 DEFINITIONS

- 1.1.1 Validate: for tests and demonstrations: to witness and validate successful performance demonstration or record deficiencies; to validate after correction successful demonstration; these validations of the tests become references for the Consultant's certification.
- 1.1.2 Certify: for documents including as-built drawings: Review for accuracy and completeness or record deficiencies.
- 1.1.3 Witness: The Commissioning Authority will observe as required and record summary of test results.
- 1.1.4 BAS: Building Automation System for controls.
- 1.1.5 TAB: Testing and Balancing for system verification.
- 1.1.6 Commissioning Authority: Commissioning authority in charge of the commissioning process and recommends final acceptance.
- 1.1.7 Independent Third Party Agent: Independent agent specialized in installation and testing of the system and retained by the Contractor or Departmental Representative.

1.2 REFERENCES

- 1.2.1 Section 01 91 13 Facility Commissioning - General
- 1.2.2 NFPA 13-2003 Installation of Sprinkler Systems
- 1.2.3 National Building Code Latest version of National Building Code
- 1.2.4 NECB 2011 National Energy Code of Canada for Buildings
- 1.2.5 CSA B52-05 Mechanical Refrigeration
- 1.2.6 CP.1 PWGSC Commissioning Manual 2006

1.3 DOCUMENTS

- 1.3.1 In case of discrepancies or conflicts between documents, documents will be governed in the order specified in Division 1.

1.4 COMMISSIONING OBJECTIVES

- 1.4.1 Objectives of commissioning process are:
 - 1.4.1.1 to support quality management through monitoring and checking of installation;
 - 1.4.1.2 to verify system performance through testing and commissioning of completed installation;
-

- 1.4.1.3 to move completed facility from “static completion” state to optimal “dynamic” operating state;
- 1.4.1.4 to transfer facility from Contractor to Departmental Representative in such a manner that provision of a quality facility to Departmental Representative has been assured.
- 1.4.1.5 to optimize operating and maintenance through delivery of comprehensive quality training and instruction to Departmental Representative’s operating personnel.
- 1.4.1.6 to assure provision of accurate and useful historical records, such as, as-built drawings, test certificates, etc. to Departmental Representative. Such records provide important data for operating and maintaining systems as well as for future system testing, maintenance or renovations and to trouble shoot and repair the components of systems.
- 1.4.1.7 to extend commissioning into operational phase in order to verify performance levels under a range of operating conditions; such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on.
- 1.4.1.8 monitor operation, performance and maintenance programs; optimize system’s performance under normal operating conditions, reasonable possible operating conditions (equipment failure, partial system failure, etc.), partial occupancy, and full occupancy, under the direction and review of Commissioning Authority. This phase lasts throughout warranty period. It may, however, involve activities to ensure completion of:
 - 1.4.1.8.1 system debugging and optimization.
 - 1.4.1.8.2 completion of training and instruction for operating and maintenance personnel.
 - 1.4.1.8.3 completion of all commissioning activities on defective, seasonally-sensitive systems, for varying modes and periodic simulated emergency conditions.
- 1.4.1.9 commissioning shall be considered complete when all of the objectives of commissioning, as specified herein, have been achieved.

1.5 COMMISSIONING MEETINGS, SCHEDULING, AND REPORTING

- 1.5.1 Contractor shall include the commissioning plan in their construction schedule and shall schedule for all tests and equipment start-up.
 - 1.5.2 Commissioning meetings shall be scheduled as required. The meetings shall address commissioning related responsibilities as well as all specified testing, documentation, O&M manuals, training, and post construction requirements. The testing schedules and results of all tests shall be reviewed at the meetings.
-

- 1.5.3 Where construction may be completed in phases, allow for the frequency of meetings to correspond to the varying stages of construction of each phase.
- 1.5.4 The Contractor shall attend commissioning meetings at regular intervals, as called by the Commissioning Authority.
- 1.5.5 The Contractor shall schedule work to include specified Commissioning related tasks. Cooperate with the Departmental Representative's Commissioning Authority, and coordinate subtrades as required, to successfully demonstrate and verify commissioning related testing and verifications.
- 1.5.6 The Contractor shall schedule work to include specified Commissioning related testing prior to Departmental Representative's demonstration and Departmental Representative's training.
- 1.5.7 Testing forms and reports associated with the mechanical systems shall be directed to the Departmental Representative, to the Consultant, and to the Commissioning Authority.
- 1.5.8 The forms and reports to be issued shall include:
 - 1.5.8.1 shop drawings, issued and accepted;
 - 1.5.8.2 equipment verification forms;
 - 1.5.8.3 testing forms;
 - 1.5.8.4 reports resulting from tests;
 - 1.5.8.5 testing schedule;
 - 1.5.8.6 minutes of commissioning meetings.

1.6 WARRANTY

- 1.6.1 Involvement of Commissioning Authority does not void any guarantees or warranties nor does it relieve Contractor of any contractual responsibilities.

1.7 RESPONSIBILITIES OF COMMISSIONING AUTHORITY (CxA)

- 1.7.1 Responsibilities of Commissioning Authority are as follows:
 - 1.7.1.1 Design Phase:
 - 1.7.1.1.1 participate in design team meetings. Obtain Departmental Representative's requirements and Consultant's philosophy and intent and expected system performance. This will form the basics of the testing and commissioning documents.
 - 1.7.1.1.2 provide input and feedback to design team with emphasis on testing, commissioning, operation and maintenance of the proposed system and equipment.
-

1.7.1.1.3 provide commissioning document to form part of the Bid documents.

1.7.1.2 Bid Phase:

1.7.1.2.1 provide commissioning related comments for incorporation in Contract Documents.

1.7.1.3 Construction Phase:

1.7.1.3.1 review Contractor's approved shop drawing submission for commissioning related issues.

1.7.1.3.2 prepare commissioning plan based on the Contractor's schedule and installation method statement;

1.7.1.3.3 monitor, check and inspect the installation throughout the construction stages.

1.7.1.3.4 supervise the commissioning, including scheduling.

1.7.1.3.5 issue deficiencies reports noting any issues that may have an impact on the commissioning of the equipment or system.

1.7.1.3.6 attend construction site meetings as required to discuss commissioning related items and any impact on Project schedule.

1.7.1.3.7 set-up and chair commissioning meetings.

1.7.1.3.8 witness and validate tests; note deficiencies and issue progress reports.

1.7.1.3.9 work with the project team to expeditiously resolve any problems that may arise due to site conditions.

1.7.1.3.10 prepare Building Management Manual.

1.7.1.3.11 coordinate with Departmental Representative, training and instructions provided by Contractors, manufacturers and Suppliers.

1.7.1.4 Post-Construction Phase:

1.7.1.4.1 prepare final report on commissioning, identifying any deficiencies that may be outstanding.

1.7.1.4.2 recommendation of any additional training and/or instruction of operating and maintenance personnel deemed necessary over and above that already provided.

1.7.1.4.3 complete system checks with Contractor.

1.8 RESPONSIBILITIES OF DEPARTMENTAL REPRESENTATIVE

1.8.1 Responsibilities of Departmental Representative are as follows:

- 1.8.1.1 to provide operating personnel to attend training and instruction regarding specific components, equipment and systems.
- 1.8.1.2 to observe on-site installation, start-up and testing equipment and systems.

1.9 RESPONSIBILITIES OF CONSULTANT

1.9.1 Responsibilities of Consultant are as follows:

- 1.9.1.1 review Contractor's shop drawings submission to verify general conformance with contract documents;
- 1.9.1.2 periodically observe the installation throughout the construction stages to determine that the installation generally conforms to the requirements of the contract documents and issue field observation reports;
- 1.9.1.3 review operating and maintenance manuals, balancing and test reports and as-builts for completeness;
- 1.9.1.4 witness selected tests; note deficiencies and provide field observation reports;

1.10 RESPONSIBILITIES OF CONTRACTOR

1.10.1 Responsibilities of Contractor are as follows:

1.10.1.1 Construction Phase:

- 1.10.1.1.1 to manage and ensure entire installation comply with requirements of the Contract Documents;
 - 1.10.1.1.2 submit shop drawings complete with Contractor's Stamp of Review;
 - 1.10.1.1.3 submit working detail (interference or installation) drawings, as required;
 - 1.10.1.1.4 complete commissioning data test forms provided by the Commissioning Authority;
 - 1.10.1.1.5 complete Airport's Facility Management New Equipment forms;
 - 1.10.1.1.6 submit installation method statement. This generally includes:
 - 1.10.1.1.6.1 method of equipment delivery to the installation location on site;
 - 1.10.1.1.6.2 prerequisite preparation for delivery, such as completion of the factory testing and the completion of site work to accept this equipment;
 - 1.10.1.1.6.3 installation method and sequences of installing the equipment and the associated connections to the equipment;
-

- 1.10.1.1.7 submit an installation schedule. This schedule shall include:
 - 1.10.1.1.7.1 time schedule of each activity, with lead and lag time allowed and indicated;
 - 1.10.1.1.7.2 shop drawings and working detail drawings submission;
 - 1.10.1.1.7.3 major equipment delivery and factory testing date
 - 1.10.1.1.7.4 coordinated installation activities and sequences in compliance with the Construction Manager's project schedule and other trade's installation schedule;
 - 1.10.1.1.7.5 schedule of testing and commissioning of the systems and major equipment;
 - 1.10.1.1.8 attend progress and commissioning meetings;
 - 1.10.1.1.9 promptly rectify or replace reported deficiencies and defects;
 - 1.10.1.1.10 where required by codes and/or specification, retain manufacturers and/or independent third parties to provide service for testing and certification of the systems and training of Departmental Representative's personnel;
 - 1.10.1.1.11 provide training and instruction to the Departmental Representative's operating personnel;
 - 1.10.1.1.12 perform testing and commissioning of equipment and systems to the satisfaction of the Consultant and Commissioning Authority as stated in approved schedule and method described above. Testing and commissioning will be witness by the Commissioning Authority as required. Contractor or his retained agents shall also record procedure and finding in approved test and record forms. Submit test and record forms with the signature of the tester for review and approval to the Consultant and Commissioning Authority;
 - 1.10.1.1.13 pay for and be responsible for all inspections required by codes, specification and Authorities having Jurisdiction. Obtain and submit all Certificate of Approval for such inspections and verifications;
 - 1.10.1.1.14 submit for review as-builts drawings including those for location of control devices and wiring and operating and maintenance manuals for each equipment as per the specification requirements;
 - 1.10.1.1.15 provide Operating and Maintenance Manuals for review by the Consultant and Commissioning Authority with all the testing and commissioning results and reports incorporated;
 - 1.10.1.1.16 obtain, issue and assign warranties for equipment and systems to the Departmental Representative;
-

1.10.1.1.17 provision of all necessary test equipment shall be the responsibility of the contractor. Provide recently validated calibration certificate for all equipment to be used for verification prior to testing and commissioning commencement.

1.10.1.2 Post-Construction Phase:

1.10.1.2.1 optimize operation according to occupant's needs, using the Building Management Manual prepared by the Commissioning Authority as reference points;

1.10.1.2.2 complete all commissioning procedures and activities and performance verification procedures which were delayed or not concluded during the commissioning phase;

1.10.1.2.3 complete system checks:

1.10.1.2.3.1 once during the first month of building operation;

1.10.1.2.3.2 once during the third month of building operation;

1.10.1.2.3.3 once between the fourth and tenth months in a season opposite to the first or third month visit;

1.10.1.2.4 complete rectification of all deficiencies revealed by these checks. Equipment manufacturers involved in commissioning shall participate in systems checks.

1.10.1.2.5 revise all "as-built" and operating and maintenance documents to reflect all changes, modifications, revisions and adjustment upon completion of commissioning;

1.10.1.2.6 schedule a question and answer session for the operating and maintenance personnel 3 months after handover of the facility to the Departmental Representative. The duration of this session or sessions will be dictated by the number of questions or concerns that shall be addressed.

1.11 COMMISSIONING INVOLVEMENT

1.11.1 Commissioning Authority shall direct, witness and validate as required; and Contractor and/or his Suppliers or retained Independent Third Party Agents shall perform the following:

1.11.1.1 check and ensure installation of systems and equipment to ensure installations are completed and in a proper and safe state ready for testing and commissioning;

1.11.1.2 Start-up: run the systems and equipment to verify their operation, direction, and installation prior to testing and verification;

- 1.11.1.3 Testing/Verification: run and test the systems and equipment through their design parameters to verify their capabilities in performance, sequencing, safety protection and alarms annunciation;
- 1.11.1.4 Testing/Verification: run and test the systems and equipment through actual or simulated normal and reasonable possible situations to verify their capabilities in performance, sequencing, safety protection and alarms annunciation;
- 1.11.1.5 ensure deficiencies and defects found are rectified and replaced and the systems and equipment re-tested as required;
- 1.11.1.6 arrange and provide demonstration and training of Departmental Representatives' personnel;
- 1.11.1.7 issue Operating and Maintenance Manuals for systems and equipment;

1.12 SYSTEMS TO BE COMMISSIONED

1.12.1 Mechanical systems shall include but not limited to following:

- 1.12.1.1 Plumbing and drainage;
- 1.12.1.2 chemical treatment of systems;
- 1.12.1.3 fire protection systems; sprinkler and water supply;
- 1.12.1.4 distribution systems;
- 1.12.1.5 Domestic Hot Water Heating (HWT-1)
- 1.12.1.6 Unit Heaters (UH-1 to UH-9)
- 1.12.1.7 Air Handling Units (AHU-1 to AHU-5)
- 1.12.1.8 Air-Cooled Condensers (Cond-1 to Cond-5)
- 1.12.1.9 VAV Boxes (VAV-1 to VAV-30)
- 1.12.1.10 Fans (H-1 and EF-1 to EF-4)
- 1.12.1.11 Hydronic heating system;
- 1.12.1.12 building automation system (controls).

1.13 TESTING EQUIPMENT

- 1.13.1 Contractor and manufacturer shall provide all instrumentation and test equipment necessary to conduct the tests specified during the commissioning process. Contractor shall submit a list of equipment to be used and copies of latest equipment calibration certificates to the Commissioning Authority and Consultant for approval.
-

1.13.2 Mechanical Testing Equipment:

1.13.2.1 Following equipment shall be provided but not limited to:

- 1.13.2.1.1 pressure measurements: manometers, pressure gauges, digital pressure readers, pressure trending devices;
- 1.13.2.1.2 temperature measurements: thermometers, digital thermometers, thermocouples, temperature trending devices;
- 1.13.2.1.3 velocity measurement: pitot tube, propeller or revolving vane manometer, thermo anemometers, hot wire anemometers;
- 1.13.2.1.4 volume or mass flow measurement: venturi, nozzle and orifice flowmeter, positive displacement meter;
- 1.13.2.1.5 rotative speed: tachometer;
- 1.13.2.1.6 combustion analysis: flue gas analysis;
- 1.13.2.1.7 sound measurement: electronic sound level meter for acoustic measurement with octave band analysis;
- 1.13.2.1.8 vibration measurement: accelerometer;
- 1.13.2.1.9 recording: chart recorder;
- 1.13.2.1.10 electrical measurements: voltmeter, ammeter and wattmeter;
- 1.13.2.1.11 Any other equipment specified by the manufacturer to perform required testing and verification.

1.14 DOCUMENTATION

- 1.14.1 Contractor shall record test results and procedures on approved record forms and submit the forms together with copies of test certificates to Consultant and Commissioning Authority for review and approval.
- 1.14.2 When results are validated, Commissioning Authority shall incorporate those records in the Building Management Manual as reference for future system/equipment performance tests.

1.15 COMMISSIONING PROCESS

- 1.15.1 Commissioning Authority: to perform and complete all work as specified in the “GENERAL” Section of this specification “Responsibilities of Commissioning Authority”.
 - 1.15.2 Contractors: To perform and complete all works as specified in the “GENERAL” Section of this specification “Responsibilities of Contractor”. In general, it shall include complete activation of all systems; calibration, test, and verification of performance of all
-

components, equipment and systems; verification of performance of all systems through all specified modes of control and sequence of operation along with simulated reasonable operational situations; rectification of deficiencies; recording of test results for submission; demonstration, instruction and training of Departmental Representative's operating and maintenance personnel; follow-up during first year of operation for fine tuning and building service monitoring.

1.15.3 Equipment verification: Contractor shall complete the equipment verification forms for each piece of equipment. Forms shall be submitted to the Commissioning Authority for inclusion in the final commissioning report. Equipment data shall include, but is not limited to:

- 1.15.3.1 manufacturer's name, address and telephone number;
- 1.15.3.2 distributors' name, address and telephone number;
- 1.15.3.3 make, model number and serial number;
- 1.15.3.4 pumps – type, RPM, impeller sizes, rated flow;
- 1.15.3.5 fans – belt type and size, sheave type and size;
- 1.15.3.6 electrical – volts, amps, fuse size, overload size;
- 1.15.3.7 equipment enclosure type;
- 1.15.3.8 switchboard, panel board – volt, rated current, number of phase and fault rating;
- 1.15.3.9 any other special characteristics.

1.15.4 Pre-requisites to Functional Performance Testing (FPT) for a System/Assembly in order of required completion:

- 1.15.4.1 Prefunctional / Facility Management forms completed
 - 1.15.4.2 Static Installation Completed
 - 1.15.4.3 Mechanical Contractor Testing and Verification
 - 1.15.4.4 Testing Adjusting and Balancing of Air and Water
 - 1.15.4.5 Controls Point to Point Complete
 - 1.15.4.6 Controls Sequence of operation complete
 - 1.15.4.7 Controls Testing and Verification
 - 1.15.4.8 Controls Graphics complete
 - 1.15.4.9 BMS Integration (BacNet etc) complete
-

1.15.4.10 Mechanical Inspection Deficiencies complete

1.15.4.11 The contractor is to perform a dry run of the Functional Performance Testing prior to the start of FPT by the Commissioning Authority.

1.15.5 Functional Performance Testing by the Commissioning Authority (CxA):

1.15.6 It is expected that once the contractor has performed a dry run of the Functional Performance Test (FPT) and is satisfied that the system is working properly; the contractor will invite the Commissioning Authority to the Functional Performance Testing.

1.15.7 During the Functional Performance Testing; minor issues (that can be resolved in 15 – 30 minutes) will be tolerated to an extent depending on the importance/severity of the issue. Once two minor issues have been encountered; testing may be suspended (and re-scheduled) at the Commissioning Authority's discretion.

1.15.8 If the first Functional Performance Test fails, the cost of re-testing(s) will be the contractor's.

1.15.9 Any System/Assembly that is microprocessor based, and includes any customized programming/software is required to pass functional performance testing without any failure. Partial functional performance testing is not acceptable. Should any aspect of the functional performance test fail, defects shall be corrected and the entire test shall be repeated.

1.16 TESTING FOR MECHANICAL SYSTEMS

1.16.1 Plumbing and Drainage System Testing:

1.16.1.1 Plumbing and drainage system shall be tested in accordance with the National Building Code of Canada and Municipal Regulations.

1.16.1.2 Contractor shall notify Building Inspector when systems are available for testing. Contractor shall document all tests performed and shall arrange for Building Inspector to sign for tests completed. Forward forms to Consultant and Commissioning Authority for review.

1.16.1.3 When the plumbing system has been completed take a sample of the drinking water, in the presence of the Consultant. Forward the sample to a testing laboratory which shall be approved by the Consultant. Forward the test results to the Consultant and Commissioning Authority. Include for all cost of water analysis.

1.16.1.4 Also perform hydrostatic pressure test and system flush and disinfection for domestic hot and cold water systems as per the specification.

1.16.1.5 Perform a videotape of all under slab drainage systems to ensure no damage/clogs are visible.

1.16.2 Water Treatment Systems:

- 1.16.2.1 Contractor shall employ a Chemical Treatment Specialist who shall assist the Contractor with selection of the chemical treatment system, inspect the installation and test the system. Specialist shall complete manufacturers' testing forms and submit a report to the Consultant.
- 1.16.2.2 Specialist shall assist Contractor to clean all piping systems. Specialist shall take samples and repeat the cleaning process if specification requirements are not met.
- 1.16.2.3 Specialist shall assist Contractor and add chemical immediately after the cleaning process for each system for protection. The specialist shall take samples and repeat the process until specification requirements are met.
- 1.16.2.4 Ensure 'water potable test' as part of life safety section of Close-out Submittals.

1.16.3 Fire Protection System and Smoke Control and Evacuation System:

- 1.16.3.1 Contractor shall hydrostatically test the systems as per the specifications and NFPA requirements to meet all certifications. The test shall be witnessed. Provide a copy of the report in NFPA 13 reporting format for all such test to the Commissioning Authority.
- 1.16.3.2 Contractor to perform flow, alarm, drain flow and supervision as required.
- 1.16.3.3 Coordinate interfacing with fire alarm control panel installation specified under Division 28. Perform test include smoke control and evacuation as required by this specification, National Building Code and its Supplementary Guidelines and Authorities having Jurisdiction.
- 1.16.3.4 Obtain approval certificates from Authorities having Jurisdiction and submit copies of the certificates to the Commissioning Authority for review.

1.16.4 Contractor's testing of piping systems (applicable to hydronic circulation, domestic hot and cold water, steam and condensate)

- 1.16.4.1 Test all piping systems in accordance with all applicable Plumbing Codes and CSA B139.
 - 1.16.4.2 All other systems not covered by Codes noted above shall be tested and proven tight over a period of 24 hours by a hydrostatic test. Remove fixtures, appliances, devices, vents and gauges and temporarily plug connections as required. Provide temporary by-pass when required. Protect equipment not capable of withstanding test pressure during testing.
 - 1.16.4.3 Test pressure for water systems (heating, domestic cold and hot water) shall be:
 - 1.16.4.3.1 1-1/2 times the system working pressure but not less than 100 psig for a minimum of 4 hours;
-

- 1.16.4.3.2 test pressure shall be limited to the maximum working pressure of expansion joints and vibration isolators.
 - 1.16.4.4 Repair any leaks or defects and repeat the tests to the satisfaction of the Consultant.
 - 1.16.4.5 After completion of the testing, rough balance the water systems and ensure all coils, converters, etc., are operating approximately to the design conditions to ensure freezing conditions will not occur anywhere. Adjust the circuits by means of the balancing valves.
 - 1.16.4.6 Where multiple branch, domestic hot recirculation or drinking fountain chilled water lines are installed, the flow in these shall be balanced to ensure hot or chilled water, as applicable, at all fixtures.
 - 1.16.4.7 All tests for the systems shall be witnessed. Complete the testing forms and forward copies of the tests reports to the Consultant and Commissioning Authority.
 - 1.16.4.8 Coordinate with TAB Contractor to ensure all necessary valves required for balancing the system are installed.
 - 1.16.4.9 Notify Consultant and Commissioning Authority in writing that this coordination has taken place before installation begins. If Contractor fails to coordinate with TAB Contractor and if failure to co-ordinate results in being unable to balance the systems, the cost of any changes required shall be paid for by Contractor at no cost to Departmental Representative.
 - 1.16.4.10 Ensure all cooling coil drain pans drain freely and that no standing water remains.
 - 1.16.4.11 Ensure access is provided to all valves and equipment that requires servicing.
 - 1.16.4.12 Contractor is responsible for all equipment operating to design conditions and shall trim impellers, etc., to provide the required conditions, but is not responsible for the final balancing of the system, which shall be carried out by TAB Contractor. Final verification of balancing to be coordinated by the TAB Contractor and witnessed/verified by the Commissioning Authority.
 - 1.16.4.13 Contractor shall make available staff at no extra cost to Departmental Representative, as required by TAB Contractor, to correct any deficiencies in the mechanical systems which prevent TAB Contractor from balancing the system.
 - 1.16.4.14 Contractor shall provide copies of all shop drawings requested by TAB Contractor.
 - 1.16.5 The Independent Testing and Balancing Contractor's balancing of water and glycol hydronic systems:
 - 1.16.5.1 Contractor shall co-ordinate with TAB Contractor and provide assistance during balancing process.
-

- 1.16.5.2 Balancing shall not begin until all point to point and BAS component testing has been satisfactorily completed.
 - 1.16.5.3 TAB Contractor shall balance the entire water system to ensure all equipment and systems are operating to design conditions. Adjust the circuits by means of the balancing valves and record the balance positions.
 - 1.16.5.4 Each pump shall be checked for design, working and shut-off head conditions. Any pump that varies by more than 10% from the design conditions shall have the impeller trimmed or pump changed until design conditions have been met. Contractor shall pay for impeller trimming.
 - 1.16.5.5 Flow through all heat exchangers and other such equipment shall be balanced to ensure that the pressure drop through the equipment is within 10% of manufacturer's design conditions.
 - 1.16.5.6 Initial balancing of coils shall be used to ensure that the pressure drops are within 10% of manufacturers' design conditions. When both the air and water systems are fully operational, entering air and water, and leaving air and water readings shall be taken as close as possible to the peak design conditions to ensure the coil performance meets the design conditions. Coil water working conditions shall only be taken in conjunction with the air flow working conditions for the coil.
 - 1.16.5.7 Adjust bleed-off from evaporative condensers, spray coils and similar equipment to prevent lime deposits. Record bleed-off rate.
 - 1.16.5.8 TAB Contractor shall co-ordinate with Contractor to ensure all necessary devices and valves for control and balancing are installed in all necessary locations. Notify Consultant and Commissioning Authority in writing that this co-ordination has taken place. Include in this letter any recommendations made regarding valves, locations, installation, etc. If TAB Contractor fails to coordinate with Contractor and if failure to co-ordinate results in being unable to balance the systems, the cost of any changes required shall be paid for by TAB Contractor at no cost to Departmental Representative.
 - 1.16.5.9 TAB Contractor shall not disconnect any direct digital control (DDC) device after it has been calibrated. BAS Contractor shall make all necessary adjustments through the control system as requested by TAB Contractor. If TAB Contractor fails to co-ordinate with BAS Contractor and if failure to co-ordinate results in any cost, the cost of any change required shall be paid for by TAB Contractor at no cost to Departmental Representative.
 - 1.16.5.10 TAB Contractor shall coordinate with the BAS Contractor and receive instruction regarding set-up, calibration and operation of the DDC as it applies to the TAB Contractor work. The BAS Contractor shall provide the TAB Contractor with a portable operator's terminal for this work.
 - 1.16.5.11 TAB Contractor is responsible for balancing the systems to obtain the design conditions and shall repeat the balancing until the required conditions have been met.
-

- 1.16.5.12 At time of final inspection, recheck, in presence of Consultant and Commissioning Authority, random selections of data recorded in the certified report. Points or areas of recheck shall be selected by Consultant/Commissioning Authority and shall be up to a maximum of 50% of the report data.
 - 1.16.5.13 A measured deviation of more than 10% between the verification reading and the reported data will be considered as failing the verification procedure.
 - 1.16.5.14 A failure of more than 10% of the selected verification readings will be considered unacceptable and will result in rejection of the report.
 - 1.16.5.15 In the event the report is rejected, rebalance all systems, submit new certified reports and perform a re-inspection, all at no additional cost to Departmental Representative.
 - 1.16.5.16 Following final acceptance of the certified reports by Consultant, permanently mark the settings of all valves and other adjustable devices so that balance set position can be restored if distributed at any time. For circuit balancing valves, record the valve position by the number of turns registered on the valve and lock the valve into that position. Do not mark such devices until after final acceptance.
 - 1.16.5.17 Submit 1 Hard copy in a binder and 1 PDF on a USB drive of the final testing and balancing reports to Consultant. Reports shall be complete with index pages and index tabs and certified by TAB Contractor. Any diagram or single line representation of a mechanical system specifically prepared for this project shall be prepared using a CAD system and shall be acceptable to Consultant.
 - 1.16.5.18 Submit a copy of the report to Commissioning Authority for review.
 - 1.16.5.19 Include in the water balancing report: Types, serial numbers, dates, and calibration of all instruments used in balancing report.
- 1.16.6 Contractor's Testing of Air Distribution Systems:
- 1.16.6.1 Contractor shall test for air leakage in accordance with SMACNA Manuals and Standards, all ductwork with the exception of ductwork downstream of variable air volume boxes or other pressure reducing devices. Seal ducts at all equipment connections and pressurize with a smaller blower. Test methods and results shall be in compliance with HVAC air duct leakage test manuals of SMACNA. In addition, seal any leaks. Test system as a whole or in parts, provided all ductwork is accessible for inspection at the time of test. Provide blower, calibrated orifice tube and all test equipment. (The inlet opening of the test blower shall be blocked off before the test blower is started. The inlet opening shall then be opened slowly to prevent over-pressurizing the system). Refer to the specifications for the criteria for leakage evaluation and for the definition of acceptable test results.
 - 1.16.6.2 Refer to specification Section related to Ductwork and Specialties for pressure ratings of ductwork and systems.
-

- 1.16.6.3 Entire system shall be tested for noise, tightness of joints and proper functioning of the system. Noise tests shall be made under minimum system pressure drop conditions (highest air velocities and clean filter conditions). This section shall make all necessary alterations and repeat the tests until satisfactory operation is achieved.
 - 1.16.6.4 All tests shall be performed in presence of Consultant. Complete the testing forms and forward to Consultant and Commissioning Authority.
 - 1.16.6.5 Adjust minimum outside air controller and adjust return air and exhaust air damper linkages to approximately design air quantities, for both maximum and minimum conditions where required, to ensure freezing conditions will not occur.
 - 1.16.6.6 Coordinate with TAB Contractor to ensure all necessary manual dampers and splitter dampers for balancing the system are installed. Notify Consultant in writing that this co-ordination has taken place before installation begins. If this Contractor fails to coordinate with TAB Contractor and if failure to co-ordinate results in being unable to balance the systems, the cost of any changes required shall be paid for by Contractor at no cost to Departmental Representative.
 - 1.16.6.7 The testing equipment shall be itemized in the test reports and shall be approved by the Consultant before any tests are undertaken. Calibration of the test equipment must be submitted, confirmed, and approved by the Consultant before any tests are undertaken.
 - 1.16.6.8 Ensure access is provided to all fire dampers and equipment that require servicing. Fire damper operation to be verified by the Commissioning Authority with, and coordinated by, the Contractor.
 - 1.16.6.9 Contractor is responsible for all equipment operating to design conditions and shall change fan sheaves, etc., to provide the required conditions, but is not responsible for the final balancing of the system.
 - 1.16.6.10 Contractor shall make available staff, as required by TAB Contractor, to correct any deficiencies in mechanical systems which prevent TAB Contractor from balancing system.
 - 1.16.6.11 Contractor shall provide copies of all shop drawings requested by TAB Contractor.
 - 1.16.6.12 Contractor shall provide access ports for balancing as requested by TAB Contractor.
 - 1.16.7 The Independent Testing and Balancing Contractor's balancing of air systems:
 - 1.16.7.1 Contractor shall co-ordinate with TAB Contractor and provide assistance during the balancing process.
 - 1.16.7.2 Balancing shall not begin until all point to point and BAS component testing has been satisfactorily completed.
-

- 1.16.7.3 TAB Contractor shall balance the entire air systems including air volumes and control settings under maximum system pressure drop conditions (filter at replacement condition).
 - 1.16.7.4 TAB Contractor shall take air measurements, make final adjustments and report upon the air volume at each variable volume box, diffuser, register and grille. Measure the static pressure upstream and downstream of the fan, the fan speed and the motor current.
 - 1.16.7.5 Measure the return and supply air flow when mixing dampers are set for full outside air and minimum outside air position.
 - 1.16.7.6 Set the minimum position for the mixing dampers. Coordinate with BAS Contractor.
 - 1.16.7.7 Contractor shall provide new filters, when the final balancing has been completed.
 - 1.16.7.8 Air volumes measured by TAB Contractor shall be within $\pm 5\%$ of those shown on Drawings for diffusers, grilles, registers, variable air volume boxes and fans, at both maximum and minimum volumes shown.
 - 1.16.7.9 Duct traverse readings shall be taken through access ports. The access ports shall be Duro Dyne IP-1 or IP-2 air tight type. Duct tape is not acceptable.
 - 1.16.7.10 The insulation or vapour barrier shall be repaired in an approved manner, if damaged.
 - 1.16.7.11 For variable air volume boxes, TAB Contractor shall verify the minimum and maximum air volumes after the VAV boxes are commissioned by the BAS Contractor.
 - 1.16.7.12 In all cases where measurements by TAB Contractor show failure to comply with the drawings and specifications, Contractor at no cost to Departmental Representative shall change fan sheaves, etc., as required, and new balancing measurements shall be taken, and a report issued, by TAB Contractor.
 - 1.16.7.13 Ensure all thermostats and controls are set to give the specified conditions and include settings in the report.
 - 1.16.7.14 Adjust each supply outlet to provide proper throw and distribution in accordance with architectural requirements.
 - 1.16.7.15 Fans on all systems shall be set-up to give the minimum discharge pressure required to overcome the resistance of the box, discharge ductwork and diffusers.
 - 1.16.7.16 Coordinate with Contractor to ensure that all necessary manual and splitter dampers for balancing are installed in all necessary locations. Notify Consultant in writing that this co-ordination has taken place. Include in this letter any recommendations made regarding dampers, locations, installation, etc. If TAB Contractor fails to co-ordinate with Contractor and if failure to co-ordinate results
-

in being unable to balance the systems, the cost of any changes required shall be paid for by TAB Contractor at no cost to Departmental Representative.

- 1.16.7.17 TAB Contractor shall not disconnect any control device after it has been calibrated. BAS Contractor shall make all necessary adjustments through Building Automation and Controls Systems as requested by TAB Contractor. If TAB Contractor fails to co-ordinate with BAS Contractor and if failure to co-ordinate results in any cost, the cost of any change required shall be paid for by TAB Contractor at no cost to Departmental Representative.
 - 1.16.7.18 TAB Contractor shall co-ordinate with BAS Contractor and receive instruction regarding set-up, calibration and operation of the DDC as it applies to TAB Contractor work. BAS Contractor shall provide, TAB Contractor, with a portable operator's terminal for this work.
 - 1.16.7.19 TAB Contractor is responsible for balancing the systems to obtain the design conditions and shall repeat the balancing until the required conditions have been met.
 - 1.16.7.20 At the time of final inspection, recheck in the presence of Consultant and Commissioning Authority random selections of air quantities and fan data recorded in the certified report. Points or areas for recheck would be selected by Consultant/Commissioning Authority and shall be a maximum of up to 50% of the report data.
 - 1.16.7.21 At the time of verification measure space temperature and relative humidity in a representative number of rooms to verify performance. Tabulate these results and include in certified report as an appendix.
 - 1.16.7.22 A measured flow deviation of more than 10% between the verification reading and the reported data will be considered as failing the verification procedure.
 - 1.16.7.23 A failure of more than 10% of the selected verification readings will be considered unacceptable and will result in rejection of the report.
 - 1.16.7.24 In the event the report is rejected, rebalance all systems, submit new certified reports and re-inspect, all at no additional cost to Departmental Representative.
 - 1.16.7.25 Following final acceptance of the certified report by Consultant, permanently mark the settings of all dampers, splitters and other adjustable devices so balance set position can be restored if distributed at any time. Do not mark such devices until after final acceptance.
 - 1.16.7.26 Submit one Searchable PDF copy of the final testing and balancing report to Consultant. Reports shall be complete with index pages and index tabs and certified by TAB Contractor. Any diagram or single line representation of a mechanical system specifically prepared for this project shall be prepared using a CAD system and shall be acceptable to Consultant.
 - 1.16.7.27 Submit a copy of the report to Commissioning Authority for review.
-

1.16.7.28 Include in balancing report:

- 1.16.7.28.1 types, serial numbers and dates of calibration of all instruments used in balancing report;
- 1.16.7.28.2 equipment data, manufacturer and model size, arrangement discharge and class, motor type, horse power, voltage, phase, cycles and full load amps. Location and local identification data;
- 1.16.7.28.3 fan design data, total volume flow rate, static pressure, motor type, RPM, volts, full load amps and outside air flow rate;
- 1.16.7.28.4 a complete system schematic with design and actual flow rates at each outlet or inlet. Show room numbers and floors. Duct air quantities: for mains, branches and maximum and minimum for outside air and exhausts, duct size, pressure readings, average velocity, duct recorded flow rates, duct design flow rates. Air inlet and outlets, supply or exhaust outlet identification. Location and number designation;
- 1.16.7.28.5 Manufacturers' catalogue identification and type, of air inlets and outlets application factors, designated area, design and recorded velocities, design and recorded air flow rates, deflector vane of diffusion cone settings.

1.16.8 Testing of HVAC and Specialties Equipment and Systems:

1.16.8.1 General:

- 1.16.8.1.1 Contractor shall prepare and submit for approval, Commissioning Plan and schedule which includes:
 - 1.16.8.1.1.1 the status of systems to be able to perform tests;
 - 1.16.8.1.1.2 required testing equipment;
 - 1.16.8.1.1.3 Manufacturers' commissioning time for all systems and equipment;
 - 1.16.8.1.1.4 required time for remedial works if necessary;
 - 1.16.8.1.1.5 staged start-up and commissioning of the systems.
 - 1.16.8.1.2 Start-up and test procedures must be consistent with manufacturer's recommendations contained in the Operating and Maintenance Manual.
 - 1.16.8.1.3 The start-up report shall record all observations made during the start-up procedures including problems and their resolutions.
 - 1.16.8.1.4 Contractor shall retain the services of the manufacturer's technicians to test the equipment and associated systems. Technician shall record the results of the tests on the testing forms. The tests shall be witnessed by Consultant. When tests have been completed satisfactorily the technician and witnessing authority shall sign the forms. A copy of the forms shall be
-

forwarded to the Consultant and Commissioning Authority. The original shall be inserted into the System Description Manual.

- 1.16.8.1.5 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed by the Consultant and the Commissioning Authority.
- 1.16.8.1.6 Tests which have not been witnessed shall not be accepted and shall be repeated.
- 1.16.8.1.7 Equipment and systems to be tested shall include but not limited to those listed in 1.12 Systems to be Commissioned.

1.16.9 Air Handling Systems:

- 1.16.9.1 Air handling units shall be inspected and tested by manufacturer's technician. Technician shall enter the test results on forms provided by manufacturer. The Consultant shall witness the final operational test.
- 1.16.9.2 Technician shall verify that the air handling units have been installed according to manufacturer's recommendations, shop drawings and the specification.
- 1.16.9.3 Tests shall include verification of electrical power, electrical interlocks, safeties, control, DX compressor, remote condensing unit, heating coil and plenum/coils, fans, ductwork, dampers and fire dampers.
- 1.16.9.4 Technician shall start-up the air handling unit and monitor the operation for a minimum of 4 hours of running time after all tests have been completed. Technician shall revisit the site after 1 month of operation and monitor the operation of the system for a minimum period of 4 hours running time. Technician shall issue a report to Consultant after each visit.
- 1.16.9.5 Air handling unit manufacturer shall co-ordinate with BAS Contractor to provide the necessary interface to the Building Automation and Controls Systems. Technician shall witness the Building Automation and Controls Systems testing procedure for the air handling unit and sign the testing forms.
- 1.16.9.6 Contractor shall rectify any deficiencies identified by TAB Contractor.

1.16.10 Humidification System:

- 1.16.10.1 Humidifiers shall be inspected and tested by manufacturer's technician. Technician shall enter the test results on the forms provided by manufacturer. Consultant shall witness the final operational test.
 - 1.16.10.2 Technician shall verify humidifiers have been installed according to manufacturer's recommendations, shop drawings and the specification.
 - 1.16.10.3 Tests include verification of safeties and control, drains, steam piping and insulation, steam nozzles and distribution.
-

1.16.10.4 Technician shall start-up the humidifiers, record and monitor their operation for a minimum of 4 hours running time after the tests have been completed. Technician shall revisit the site after 1 month of operation and monitor the operation of the humidifiers for a minimum period of 4 hours running time. Reports shall be forwarded to Consultant after each visit.

1.16.10.5 Manufacturer shall co-ordinate with BAS Contractor to provide necessary interface to the Building Automation and Controls Systems. Technician shall witness the Building Automation and Controls Systems testing procedure and control of the humidifiers.

1.16.11 Heating Systems:

1.16.11.1 Heat exchangers, pumps and distribution piping shall be inspected and tested by manufacturer's technician. Technician shall enter the test results on forms provided by manufacturer. Consultant and Commissioning Authority shall witness the final operational test.

1.16.11.2 Technician shall verify heat exchangers and pumps have been installed according to manufacturer's recommendations, shop drawings and the specification.

1.16.11.3 Tests shall include verification of safeties and controls.

1.16.12 Building Automation and Controls Systems:

1.16.12.1 The Building Automation and Controls Systems shall be fully tested and commissioned by manufacturer's technician to operate in the manner defined by the specifications.

1.16.12.2 BAS Contractor shall provide a print-out of general and critical alarm lists and all points connected to the Building Automation and Controls Systems. The all point log shall be sub-divided into points per system. One report shall be taken prior to the acceptance test.

1.16.12.3 BAS Contractor shall provide an operating terminal and sufficient training and instruction to TAB Contractor which will allow them to set-up and balance the water and air systems.

1.16.12.4 A point-to-point testing shall be done by BAS Contractor. This test shall include, but is not limited to:

1.16.12.4.1 ensuring that wiring is accurately connected to appropriate terminals;

1.16.12.4.2 checking the function of each control and controlled device (such as the beginning, end and extent of actuator travel);

1.16.12.4.3 connection integrity between actuator and device;

1.16.12.4.4 calibration of sensors;

- 1.16.12.4.5 output from sensors;
 - 1.16.12.4.6 operation of relays;
 - 1.16.12.4.7 data/information integrity at console;
 - 1.16.12.4.8 remote reset integrity from console to field device;
 - 1.16.12.4.9 interfacing with other systems such as life safety monitoring system.
 - 1.16.12.4.10 BAS contractor in conjunction with the mechanical contractor shall create simulated design load conditions for control verification tests.
 - 1.16.12.5 Testing procedure shall include but is not limited to:
 - 1.16.12.5.1 check and verify that each input point is reporting to the Building Automation and Controls Systems panels and workstations in the normal state and change or state;
 - 1.16.12.5.2 create false alarms at each point and provide a print-out of the test;
 - 1.16.12.5.3 command each output point, via the workstation and verify the action at the device;
 - 1.16.12.5.4 verify that each time of day and optimum start program is operational in software and at the device;
 - 1.16.12.5.5 verify that each program is operational in software and at the device(s);
 - 1.16.12.5.6 verify that each system graphic is dynamically updating;
 - 1.16.12.5.7 test each DDC loop and verify that it is controlling in a stable manner. Create set point changes on output points. False loads shall be introduced to observe the control loops response. Program trend logs at the Building Automation and Controls Systems for a minimum of 30 minutes per control loop with a sampling time of 30 seconds. Provide a print-out of the results. Tune each DDC loop prior to acceptance test. Check each loop again, once during the heating and once during the cooling season and re-tune where necessary;
 - 1.16.12.5.8 verify that each report type is functional;
 - 1.16.12.5.9 verify that each global program that controls more than 1 system is operating;
 - 1.16.12.5.10 verify that all safeties are operating (ie. firestats);
 - 1.16.12.5.11 verify valve and damper actuation;
 - 1.16.12.5.12 verification of the minimum and maximum settings on VAV boxes;
-

- 1.16.12.5.13 verify the calibration of each analog input point.
- 1.16.12.6 Any sensor disconnected from the input terminal after completion of the performance test shall be retested.
- 1.16.12.7 BAS Contractor shall provide a “signed-off” copy of the results of all tests to the Consultant. Acceptance test will not begin until the tests have been reviewed and accepted. Consultant and Commissioning Authority shall witness these tests.
- 1.16.12.8 Provide the calibration procedure for each analog sensor. Physically check the calibration of each analog sensor type using a calibrated instrument prior to testing.
- 1.16.12.9 When all tests have been completed BAS Contractor shall request the acceptance test procedure shall begin. Consultant shall verify the installation is complete and all tests have been performed and have been successful. BAS Contractor shall then initiate the acceptance test.
- 1.16.12.10 The acceptance test period shall be 21 Days. BAS Contractor shall visit the site each morning. Monday to Friday, to review the Building Automation and Controls Systems operation and the building operators log book. The operators log book shall be provided by the BAS Contractor and shall contain all problems experienced by the Custodians. The log shall show the point name and number, time and date of failure and time of return service. During the first 14 Days of the acceptance test, any operational or equipment failures shall be corrected and the acceptance test shall continue from the date the failure has been corrected. During the last 7 Days of testing, no major failures of any kind will be accepted, or the last 7 Days shall be repeated.
- 1.16.12.11 During the acceptance test Contractor shall print out 1 “all-points” log per day. The logs shall be issued to Consultant for review.
- 1.16.12.12 BAS Contractor shall set up trend logs and group logs which shall be stored on hard disk for review by Consultant.
- 1.16.12.13 System shall not be accepted or considered substantially complete until all tests are completed and approved.
- 1.16.12.14 BAS Contractor shall provide a minimum of 2 weeks notice to Consultant prior to testing date.
- 1.16.12.15 BAS Contractor shall revisit the site during the first year of operation to review the performance of the Building Automation and Controls Systems. The review shall include DDC loop tuning, sensor calibration, programs, communication, DDC panels, workstations and the operational logs. The visits shall be a minimum of 8 hours each visit. The visits shall be:
- 1.16.12.15.1 beginning of cooling season;
- 1.16.12.15.2 during the cooling season;
-

1.16.12.15.3 beginning of heating season;

1.16.12.15.4 during the heating season.

1.17 OPERATING AND MAINTENANCE MANUAL

1.17.1 Contractor shall prepare and submit the Operating and Maintenance Manual to Consultant and Commissioning Authority 6 weeks prior to beginning of training.

1.17.2 The O&M manual to be in searchable PDF format.

1.17.3 Each Mechanical Operations and Maintenance manual shall be organized as per section 01 78 00 Closeout Submittals.

1.17.4 Contractor shall re-submit the manual should the Consultant find deficiencies. Training shall not begin until the manual has been accepted by the Consultant.

1.17.5 Operating procedures shall be the recommended manufacturer's operating procedures for the equipment.

1.17.6 Maintenance procedures shall include Scope of Work, frequency of activity, parts required and necessary documentation.

1.17.7 Spare parts list shall be manufacturer's recommended list for maintenance purposes.

1.17.8 Trouble shooting guide shall be manufacturer's recommendation for equipment.

1.17.9 Equipment list shall include make, model, serial number, electrical characteristics, RPM, pump impeller sizes, fan belt and sheave sizes.

1.17.10 Operating and Maintenance Manual shall be submitted to the Departmental Representative in searchable PDF format.

1.17.11 The Operating and Maintenance Manual will be used by the maintenance personnel to assist them in the daily operation of the systems.

1.18 BUILDING MANAGEMENT MANUAL

1.18.1 Building Management Manual shall be prepared by Commissioning Authority using data collected by Contractor and test results.

1.18.2 Commissioning Authority shall provide a copy of the Building Management Manual to the Departmental Representative.

1.19 OPERATOR TRAINING AND INSTRUCTIONS

1.19.1 Contractor and equipment manufacturers shall provide operator training for each mechanical system and equipment.

- 1.19.2 The training and instruction shall be provided by qualified technicians and shall be conducted in a classroom setting at the equipment or system.
 - 1.19.3 Departmental Representative Training Pre-requisites:
 - 1.19.3.1 O&M manual(s) been reviewed and approved by the engineers.
 - 1.19.3.2 For the system/assembly that training will occur on:
 - 1.19.3.2.1 TAB has been 100% completed, with no remaining deficiencies
 - 1.19.3.2.2 Contractor Testing and Verification has been 100% completed, with no remaining deficiencies
 - 1.19.3.2.3 Cx Functional Performance Testing has been 100% completed, with no remaining deficiencies, or items on the Commissioning Issues Log.
 - 1.19.3.3 Two weeks in advance of the scheduled training date, the following to be submitted to the Departmental Representative for review:
 - 1.19.3.3.1 An Agenda
 - 1.19.3.3.2 A Trainor's bio
 - 1.19.3.3.3 Training materials specific to the Agenda have been provided in electronic form for review and approval.
 - 1.19.3.4 The Departmental Representative reserves the right to reject the Trainor, or modify the agenda, if either are found to be unacceptable.
 - 1.19.4 Each session shall be structured to cover:
 - 1.19.4.1 the Operating and Maintenance Manual;
 - 1.19.4.2 operating procedures;
 - 1.19.4.3 maintenance procedures;
 - 1.19.4.4 trouble-shooting procedures;
 - 1.19.4.5 manufacturer's or service representative's name, address and phone number.
 - 1.19.5 Contractor shall prepare a detailed training and instruction plan. This plan shall include the outline of all sessions and identification of the training presenters.
 - 1.19.6 Provide course documentation for up to 6 people.
 - 1.19.7 The sessions may be videotaped by the Departmental Representative as required.
 - 1.19.8 Training and instruction requirement for the mechanical system shall include a walk-through of building by Contractor. During the walk-through the Contractor shall:
-

- 1.19.8.1 identify equipment;
- 1.19.8.2 identify starters associated with equipment;
- 1.19.8.3 identify valves and balancing dampers;
- 1.19.8.4 identify access doors;
- 1.19.8.5 review general maintenance of equipment;
- 1.19.8.6 review drain points in pipework systems;
- 1.19.8.7 identify maintenance items.

1.19.9 Should any deficiencies be discovered during training; the session will be re-scheduled

1.19.10 When each session has been completed, the Commissioning Authority shall sign to certify completion.

1.20 SYSTEMS DEMONSTRATION AND TURNOVER

1.20.1 System demonstration and turnover to the Departmental Representative shall occur when:

- 1.20.1.1 the installation is complete;
- 1.20.1.2 acceptance test conducted by the Consultant has been successfully completed;
- 1.20.1.3 Commissioning Authority Functional Performance Testing (FPT) and verification has been successfully complete;
- 1.20.1.4 training and instruction has been completed;
- 1.20.1.5 Operating and Maintenance Manuals have been accepted;
- 1.20.1.6 shop drawings have been updated;
- 1.20.1.7 as-built drawings have been completed.

1.20.2 Systems demonstration shall be conducted by Contractor and manufacturers. The demonstration shall cover all operation and maintenance requirements and a physical demonstration of equipment installation and operation.

1.21 TESTING FORMS

1.21.1 Contractor and manufacturers shall provide information required to complete forms supplied by Commissioning Authority (e.g., drainage testing form, piping pressure test form, chemical treatment data sheet, etc.).

1.22 EQUIPMENT AND SYSTEM WARRANTIES

1.22.1 Equipment and system warranties shall be as defined in Division 1.

- 1.22.2 Contractor shall fill-out the warranty form listing the equipment and systems and the start and finishing dates for warranty.
- 1.22.3 Refer to Division 1 and all Mechanical and Electrical divisions of the specification for the requirements during the warranty period.
- 1.22.4 Contractor shall re-visit the building during the warranty period with Consultant, Commissioning Authority and Departmental Representative. During these visits the performance of the system shall be reviewed.
- 1.22.5 At these meetings Departmental Representative, Consultants, and Commissioning Authority shall review the performance of the systems. If the performance is satisfactory then no further action required. If unsatisfactory then Contractor will be instructed to correct deficiencies, at his cost, to the satisfaction of Consultant.

END

PART 1 – GENERAL

1.1 DEFINITIONS

- 1.1.1 Validate: for tests and demonstrations: to witness and validate successful performance demonstration or record deficiencies; to validate after correction successful demonstration; these validations of the tests become references for the Consultant's certification.
- 1.1.2 Certify: for documents including as-built drawings: Review for accuracy and completeness or record deficiencies.
- 1.1.3 Witness: the Commissioning Authority will observe as required and record summary of test results.

1.2 REFERENCES

- 1.2.1 Section 01 91 13 Facility Commissioning - General
- 1.2.2 CAN/ULC-S524-06 Installation of Fire Alarm Systems
- 1.2.3 CAN/ULC-S537-04 Verification of Fire Alarm Systems
- 1.2.4 Canadian Electrical Code 23rd Edition/2015 (CSA)
- 1.2.5 National Building Code 2010
- 1.2.6 NECB 2011 National Energy Code of Canada for Buildings
- 1.2.7 CP.1 PWGSC Commissioning Manual 2006

1.3 DOCUMENTS

- 1.3.1 In case of discrepancies or conflicts between the documents, the documents will be governed in the order specified in Division 1.

1.4 COMMISSIONING OBJECTIVES

- 1.4.1 Objectives of the commissioning process are:
 - 1.4.1.1 to support quality management through monitoring and checking of the installation.
 - 1.4.1.2 to verify system performance through testing and commissioning of the completed installation.
 - 1.4.1.3 to move the completed facility from the “static completion” state to the optimal “dynamic” operating state.
 - 1.4.1.4 to transfer the facility from the Contractor to the Owner in such a manner that provision of a quality facility to the Owner has been assured.
-

- 1.4.1.5 to optimize operating and maintenance through delivery of comprehensive quality training and instruction to the Owner's operating personnel.
- 1.4.1.6 to assure provision of accurate and useful historical records, such as, as-builts drawings, test certificates, etc. to the Owner. Such records provide important data for operating and maintaining the systems as well as for future system testing, maintenance or renovations and to trouble shoot and repair the components of the systems.
- 1.4.1.7 to extend the commissioning into operational phase in order to verify performance levels under a range of operating conditions; such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on.
- 1.4.1.8 monitor the operation, performance and maintenance programs; optimize system's performance under normal operating conditions and partial and full occupancy, under the direction and review of the Commissioning Authority. This phase lasts throughout the warranty period. It may, however, involve activities so as to ensure completion of:
 - 1.4.1.8.1 system debugging and optimization.
 - 1.4.1.8.2 completion of training and instruction for the operating and maintenance personnel.
 - 1.4.1.8.3 completion of all commissioning activities on defective, seasonally-sensitive systems, for varying modes and periodic simulated emergency conditions.
- 1.4.1.9 commissioning shall be considered complete when all of the objectives of commissioning, as specified herein, have been achieved.

1.5 COMMISSIONING MEETINGS SCHEDULING and REPORTING

- 1.5.1 Contractor shall include the commissioning plan and shall schedule for all tests and equipment start-up in the construction schedule.
 - 1.5.2 Commissioning meetings shall be scheduled as required. The meetings shall address commissioning related responsibilities as well as all specified testing, documentation, O&M manuals, training, and post construction requirements. The testing schedules and results of all tests shall be reviewed at the meetings.
 - 1.5.3 Where construction may be completed in phases, allow for the frequency of meetings to correspond to the varying stages of construction of each phase.
 - 1.5.4 The Contractor shall attend commissioning meetings at regular intervals, as called by the Commissioning Authority
 - 1.5.5 The Contractor shall schedule work to include specified Commissioning related tasks. Cooperate with the Owner's Commissioning Authority, and coordinate subtrades as required, to successfully demonstrate and verify commissioning related tests.
-

1.5.6 The Contractor shall schedule work to include specified Commissioning related testing prior to Owner's demonstration and Owner's training.

1.5.7 Testing forms and reports associated with the electrical systems shall be directed to the Owner, to the Consultant, and to the Commissioning Authority.

1.5.8 Forms and reports to be issued shall include:

1.5.8.1 shop drawings, issued and accepted.

1.5.8.2 equipment verification forms.

1.5.8.3 testing forms.

1.5.8.4 reports resulting from tests.

1.5.8.5 testing schedule.

1.5.8.6 minutes of commissioning meetings.

1.6 WARRANTY

1.6.1 Involvement of Commissioning Authority shall not void any guarantees or warranties nor shall it relieve Contractor of any contractual responsibilities.

1.7 RESPONSIBILITIES OF COMMISSIONING AUTHORITY (CxA)

1.7.1 Responsibilities of Commissioning Authority are as follows:

1.7.1.1 Design Phase:

1.7.1.1.1 Participate in design team meetings. Obtain Owner's requirements and Consultant's philosophy and intent and expected system performance. This will form the basics of the testing and commissioning documents.

1.7.1.1.2 provide input and feedback to the design team with emphasis on testing, commissioning, operation and maintenance of the proposed system and equipment.

1.7.1.1.3 provide commissioning document to form part of the Bid documents.

1.7.1.2 Bid Phase:

1.7.1.2.1 review Bid documents, design Drawings and specifications.

1.7.1.2.2 provide testing and commissioning related reviews for incorporation in Contract Documents to ensure documents have included all required testing and commissioning requirements.

1.7.1.2.3 provide commissioning related comments for incorporation in Contract Documents.

- 1.7.1.2.4 participate in Bid review meetings to ensure Bidders are aware of the testing and commissioning requirements.

1.7.1.3 Construction Phase:

- 1.7.1.3.1 review contractor's approved shop drawing submission for commissioning related issues.
- 1.7.1.3.2 review Contractor's commissioning plan to ensure proposed tests, sequences and the methods of tests conform to Contract requirements; ensure ample time is schedule for the testing and commissioning.
- 1.7.1.3.3 monitor, check and inspect installation throughout the construction stages.
- 1.7.1.3.4 supervise the commissioning, including scheduling.
- 1.7.1.3.5 issue deficiencies reports noting any issues that may have an impact on the commissioning of the equipment and system.
- 1.7.1.3.6 attend construction site meetings as required to discuss commissioning related items and any impact on the project schedule.
- 1.7.1.3.7 set-up and chair commissioning meetings.
- 1.7.1.3.8 witness and validate tests; note deficiencies and issue progress reports.
- 1.7.1.3.9 work with Project team to expeditiously resolve any problems that may arise due to site conditions.
- 1.7.1.3.10 prepare Building Management Manual.
- 1.7.1.3.11 coordinate with Consultant training and instructions provided by Contractors, manufacturers and Suppliers.

1.7.1.4 Post-Construction Phase:

- 1.7.1.4.1 prepare final report on commissioning, identifying any deficiencies that may be outstanding.
- 1.7.1.4.2 recommendation of any additional training and/or instruction of operating and maintenance personnel deemed necessary over and above that already provided.
- 1.7.1.4.3 complete system checks with the Contractor.

1.8 RESPONSIBILITIES OF OWNER

1.8.1 Responsibilities of Owner are as follows:

- 1.8.1.1 to provide operating personnel to attend training and instruction regarding specific components, equipment and systems.
-

1.8.1.2 to retain the services of independent third parties for system verification and certification as required in the document or by applicable codes.

1.8.1.3 to observe on-site installation, start-up and testing equipment and systems.

1.9 RESPONSIBILITIES OF CONSULTANT

1.9.1 Responsibilities of Consultant are as follows:

1.9.1.1 review Contractor's shop drawings submission to verify general conformance with the contract documents;

1.9.1.2 periodically observe the installation throughout the construction stages to determine that the installation generally conforms to the requirements of the contract documents and issue field observation reports;

1.7.1.5 review operating and maintenance manuals; test reports and as-builts for completeness;

1.7.1.6 witness selected tests; note any deficiencies and provide field observation reports;

1.10 RESPONSIBILITIES OF CONTRACTOR

1.10.1 Responsibilities of the Contractor are as follows:

1.10.1.1 Construction Phase:

1.10.1.1.1 to manage and ensure the entire installation comply with the requirements of the Contract Documents.

1.10.1.1.2 submit shop drawings complete with Contractor's Stamp of Review.

1.10.1.1.3 submit working detail (interference or installation) drawings, as required.

1.10.1.1.4 complete commissioning data test forms provided by the Commissioning Authority

1.10.1.1.5 complete the Airport's Facility Management New Equipment forms.

1.10.1.1.6 submit installation method statement. This generally includes:

1.10.1.1.6.1 method of equipment delivery to the installation location on site.

1.10.1.1.6.2 prerequisite preparation for delivery, such as completion of the factory testing and the completion of site work to accept this equipment.

1.10.1.1.6.3 installation method and sequences of installing the equipment and the associated connections to the equipment.

1.10.1.1.7 submit an installation schedule. This schedule includes:

- 1.10.1.1.7.1 time schedule of each activity, with lead and lag time allowed and indicated.
 - 1.10.1.1.7.2 shop drawings and working detail drawings submission.
 - 1.10.1.1.7.3 major equipment delivery and factory testing dates.
 - 1.10.1.1.7.4 coordinate installation activities and sequences in compliance with the Construction Manager's Project schedule and other trade's installation schedule.
 - 1.10.1.1.7.5 schedule of testing and commissioning of the systems and major equipment.
 - 1.10.1.1.8 submit a commissioning schedule. This schedule includes:
 - 1.10.1.1.8.1 time schedule for system and equipment commissioning which are in compliance with the timing and sequences of installation schedule stated above. In this schedule allow for additional time for testing and commissioning, such that re-test of the equipment can be performed in a timely manner if required without impacting the overall Project schedule or cause delay to the project completion.
 - 1.10.1.1.8.2 dates for completion of required factory tests prior to equipment delivery to the site shall be indicated in the schedule.
 - 1.10.1.1.8.3 prepare and submit testing and commissioning method statements for review and approval.
 - 1.10.1.1.8.4 prepare and submit testing and commissioning record or report forms for review and approval.
 - 1.10.1.1.9 attend progress and commissioning meetings.
 - 1.10.1.1.10 promptly rectify or replace reported deficiencies and defects.
 - 1.10.1.1.11 where required by codes and/or specification, retain manufacturers and/or independent third parties to provide service for testing and certification of the systems and training of Owner's personnel.
 - 1.10.1.1.12 provide training and instruction to the Owner's operating personnel.
 - 1.10.1.1.13 pay for and retain the services of Independent Third Party Testing Agent (ITPTA) and manufacturer as required to perform testing and commissioning of equipment and systems to satisfaction of Consultant and Commissioning Authority as stated in approved schedule and method described above. Testing and commissioning will be witnessed by the Commissioning Authority as required. Contractor or his retain agents shall also record procedure and finding in approved test and record forms. Submit test and
-

record forms with the signature of the tester for review and approval to the Consultant and Commissioning Authority.

1.10.1.1.14 pay for and be responsible for all inspections required by codes, specification and Authorities having Jurisdiction. Obtain and submit all Certificate of Approval for such inspections and verifications.

1.10.1.1.15 submit for review as-builts drawings including those for location of control devices and wiring and operating and maintenance manuals for each equipment as per the specification requirements.

1.10.1.1.16 provide Operating and Maintenance Manuals for review by the Consultant and Commissioning Authority with all the testing and commissioning results and reports incorporated.

1.10.1.1.17 obtain, issue and assign warranties for equipment and systems to the Owner.

1.10.1.1.18 provide all necessary test equipment shall be the responsibility of Contractor. Provide recently validated calibration certificate for all equipment to be used for verification prior to testing and commissioning commencement.

1.10.1.2 Post-Construction Phase:

1.10.1.2.1 optimize operation according to occupant's needs, using the System Operation Manual prepared by the Commissioning Authority as reference points.

1.10.1.2.2 complete all commissioning procedures and activities and performance verification procedures which were delayed or not concluded during the commissioning phase.

1.10.1.2.3 complete system checks.

1.10.1.2.4 complete rectification of all deficiencies revealed by these checks. Equipment manufacturers involved in commissioning shall participate in systems checks.

1.10.1.2.5 revise all "as-built" and operating and maintenance documents to reflect all changes, modifications, revisions and adjustment upon completion of commissioning.

1.10.1.2.6 schedule a question and answer session for the operating and maintenance personnel 3 months after handover of the facility to the Owner. The duration of this session or sessions will be dictated by the number of questions or concerns that shall be addressed.

1.11 COMMISSIONING INVOLVEMENT

1.11.1 Commissioning Authority shall witness and validate as required; and Contractor and/or his Suppliers or retained Independent Third Party Agents shall perform the following:

1.11.1.1 check and ensure installation of the systems and equipment to ensure installations are completed and in a proper and safe state ready for testing and commissioning.

1.11.1.2 run and test the systems and equipment through their design parameters to verify their capabilities in performance, sequencing, safety protection and alarms annunciation.

1.11.1.3 ensure deficiencies and defects found are rectified and replaced and the systems and equipment re-tested as required.

1.11.1.4 arrange and provide demonstration and training of Owner's personnel.

1.11.1.5 issue Operating and Maintenance Manuals for systems and equipment.

1.12 SYSTEMS TO BE COMMISSIONED

1.12.1 Electrical systems shall include but not limited to following:

1.12.1.1 Switchboards.

1.12.1.2 Distribution panel boards.

1.12.1.3 Branch panel boards.

1.12.1.4 Transformers.

1.12.1.5 Central lighting inverters.

1.12.1.6 Motor control centers.

1.12.1.7 Distribution system.

1.12.1.8 Coordination study and overcurrent device settings.

1.12.1.9 Lighting and Lighting Control system.

1.12.1.10 Fire alarm system.

1.12.1.11 Duress Alarm system.

1.12.1.12 P.A. system.

1.12.1.13 Security system and Access control.

1.12.1.14 Telecommunications system.

1.12.1.15 Video Surveillance System (CCTV)

1.13 TESTING EQUIPMENT

- 1.13.1 Contractor and manufacturer shall provide all instrumentation and test equipment necessary to conduct the tests specified during the commissioning process. The Contractor shall submit a list of equipment to be used and copies of latest equipment calibration certificates to the Commissioning Authority and Consultant for approval.

1.14 DOCUMENTATION

- 1.14.1 Contractor shall submit test procedures for review prior to testing and commissioning. Record test results and procedures on approved record forms and submit the forms together with copies of test certificates to consultant and Commissioning Authority for review and approval.
- 1.14.2 When results are validated, Commissioning Authority shall incorporate those records in his Building Management Manual.

1.15 COMMISSIONING PROCESS

- 1.15.1 Commissioning Authority: to perform and complete all work as specified in the “GENERAL” Section of this specification “Responsibilities of Commissioning Authority”.
- 1.15.2 Contractors: To perform and complete all works as specified in the “GENERAL” Section of this specification “Responsibilities of Contractor”. In general, it shall include complete activation of all systems; calibration, test, and verification of performance of all components, equipment and systems; verification of performance of all systems through all specified modes of control and sequence of operation; rectification of deficiencies; recording of test results for submission; demonstration, instruction and training of Owner’s operating and maintenance personnel; follow-up during first year of operation for fine tuning and building service monitoring.
- 1.15.3 Equipment verification: The Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the commissioners Building Management Manual. The equipment data shall include, but is not limited to:
- 1.15.3.1 manufacturer’s name, address and telephone number.
 - 1.15.3.2 distributors’ name, address and telephone number.
 - 1.15.3.3 make, model number and serial number, year built.
 - 1.15.3.4 voltage, ampere rating, fault rating, frequency, breaker size, fuse size, overload size.
 - 1.15.3.5 equipment enclosure type.
-

1.15.3.6 any other special characteristics.

1.15.4 Pre-requisites to Functional Performance Testing (FPT) for a System/Assembly in order of required completion:

1.15.4.1 Prefunctional / Facility Management forms completed

1.15.4.2 Static Installation Completed

1.15.4.3 Electrical Contractor Testing and Verification

1.15.4.4 Electrical Inspection Deficiencies complete

1.15.4.5 The contractor is to perform a dry run of the Functional Performance Testing prior to the start of FPT by the Commissioning Authority.

1.15.5 Functional Performance Testing by the Commissioning Authority (CxA):

1.15.6 It is expected that once the contractor has performed a dry run of the Functional Performance Test (FPT) and is satisfied that the system is working properly; the contractor will invite the Commissioning Authority to the Functional Performance Testing.

1.15.7 During the Functional Performance Testing; minor issues (that can be resolved in 15 – 30 minutes) will be tolerated to an extent depending on the importance/severity of the issue. Once two minor issues have been encountered; testing may be suspended (and re-scheduled) at the Commissioning Authority's discretion.

1.15.8 If the first Functional Performance Test fails, the cost of re-testing(s) will be the contractor's.

1.15.9 Any System/Assembly that is microprocessor based, and includes any customized programming/software is required to pass functional performance testing without any failure. Partial functional performance testing is not acceptable. Should any aspect of the functional performance test fail, defects shall be corrected and the entire test shall be repeated

1.16 TESTING FOR ELECTRICAL SYSTEMS

1.16.1 All systems as specified in the Electrical specification sections.

1.16.2 Test and commission equipment and system as per Electrical Specification, CSA Z318.0-05 and the following requirements.

1.16.3 Contractor to submit test reports for the test procedures, results of all items inspected, checked, measured and tested. Comments and deficiencies should also be noted in the reports.

1.16.4 Switchboard: Manufacturer/ITPTA shall carry out the following pre-service tests.

- 1.16.4.1 all pre-service checks, inspections and testing as recommended by the manufacturer.
 - 1.16.4.2 check and record nameplate data.
 - 1.16.4.3 check and inspect the switchboard that it is installed in accordance with the manufacturer's recommendations and to the Code requirements.
 - 1.16.4.4 check the installation is complete and is ready and safe to carry out the testing.
 - 1.16.4.5 check and report the switchboard enclosure is suitable for the environment in which it is installed.
 - 1.16.4.6 check and test grounding is completed and satisfactory prior to carrying out any test.
 - 1.16.4.7 check and record the entire switchboard is clean and free of debris before the testing.
 - 1.16.4.8 check the mechanical operation of the switches or breakers.
 - 1.16.4.9 check all connecting bolts are tightened to the correct torque values.
 - 1.16.4.10 megger test
 - 1.16.4.11 set all protective devices to the settings as per the reviewed Coordination Study.
 - 1.16.4.12 check all the indication lights and control switches for correct functions.
 - 1.16.4.13 set up, check and test the proper operations of the TVSS, measuring, indicating and recording meters.
 - 1.16.4.14 after the board is energized, check and test phase sequence, the available voltages and load on the system and each feeder. For multi-section boards with different sources, check the phase sequence, available voltage and the polarity of each source.
- 1.16.5 Motor Control Centres (MCC): Manufacturer shall carry out the following pre-service tests and measurements after the board is energized.
- 1.16.5.1 all pre-service checks, inspections and testing as recommended by the manufacturer.
 - 1.16.5.2 check and record nameplate data.
-

- 1.16.5.3 check and inspect the MCC to ensure they are installed in accordance with the manufacturer's recommendations and to the Code requirements.
 - 1.16.5.4 check the installation is complete and is ready and safe to carry out the testing.
 - 1.16.5.5 check and report the MCC enclosure is suitable for the environment in which it is installed.
 - 1.16.5.6 check and test grounding is completed and satisfactory prior to carrying out any test.
 - 1.16.5.7 check and record the entire MCC is clean and free of debris before the testing.
 - 1.16.5.8 check the mechanical operation of the switches or breakers.
 - 1.16.5.9 check all connecting bolts are tightened to the correct torque values.
 - 1.16.5.10 megger test
 - 1.16.5.11 set all protective devices to the settings as per the reviewed Coordination Study.
 - 1.16.5.12 check and record the size of all fused switches and fuses.
 - 1.16.5.13 Check, set and record the rating and setting of the overload relays.
 - 1.16.5.14 check all the indication lights and control switches for correct functions.
 - 1.16.5.15 check all control functions for proper functioning and connections.
 - 1.16.5.16 check all interface contacts for control and indications for proper functioning and connections.
 - 1.16.5.17 set up, check and test the proper operations of the TVSS, measuring, indicating and recording meters.
 - 1.16.5.18 after the MCC is energized, check and test phase sequence and the available voltages.
 - 1.16.5.19 check motor running current and for correct rotation.
- 1.16.6 Distribution cables: Contractor/Independent Third Party Testing Agent shall carry out the following tests:
- 1.16.6.1 check cables are properly installed, terminated and tightened to the correct torque values.
-

- 1.16.6.2 check and record cable sizes, types and method of installation.
 - 1.16.6.3 check and confirm the installed cable sizes are of adequate rating, taking into consideration of the type of cable, the method of installation, the correction factors and any other requirements.
 - 1.16.6.4 grounding test to ensure the equipment, the conduit and the cable armour/sheath, if applicable, are properly grounded.
 - 1.16.6.5 megger test.
 - 1.16.6.6 check and measure voltage and current under typical building load conditions (once other systems are commissioned and running). For cables in parallel, measure load current on each cable.
- 1.16.7 Transformers: Independent Third Party Testing Agent or manufacturer shall carry out following tests:
- 1.16.7.1 check and record nameplate data.
 - 1.16.7.2 check and report the transformer enclosure is suitable for the environment in which it is installed.
 - 1.16.7.3 check and record sizes and types of primary and secondary protection devices, conductor sizes and types.
 - 1.16.7.4 check cables are properly installed, terminated and tightened to the correct torque values.
 - 1.16.7.5 megger the primary and secondary windings.
 - 1.16.7.6 measure the primary and secondary winding resistances.
 - 1.16.7.7 grounding test to ensure transformer is properly grounded.
 - 1.16.7.8 polarity and phase sequence tests.
 - 1.16.7.9 sound level test for different points at 1 m (3') away from transformers.
 - 1.16.7.10 check and record transformer primary and secondary voltages and load current under typical load conditions. Check and record transformer on-load temperatures.
- 1.16.8 Central Lighting Inverters: Manufacturer shall perform tests to the specification, CSA C22.2 No. 141-15 and the following requirements:
-

1.16.8.1 Prior to carrying out site test, the following items must be completed:

1.16.8.1.1 the complete installation, must be completed, properly set and tested, and report submit. Report to include all settings.

1.16.8.1.2 test procedures submitted and reviewed by the Consultants and the Commissioning Authority.

1.16.8.1.3 factory test report submitted and reviewed by the Consultants and the Commissioning Authority.

1.16.8.2 check and record nameplate data.

1.16.8.3 verify the room conditions, such as temperature and humidity is within the range as recommended by the central lighting inverter manufacturer.

1.16.8.4 check cables are properly installed, terminated and tightened to the correct torque values.

1.16.8.5 check and test grounding system to ensure the unit, switchboard, panels and the associated equipment is properly grounded.

1.16.8.6 test all protective devices for proper shutdown and warning operations.

1.16.8.7 perform 100% full load test on the central lighting inverter for 30 minutes and one hour on the bypass circuit. Record all electrical data and the room temperatures. Measure and record battery voltages before and after the full load test.

1.16.8.8 measure and record input and output voltage, current, harmonic performance for each test.

1.16.8.9 0-100% and 100%-0% step load transient test on normal power available and battery supply only.

1.16.8.10 battery discharge test to verify the specified performance requirements.

1.16.8.11 manufacturer to provide a full site test report recording all the tests carried out, the results, including the results of the operation of the associated electrical and mechanical systems. The records must also include all settings in the Central Lighting Inverter. All deficiencies are also to be noted.

1.16.9 Distribution panel boards and branch panel boards: Contractor/ Independent Third Party Agent shall carry out following tests:

- 1.16.9.1 check and record nameplate data.
 - 1.16.9.2 check and report the panel enclosure is suitable for the environment in which it is installed.
 - 1.16.9.3 check cables are properly installed, terminated and tightened to the correct torque values.
 - 1.16.9.4 check and test to verify the panel board directory is correct.
 - 1.16.9.5 include the directory in the test records. The directory shall contain size of each breaker, equipment served, cable type and size.
 - 1.16.9.6 check and test the voltage drop is within the specify limit from the service entrance switchboard to the distribution panels and branch panel boards.
 - 1.16.9.7 test branch circuits voltage drop is within the requirements.
 - 1.16.9.8 grounding test to ensure panel boards are properly grounded.
 - 1.16.9.9 megger test.
 - 1.16.9.10 Measure voltage and load current on each phase under typical building load conditions. Submit test reports to Consultant. When required, re-arrange branch circuits as directed by the Consultants for proper load balancing.
 - 1.16.9.11 Provide thermographic scans of all distribution and branch panel boards under typical load conditions. Submit report including thermographic image of each panel. Images to be identified with the panel name, image date, and colour scale.
- 1.16.10 Coordination study:
- 1.16.10.1 Independent Third Party Testing Agent shall, in accordance with the reviewed Coordination Study, set up all the protective devices, check and verify the rating and types of fuses and record all such ratings and settings in his reports.
- 1.16.11 Lighting and Lighting Control systems: Manufacturer and Contractor shall carry out the following tests:
- 1.16.11.1 prior to carrying out site test, submit a lighting system operation matrix to the Consultant and Commissioning Authority. Matrix to show the zoning layout, how each zone is controlled, and the settings, such as timer and sensor settings for each zone.
 - 1.16.11.2 check and verify all lighting fixtures are connected and switched properly.
-

- 1.16.11.3 check and verify all automatic controls are connected and functioning properly. Cooperate with BAS contractor to field verify lighting integration with the BAS.
 - 1.16.11.4 check and verify all operations shown in the matrix.
 - 1.16.11.5 check and verify the emergency lighting system, including battery lighting system, are connected and functioning properly.
 - 1.16.11.6 carry out lighting level tests as required and directed by the Commissioning Authority.
- 1.16.12 Fire Alarm System: Manufacturer and/or Independent Third Party Testing Agent shall carry out following tests:
- 1.16.12.1 prior to carrying out site test, submit a fire alarm system operation matrix to the Consultant and Commissioning Authority. This matrix shall include of operation of the fire alarm system and the operations of all systems interfaced with the fire alarm system.
 - 1.16.12.2 check and record nameplate data.
 - 1.16.12.3 check and report the panel enclosure is suitable for the environment in which it is installed.
 - 1.16.12.4 check and verify system is installed to specification, NBC, and S524 requirements.
 - 1.16.12.5 perform system verifications and tests according to CAN/ULC-S537.
 - 1.16.12.6 check and verify all system operations shown in the matrix.
 - 1.16.12.7 perform system integration test to verify proper fire alarm system operation, and the proper operations of all systems interfaced with the fire alarm system.
 - 1.16.12.8 Submit verification reports and system operation verification reports.
- 1.16.13 CCTV, Security, Access Control and all other Communication Systems: Manufacturer shall carry out following tests:
- 1.16.13.1 prior to carrying out site test, submit
 - 1.16.13.1.1 system operation matrix to the Consultant and Commissioning Authority. This matrix shall include of operation of the system and the operations of all interfaced systems;
-

1.16.13.1.2 test procedures to detail what tests and how each test will be carried out.
Procedure to include how the system operation will be commissioned.

1.16.13.2 check and record nameplate data.

1.16.13.3 check and report the panel enclosure is suitable for the environment in which it is installed.

1.16.13.4 Check and verify the operation of each device.

1.16.13.5 check and verify all system operations shown in the matrix.

1.16.13.6 perform system integration test to verify proper system operation, and the proper operations of all interfaced systems.

1.16.13.7 Submit report to include the system operation matrix, test procedures, system settings and all the test results, comments and list of deficiencies.

1.17 COMMISSIONING MEETINGS AND REPORTING

1.17.1 Contractor shall include the commissioning plan and schedule for all tests and equipment start-up tests in the construction schedule.

1.17.2 Commissioning meeting as required shall follow the regular construction meetings. The testing schedules and results of all tests shall be reviewed.

1.17.3 Testing forms and reports associated with the electrical systems shall be directed to Consultant, Commissioning Authority and Owner.

1.17.4 Forms and reports to be issued shall include:

1.17.4.1 shop drawings, issued and accepted.

1.17.4.2 equipment verification forms.

1.17.4.3 testing forms.

1.17.4.4 reports resulting from tests.

1.17.4.5 testing schedule.

1.17.4.6 minutes of commissioning meetings.

1.18 OPERATING AND MAINTENANCE MANUAL

1.18.1 Contractor shall prepare and submit the Operating and Maintenance Manual to Consultant and Commissioning Authority 6 weeks prior to beginning of training.

- 1.18.2 The O&M manual to be in searchable PDF format.
- 1.18.3 Each Electrical Operations and Maintenance manual shall be prepared and organized as per section 01 78 00 Closeout Submittals.
- 1.18.4 Contractor shall re-submit the manual should Consultant find deficiencies. Training shall not begin until the manual has been accepted by Consultant.
- 1.18.5 The operating procedures shall be the recommended manufacturer's operating procedures for the equipment.
- 1.18.6 The maintenance procedures shall include Scope of Work, frequency of activity, parts required and necessary documentation.
- 1.18.7 Spare parts list shall be manufacturers' recommended list for maintenance purposes.
- 1.18.8 Trouble shooting guide shall be manufacturer's recommendations for the equipment.
- 1.18.9 Equipment list shall include make, model, serial number, voltage, rated current, number of phase and wire and fault rating.
- 1.18.10 Operating and Maintenance Manual shall be submitted to the Owner in searchable PDF format.
- 1.18.11 The Operating and Maintenance Manual will be used by the maintenance personnel to assist them in the daily operation of the systems.

1.19 BUILDING MANAGEMENT MANUAL

- 1.19.1 Building Management Manual shall be prepared by Commissioning Authority using data collected by Contractor and test results.
- 1.19.2 Commissioning Authority shall provide a copy of the Building Management Manual to Owner.

1.20 OPERATOR TRAINING AND INSTRUCTIONS

- 1.20.1 Contractor and equipment manufacturers shall provide operator training for each system and equipment.
 - 1.20.2 Training and instruction shall be provided by qualified technicians and shall be conducted in a classroom setting at the equipment or system.
 - 1.20.3 Owner Training Pre-requisites:
 - 1.20.3.1 O&M manual(s) been reviewed and approved by the engineers.
-

1.20.3.2 For the system/assembly that training will occur on:

1.20.3.2.1 Contractor Testing and Verification has been 100% completed, with no remaining deficiencies

1.20.3.2.2 Cx Functional Performance Testing has been 100% completed, with no remaining deficiencies, or items on the Commissioning Issues Log.

1.20.3.3 Two weeks in advance of the scheduled training date, the following to be submitted to the owner for review:

1.20.3.3.1 An Agenda

1.20.3.3.2 A Trainor's bio

1.20.3.3.3 Training materials specific to the Agenda have been provided in electronic form for review and approval.

1.20.3.4 The owner reserves the right to reject the Trainor, or modify the agenda, if either are found to be unacceptable.

1.20.4 Each session shall be structured to cover:

1.20.4.1 Operating and Maintenance Manual.

1.20.4.2 operating procedures.

1.20.4.3 maintenance procedures.

1.20.4.4 trouble-shooting procedures.

1.20.4.5 manufacturer's or service representative's name, address and phone number.

1.20.5 Contractor shall prepare a detailed training and instruction plan. This plan shall include the outline of all sessions and identification of the training presenters.

1.20.6 Provide course documentation for up to 6 people.

1.20.7 The sessions may be videotaped by the owner as required.

1.20.8 The training and instruction requirement for the electrical system shall include a walk-through of the building by the Contractor. During the walk-through the Contractor shall:

1.20.8.1 identify, describe and explain the function of the equipment.

1.20.8.2 Detail explanation of the operation, including mechanical operation and electrical operation of the equipment; procedures and sequence of operation; procedures of switching, isolation and emergency switching.

1.20.8.3 detail explanation of the maintenance of the equipment including the procedures and items to check for.

1.20.8.4 safety procedures to be implemented before the maintenance.

1.20.8.5 interlock, interface and control with other equipment.

1.20.8.6 fault finding procedures.

1.20.9 When each session has been completed, the Commissioning Authority shall sign to certify completion.

1.21 SYSTEMS DEMONSTRATION AND TURNOVER

1.21.1 System demonstration and turnover to the Owner shall occur when:

1.21.1.1 installation is complete.

1.21.1.2 acceptance test conducted by the Consultant has been successfully completed.

1.21.1.3 Commissioning Authority Functional Performance Testing (FPT) has been successfully complete.

1.21.1.4 training and instruction has been completed.

1.21.1.5 Operating and Maintenance Manual have been accepted.

1.21.1.6 shop drawings have been updated.

1.21.1.7 as-built drawings have been completed.

1.21.2 Systems demonstration shall be conducted by Contractor and manufacturers. The demonstration shall cover all operation and maintenance requirements and a physical demonstration of equipment installation and operation.

1.22 TESTING FORMS

1.22.1.1 Contractor and manufacturers shall provide information required to complete forms supplied by Commissioning Authority (e.g., system and equipment warranty dates form, switchboard test form, motor control centre test form, transformer test form, distribution cable test sheet, Distribution and Panel board test form, loose starter test form, fire alarm testing and verification form, etc.).

1.23 EQUIPMENT AND SYSTEM WARRANTIES

1.23.1 Equipment and system warranties shall be as defined in Division 1.

- 1.23.2 Contractor shall fill-out the warranty form listing the equipment and systems and the start and finishing dates for warranty.
- 1.23.3 Refer to the Division 1 and all Mechanical and Electrical divisions of the specification for the requirements during the warranty period.
- 1.23.4 Contractor shall re-visit the building during the warranty period with the Consultant, Commissioning Authority and the Owner. During these visits the performance of the system shall be reviewed.
- 1.23.5 At these meetings Owner, Consultants and the Commissioning Authority shall review the performance of the systems. If performance is satisfactory then no further action need to be taken. If unsatisfactory then Contractor will be instructed to correct deficiencies, at his cost, to the satisfaction of Consultants.

END
