

Part 1 General

1.1 WORDS AND TERMS

- .1 Refer to and acknowledge other words, terms, and definitions in CCDC 2 Definitions. Additional words and terms are described in Supplementary Conditions.

1.2 COMPLEMENTARY DOCUMENTS

- .1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leave doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.
- .2 Drawings indicate general location and route of conduit and wire/conductors. Install conduit or wiring/conductors and plumbing piping not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.
- .3 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.
- .4 Locate devices with primary regard for convenience of operation and usage.
- .5 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.3 DESCRIPTION OF THE WORK

- .1 Work of this Contract comprises demolition of the existing cooling tower and installation of new cooling tower, located at 410, 22nd St. E, Saskatoon, SK; and identified as the Government of Canada Building (GOCB).
- .2 Division of the Work is solely the Contractor's responsibility. Neither the Departmental Representative nor Consultant assumes any responsibility to act as an arbiter to establish subcontract terms between sectors or disciplines of work.

1.4 CONTRACT METHOD

- .1 Construct Work under single, stipulated price contract.
- .2 Relations and responsibilities are between the Contractor and the Departmental Representative.
- .3 Provide the required bonds to ensure such specified assurances to the Departmental Representative.
- .4 Assigned Subcontractors are required to provide requested bonds covering faithful performance of subcontracted work, to the Departmental Representative plus payment of related obligations.

- .5 Contract Documents were prepared by the Consultant for the Departmental Representative. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.
- .6 For purposes of reference in these Contract Documents, the term "Contractor" shall mean the party in contract with the Departmental Representative.

1.5 DOCUMENTS PROVIDED

- .1 Departmental Representative will supply the Contractor with ten (10) of Contract Documents for construction purposes, which includes two (2) sets for record "as-built" purposes.
- .2 The Contractor may obtain additional sets of Contract Documents at the cost of printing, handling and shipping.
- .3 An electronic set of documents will be provided near the end of the Project for purposes of transferring changed information recorded on as-built documents to the electronic Record Documents.

1.6 PERFORMANCE OF THE WORK

- .1 Substantial Performance of the Work is required for Departmental Representative usage before August 1st 2014.

1.7 WORK SEQUENCE

- .1 Construct Work in to accommodate Departmental Representative's usage requirements during the construction period, coordinate construction schedule and operations with Departmental Representative.
- .2 Coordinate Progress Schedule and with Departmental Representative use during construction.
- .3 Maintain fire access and control of fire protection equipment.

1.8 CONTRACTOR USE OF PREMISES

- .1 Contractor has unrestricted use of site until Substantial Performance of the Work].

1.9 DEPARTMENTAL REPRESENTATIVE OCCUPANCY

- .1 Departmental Representative will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Departmental Representative usage.
- .3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present Shop Drawings, product data in SI units.
- .4 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.
- .5 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.
- .6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10 Keep one (1) reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow 14 days for Consultant's review of each submission.
- .4 Adjustments made on Shop Drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

- .5 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- .6 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to other parts of the Work.
- .8 After Consultant's review, distribute copies.
- .9 Submit a Shop Drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .10 Submit product data sheets or brochures for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.

- .13 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, Shop Drawings will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

END OF SECTION

Part 1 General

1.1 LAWS, NOTICES, PERMITS AND FEES

- .1 The laws of the Place of the Work shall govern the Work.
- .2 The Contractor shall be responsible for permits, licenses or certificates necessary for the performance of the Work which were in force at the date of executing the Agreement.
- .3 Give the required notices and comply with the laws, ordinances, rules, regulations or codes which are or become in force during the performance of the Work and which relate to the Work, to the preservation of the public health and to construction safety.
- .4 If the Contractor knowingly performs or allows work to be performed that is contrary to any laws, ordinances, rules, regulations or codes, the Contractor shall be responsible for and shall correct the violations thereof; and shall bear the costs, expenses and damages attributable to the failure to comply with the provisions of such laws, ordinances, rules, regulations or codes.
- .5 Determine detailed requirements of authorities having jurisdiction.
- .6 Pay construction damage deposits levied by municipality in connection with the issuance of a building permit.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: If material resembling asbestos is encountered in course of demolition work, immediately stop work and notify Consultant.

1.3 PERSONNEL SMOKING

- .1 Comply with regulatory and Owner imposed smoking restrictions during execution of the Work within or outside the premises.

END OF SECTION

Part 1 General

1.1 INSPECTIONS AND DECLARATIONS

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Inspection and that corrections have been made.
 - .2 Request Consultant's Inspection.
- .2 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.
- .3 Completion: Submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, and are fully operational.
 - .4 Operation of systems have been demonstrated to Owner's personnel.
 - .5 Work is complete and ready for Final Inspection.
- .4 Final Inspection: When items noted above are completed, request final inspection of Work by Consultant. If Work is deemed incomplete by Consultant complete outstanding items and request reinspection.
- .5 Declaration of Substantial Performance: when Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.
- .6 Commencement of Warranty Periods: the date of Substantial Performance of the Work shall be the date for commencement of the warranty period.
- .7 Commencement of Lien Periods: the date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period, unless required otherwise by the lien legislation applicable at the Place of the Work.
- .8 Final Payment: When Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.
- .9 Payment of Hold-back: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of hold-back amount.

1.2 CLOSEOUT SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned Contractor with Consultant's comments.

- .3 Revise content of documents as required prior to final submittal.
- .4 4 weeks prior to Substantial Performance of the Work, submit to the Consultant, 3 final copies of operating and maintenance manuals in Canadian English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.3 OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf [<219 x 279 mm><<8.5 x 11 inch>>] 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 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.

1.4 CONTENTS - EACH VOLUME

- .1 Table of Contents: Provide:
 - .1 Title of project.
 - .2 Date of submission.
 - .3 Names, addresses, and telephone numbers of Consultant with name of responsible parties.
 - .4 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.

- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Training: Refer to Section 01 79 00.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and within the Project Manual.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.
- .5 Specifications: 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.

1.6 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 30 days after completion of the applicable item of work.
- .4 Except for items put into use with Owner'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 submittals.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Demonstrate the operation and maintenance of all new equipment to Departmental Representative's personnel prior to date of Substantial Performance.
- .2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.2 COMPONENT DEMONSTRATION

- .1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.
- .2 Instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system 2 weeks prior to designated dates, for Consultant's approval.
- .2 Submit reports within 10 days after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

- .1 Testing, adjusting, and balancing have been performed in accordance with Section 01 91 00, and equipment and systems are fully operational.
- .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 PREPARATION

- .1 Verify that suitable conditions for demonstration and instructions are available.
- .2 Verify that designated personnel are present.
- .3 Prepare agendas and outlines.
- .4 Establish seminar organization.

- .5 Explain component design and operational philosophy and strategy.
- .6 Develop equipment presentations.
- .7 Present system demonstrations.
- .8 Accept and respond to seminar and demonstration questions with appropriate answers.

3.2 PREPARATION OF AGENDAS AND OUTLINES

- .1 Prepare agendas and outlines including the following:
 - .1 Equipment and systems to be included in seminar presentations.
 - .2 Name of companies and representatives presenting at seminars.
 - .3 Outline of each seminar's content.
 - .4 Time and date allocated to each system and item of equipment.
 - .5 Provide separate agenda for each system.

3.3 SEMINAR ORGANIZATION

- .1 Coordinate content and presentations for seminars.
- .2 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.
- .3 Arrange for presentation leaders familiar with the design, operation, maintenance and troubleshooting of the equipment and systems. Where a single person is not familiar with all aspects of the equipment or system, arrange for specialists familiar with each aspect.
- .4 Coordinate proposed dates for seminars with Departmental Representative and select mutually agreeable dates.

3.4 EXPLANATION OF DESIGN STRATEGY

- .1 Explain design philosophy of each system. Include following information:
 - .1 An overview of how system is intended to operate.
 - .2 Description of design parameters, constraints and operational requirements.
 - .3 Description of system operation strategies.
 - .4 Information to help in identifying and troubleshooting system problems.

3.5 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.
- .4 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

3.6 TIME ALLOCATED FOR INSTRUCTION

- .1 Ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Section 23 65 16 - Cooling Tower: 8 hours of instruction.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Departmental Representative.
- .2 Commissioning Team:
 - .1 Departmental Representative: Representative of the Owner, as defined in the Agreement.
 - .2 Consultant: Consultant, as defined in the Agreement.
 - .3 Commissioning Manager: Party engaged by the Departmental Representative to lead commissioning activities, and coordinate other team members.
 - .4 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning.
 - .5 Commissioning Auditor: Party engaged by the Departmental Representative to audit or verify results assembled by the Commissioning Team.
 - .6 Testing Agency: Specialty agency engaged by the Departmental Representative to perform tests on components or systems to verify conformance to Departmental Representative's requirements or specified requirements.
- .3 Commissioning Documents:
 - .1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.
 - .2 Submittal: Contract submittal, as specified in Contract Documents.
 - .3 Component Verification: A document used to verify equipment data actually installed, prior to startup or operation.
 - .4 Operating check certificate. A document used to verify equipment operation, including performance statistics.
 - .5 Startup Reports: Report prepared by equipment startup personnel, including start-up sequence, and performance statistics. Refer to Section 01 75 16.
 - .6 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance, to Section 01 75 19.
 - .7 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment, to Section 01 78 40.

1.2 METHODOLOGY

- .1 The Commissioning Manager shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.
- .2 Commissioning Plan to include:

- .1 Assembly of Departmental Representative's requirements, including design criteria, performance goals, budgets, and schedules.
 - .2 Scheduling and chairing of commissioning meetings between team members.
 - .3 Development of static and operating check certificates for individual equipment.
 - .4 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, startup reports, and testing reports.
 - .5 Verification of data by testing agency.
 - .6 Audit procedure, to be performed in the event of dispute or failure.
- .3 Execute the commissioning plan.

1.3 REGULATORY REQUIREMENTS

- .1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.
- .2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

1.4 CONTRACT COMMISSIONING REQUIREMENTS

- .1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.
- .2 Allow Commissioning Manager and Auditor free access to the site.
- .3 Costs: Pay costs associated with starting, testing, adjusting, and relevant instruments and supplies required to perform those duties.
- .4 Employ experienced personnel for equipment startup and commissioning, who are able to interpret results of readings and tests, and report the system status in a clear and concise manner.
- .5 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Commissioning Manager.
- .6 Utilize equipment check certificates and other commissioning documents required by the Commissioning Manager.
- .7 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.
- .8 Do not start up equipment unless component verification sheets have been completed and submitted.
- .9 Complete in detail, and sign component verification sheets.

Part 2 Products

Part 3 Execution

3.1 COMMISSION TESTING

- .1 Allow for work, effort, and associated costs necessary to assist a Departmental Representative appointed and remunerated Commissioning Manager, for fulfilment of a commission testing process of the facility and Work.
- .2 Coordinate, cooperate, and harmonize efforts with the Commissioning Manager.
- .3 Commission testing will include a random testing and evaluation process as determined by the Commissioning Manager.
- .4 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:
 - .1 Prior to start of testing, provide 2 complete sets of up-to-date contract drawings and specifications including addenda to the Commissioning Manager.
 - .2 Coordinate site visits by the Commission Manager and the affected parties during warranty periods.
- .5 The commissioning process will not:
 - .1 Preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract.
 - .2 Circumvent any required warranties.
 - .3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.
- .6 Prior to commission testing, perform the following and provide copies to the Commissioning Manager, of component and assembly Contract Document compliance:
 - .1 Component verification sheets.
 - .2 Equipment operating certificates.
 - .3 Inspection certificates from authorities having jurisdiction.
 - .4 Required copies of shop drawings.
 - .5 Manufacturer's operating and maintenance brochures of all major equipment.
- .7 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.
- .8 Cooperate with the Commissioning Manager in advance of activating operating systems.
- .9 Test results that reveal failure to conform to the Contract Documents, will result in deficiencies.

3.2 AUDIT TESTING AND THE COMMISSIONING AUDITOR

- .1 In the event on non-compliance or test failure described in the commission testing process above, comply with the following requirements.

- .2 Allow for work, effort, and associated costs necessary to assist an Departmental Representative appointed and remunerated Auditor, for fulfilment of a further audit testing of the facility and Work.
- .3 Coordinate, cooperate, and harmonize efforts with the Auditor.
- .4 Audit testing will include further random testing and evaluation as determined by the Departmental Representative, the Auditor, and the Commissioning Manager.
- .5 Suitably log, tabulate, and incorporate signed system and device check certificates into Operating and Maintenance Manuals.
- .6 Coordinate site visits by the Auditor, Commission Manager and the affected parties during warranty periods.
- .7 The audit process will not:
 - .1 Preclude the duties and responsibilities described in the Contract nor the requirements and obligations of the Contract.
 - .2 Circumvent any required warranties.
 - .3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.
- .8 Cooperate with the Auditor prior to testing of operating systems.
- .9 Test results that demonstrate failure to conform to the Contract Documents, may result in the following, at the Departmental Representative's sole discretion:
 - .1 Complete rejection of the subject component, assembly, or system.
 - .2 Removal of defective items from the Work.
 - .3 An adjustment credit to the Contract Price for the Departmental Representative's estimated value of the subject item plus remuneration for associated damages and inconvenience.
 - .4 Provision of a suitable substitute Product in place of the defective Product.
 - .5 Substituted Products will be required to be commissioned and audited and undergo the same scrutiny as described for commission testing and audit testing described above.

END OF SECTION

COMPONENT VERIFICATION

Building Name: Government of Canada Building

COOLING TOWER

1. Submittal / Approvals

Submittal. The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsible contractor. This prefunctional checklist is submitted for approval, subject to an attached list of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding areas. None of the outstanding items preclude safe and reliable functional tests being performed. ____ List attached.

_____ Mechanical Contractor	_____ Date	_____ Controls Contractor	_____ Date
_____ Electrical Contractor	_____ Date	_____ Sheet Metal Contractor	_____ Date
_____ TAB Contractor	_____ Date	_____ General Contractor	_____ Date

Prefunctional checklist items are to be completed as part of startup & initial checkout, preparatory to functional testing.

- This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report.
- Items that do not apply shall be noted with the reasons on this form (N/A = not applicable, BO = by others).
- If this form is not used for documenting, one of similar rigor shall be used.
- Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.
- "Contr." column or abbreviations in brackets to the right of an item refer to the contractor responsible to verify completion of this item. A/E = architect/engineer, All = all contractors, CA = commissioning agent, CC = controls contractor, EC = electrical contractor, GC = general contractor, MC = mechanical contractor, SC = sheet metal contractor, TAB = test and balance contractor, ____ = _____.

Approvals. This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted below.

_____ Commissioning Agent	_____ Date	_____ Owner's Representative	_____ Date
------------------------------	---------------	---------------------------------	---------------

Notes:

2. Requested documentation submitted (this section to be completed by CA)

Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag-	CT-1
>		
Equipment manufacturer's submittals, inc. performance data		
Installation and startup manual		
Startup documentation		
Test and Balance report		
Sequences and control strategies		
O&M manuals		

- *Documentation complete as per contract documents.....* ☐ **YES** ☐ **NO**

3. Model verification (this section to be completed by CA)

1 = as specified, 2 = as submitted, 3 = as installed. Enter requested data. Check if Okay. Enter note number if deficient.

Equip Tag---	CT-1
>	
1	
Manuf. 2	
3	
1	
Model 2	
3	
Serial # 3	
1	
Capacity 2	
3	
1	
Fan Mtr Hp	
3	
1	
Motor Effic	
3	
Fan motor 1	
Speed Ctl 2	
(VFD, pony,etc)3	
VFD Mfctr&	/
Model # 2	/
if applicable	/

- *The equipment installed matches the specifications for given trade* ☐ **YES** ☐ **NO**

Notes:

4. Installation Checks

Check if Okay. Enter comment or note number if deficient.

Check Tag->	Equip	CT-1	Contr.
General Installation			
Cooling tower in place and in good condition			
Test and balance report reviewed for CHW system flows			
Tower environment clean			
Adequate tower & component access for maintenance			
Equipment labels affixed			
Vibration isolators installed per spec.; released from ship. restraints			
Seismic restraints in place per spec.			
Fan inlet screens free of debris			
Fan belts adjusted			
Fan shaft collars installed and tight			
Fan lubricated			
Fan blade pitch adjusted (propeller fans only)			
Tower basin access adequate			
Tower basin sump strainers clean & sump filled (installer check)			
Sump heater &/or other freeze protection in place (alarms, tape)			
Temperature gauges installed			
Pressure gauges installed across circulating pump			
Spray water inlet strainer installed and clean (installer check)			
Spray nozzles clean (installer check)			
Water treatment system operational			
Piping			
Pipe fittings and accessories complete			
Isolation valves and balancing valves installed per spec			
Pipe fittings and accessories complete per spec			
Pipes not supported on tower			
Piping type and flow direction labeled on piping			

Notes:

Check if Okay. Enter comment or note number if deficient.

Hydronic system flushing complete & strainers cleaned (to be checked by installer)		
Valves stroke freely & close tightly (see section 7 procedures; coil valves covered w/ AHUs)		
No visible water leaks		
Pipe insulation installed per spec & in good condition where visible		
Pressure gauges, thermometers, sensors installed where spec'd		
Test plugs (P/T) installed per spec		
Makeup water supply piped		
Makeup water shut-off valve installed		
Pipes are properly labeled (direction, etc.)		
Valves are properly tagged		
Chemical treatment system or plan installed		
Water treatment report submitted		
Distribution header balanced		
Test plugs installed		
Isolation and balancing valves installed per drawings		
Fan VFDs (if applicable)		
VFD powered (wired to controlled equipment)		
VFD interlocked to control system (checked by installer)		
Controlling sensor properly located & per drawings & calibrated		
Drive location not subject to excessive temperature (high/low), moisture, or dirt		
Drive size matches motor size		
Motor is rated for use with VFDs		
Internal setting designating the model is correct		
Input of motor FLA represents 100% to 105% of motor FLA rating		
Appropriate Volts vs Hz curve is being used		
Accel and decel times are around 10-50 seconds, except for special applications. Actual decel = _____ Actual accel = _____		

Notes:

Check if Okay. Enter comment or note number if deficient.

Upper frequency limit set at 100%, unless explained otherwise		
Min. speed setting. Acceptance: <50% or 30 Hz. (See note 1)		
Motor full load speed setting. Acceptance: Equal to motor rating.		
Motor frequency setting. Acceptance: same as rated motor freq.		
Motor line voltage setting. Acceptance: same as rated motor voltage, usually 460 volts.		
No disconnects installed between VFD & motor without shutdown interlock to VFD		
Shutdown interlocks between VFD & motor verified to be operational		
Separate conduit for VFD incoming power & outgoing motor leads		
Electrical		
Power to unit and disconnect installed		
Electrical connections tight		
Size of overcurrent heater in motor starter correct (checked by installer)		
Power available to sump heater		
Controls (to be checked by installer)		
Control system interlocks hooked up and functional		
All control devices, pneumatic tubing and wiring complete		

- *The checklist items of Part 4 are all successfully completed for given trade.....* ☐ YES ☐ NO

5. Operational Checks

Enter data as requested. Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag-	CT	Contr.
>			
Cooling tower starts and runs			

Notes:

Enter data as requested. Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag-	CT	Contr.
>			
Fan rotation verified correct under normal operation			
If VFD-equipped, fan rotation verified correct in bypass mode			
Measure & record line to line voltage, all phases. Voltages within motor rating $\pm 10\%$? (If VFD-equipped, measure upstream of VFD.)			
Measure line to line voltage phase imbalance for each fan. (If VFD-equipped, measure upstream of VFD.) (% Imbalance = $100 \times (\text{avg.} - \text{furthest from avg.}) / \text{avg.}$) Record imbalance of each fan motor. Imbalance less than 2%?			
Record full load running amps for each fan. _____ rated FL amps x _____ svc factor = _____ (Max amps). Running less than max? (If VFD-equipped, measure upstream of VFD.)			
Motorized valves, dampers and float switches functional			
No unusual noise or vibration			
Verify sump heater operation			
Sump water level maintained per mfctr's instructions			
Test high and low water alarms.			
Specified point-to-point checks have been completed & documentation submitted for this system (checked by installer)			

- The checklist items of Part 5 are all successfully completed for given trade. YES NO

Notes:

6. Sensor Calibration Check (to be witnessed or completed by CA)

Instructions: All test instruments shall have had a certified calibration within the last 12 months: Y/N_____. All control points listed under each tower refer to sensors and stats that are dedicated to that tower system, and for the most part physically located close to or in the tower, not global (building-level) points. If sensor location is improper, explain in comments. Enter other tower control points that are critical to the control sequence in the blank spaces for each tower, as appropriate. It is not necessary to repeat any calibration that was documented in the Chiller Prefunctional Checklist or the Standard Commissioning Procedure for Energy Management Systems, but refer to those documents where relevant.

Criteria for Acceptance: Water temperature sensors -- EMS value ± 1.0 F degrees from measured values.
Outside air temperature sensors -- EMS value ± 1.5 F degrees from measured values.

CONTROL TYPE	SENSOR / STAT LOCATION	LOCATIO N OK?	1st EMS VALUE	MEASUR ED VALUE	Final EMS VALUE	PASS Y/N?
Outdoor air temp., global (EMS)						
Tower-____:						
Entering water temp.						
Leaving water temp.						

- *All sensors are calibrated within required tolerances.....* ☐ YES ☐ NO

7. Misc. Procedures

7.1. Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

-- END OF CHECKLIST --

Notes: