

**ADDENDUM NUMBER: TWO**

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**PROJECT: ESDC – PPT REGINA AMALGAMATION  
REGINA, SK**

This Addendum forms part of the Contract Documents and amends the original Drawings and Specifications dated 2021-03-17, previous Addenda if applicable and as noted below. This Addendum consists of 5 pages and attached Specification Sections and Drawings as listed below.

Ensure that all parties are aware of all items included in this Addendum.

**The following revised or additional Specifications and Drawings accompany and form an integral part of this Addendum:**

Section	Title	Date of Issue
01 79 00.13	Demonstration and Training for Building Commissioning (Cx)	2021-07-15
01 91 13	General Commissioning (Cx) Requirements	2021-07-15
01 91 13.13	Commissioning (Cx) Plan	2021-07-15
01 91 13.16	Commissioning (Cx) Forms	2021-07-15
	Commissioning Plan	2021-07-15

Dwg. No.	Title	Date of Issue
AR01	Roof Curb Detail	2021-07-14
AR02	Partial Main Floor Finishes Plan	2021-07-14

#### **A-2-1 REF. ARCHITECTURAL REQUESTS FOR EQUALS**

- .1 Suppliers of approved products are responsible to ensure that the following approved equals fully meet the requirements of the drawings and specifications, and that the approved equals do not diminish both the grade of product and appearance to those products specified. Claims by the General Contractor for additional costs to alter other building systems to suit the supply and installation of all approved equals will not be entertained. The following manufacturers and products listed are considered as approved equals to the specified products:

Specification Section	Specified Product	Approved Equivalent
10 28 00	Toilet Tissue Dispenser Bobrick B-2740, Frost 150	ASI 0264-1A
10 28 00	Paper Towel Dispenser Bobrick B-2860, Frost 109-70S	ASI 8523A
10 28 00	Soap Dispenser Bobrick B-2013, Frost 714-S	ASI 20365
10 28 00	Feminine Napkin Disposal Bin Bobrick B-270, Frost 622	ASI 20852
10 28 00	Mirror Bobrick B-165, Frost 941-6MM	ASI 0620-2448

Specification Section	Specified Product	Approved Equivalent
10 28 00	Grab Bar GB1 (Straight) Bobrick B-5806.99x24, Frost 1001-SP24	ASI 3700 c/w peened finish
10 28 00	Grab Bar GB2 (L-shaped) Bobrick B-5898.99, Frost 1003-SP30x30	ASI 3700 c/w peened finish
10 28 00	Coat Hook Bobrick B-233, Frost 1138	ASI 8425
10 28 00	Waste Receptacle Bobrick B-43644, Frost 330	ASI 20458

**A-2-2 REF. SECTION 01 11 00, SUMMARY OF WORK**

- .1 1.1.3 DELETE this paragraph in its entirety.

**A-2-3 REF. SECTION 01 79 00.13, DEMONSTRATION AND TRAINING FOR BUILDING COMMISSIONING**

- .1 ADD Section 01 79 00.13 accompanying this addendum.

**A-2-4 REF. SECTION 01 91 13, GENERAL COMMISSIONING REQUIREMENTS**

- .1 ADD Section 01 91 13 accompanying this addendum.

**A-2-5 REF. SECTION 01 91 13.13, COMMISSIONING PLAN**

- .1 ADD Section 01 91 13.13 accompanying this addendum.

**A-2-6 REF. SECTION 01 91 13.16, COMMISSIONING FORMS**

- .1 ADD Section 01 91 13.16 accompanying this addendum.

**A-2-7 REF. COMMISSIONING PLAN**

- .1 ADD Commissioning Plan Document accompanying this addendum.

**A-2-8 REF. SECTION 08 71 00, DOOR HARDWARE**

- .1 Reference Note 2 at end of section; DELETE references to appended Z1 Security drawings and appended Security Design Brief.

**A-2-9 REF. SECTION 09 06 00.13, ROOM FINISH SCHEDULE**

- .1 Reference Room Number 150.5; DELETE note Fire-retardant plywood on walls.
- .2 Reference Room Number 150.7; ADD note "Fire-retardant plywood on walls. Paint."

**A-2-10 REF. SECTION 26 05 00, COMMON WORK RESULTS-ELECTRICAL**

- .1 1.31 CLARIFICATION, an Integrated Life Safety Systems Test is required in the area of renovation. An existing Integrated Life Safety Systems Test has been performed on the entire building. The Integrated Life Safety Systems Test for the renovation area must include fire alarm verification of new and relocated fire alarm equipment and testing of the emergency lighting system. The contractor must coordinate with the building operator in regards to testing the emergency lighting system with the operation of the building generator. The contractor shall allow for the number of Integrated Life Safety Systems Tests as required for the phased completion of the work.
- .2 1.32 CLARIFICATION, an Arc Flash Study is required for the new panel '1H2'. An existing study of the existing distribution equipment installed within the building will be provided to the successful contractor so that a study can be completed for the new panel installation.

**A-2-11 REF. SECTION 27 05 13, COMMUNICATIONS SYSTEMS**

- .1 2.2.3 CLARIFICATION, the sound masking system will not require the use of ambient sensing microphones to operate. A standard sound masking system is to be installed in the area of renovations with speakers located where indicated on the drawings.

**A-2-12 REF. DRAWING A2.1**

- .1 Reference Detail 1, Demolition Plan Main Floor; REVISE note adjacent to Door 106.1 to read "Remove interior layers of gypsum board to facilitate new secure wall partition."
- .2 Reference Detail 1, Demolition Plan Main Floor; ADD General Note "Where interior layer of gypsum board is being removed at Door 106.1, remove, salvage, and store existing interior signage. Re-install salvaged interior signage to original detail."

**A-2-13 REF. DRAWING A2.7**

- .1 Reference Detail 1, Finishes Plan; PROVIDE stainless steel divider strip at junction of new and existing ceramic tile at Doors 150.1.1.
- .2 Reference Detail 1, Finishes Plan; REVISE the flooring finishes near the intersection of Gridlines 6 and K as indicated on attached sketch AR02 accompanying this addendum.

**A-2-14 REF. DRAWING A4.1**

- .1 Reference Detail 1, Partial Building Section; REVISE the leader arrow for the note 'Line of New Suspended Ceiling' above New Opening Into Room 150.12, to extend to the ceiling line and not the lintel above the opening.
- .2 Reference Detail 1, Partial Building Section; PROVIDE 92 steel stud angle bracing @ 400o.c. for the bulkhead framing just south of Gridline J. Install angle framing from the roof structure to approximately the half way point of the vertical framing, alternating the orientation at each support. Angle bracing to be installed to support the bulkhead framing.

**A-2-15 REF. DRAWING A4.4R1**

- .1 Reference Detail 6, Column Furring / Security Wall Detail; REVISE the P4 partition call up to a P7 partition.

**A-2-16 REF. DRAWING A4.5**

- .1 Reference Detail 7, Roof Curb Detail; REPLACE this detail in its entirety with Sketch AR01 accompanying this addendum.
- .2 Reference Detail 9, Column Furring; CLARIFICATION, fire-retardant plywood to be installed after installation of gypsum board finish.

**A-2-17 REF. DRAWING E2.2**

- .1 Reference Detail 1, Main Floor Lighting Plan; CLARIFICATION, all emergency lighting fixtures indicated on the drawings, where applicable, shall be controlled and able to dim as part of the lighting control system. The light fixtures shall be controlled by the lighting control zone of the adjacent light fixtures indicated on the drawing. The emergency light fixtures connected to the lighting control system shall immediately rise to 100% output, if dimmed, in the event of a power failure as per the Lighting Control – Sequence of Operation on drawing E3.1.

**A-2-18 REF. GENERAL QUESTIONS RAISED BY BIDDERS**

- .1 Q#05: Request for time extension.
- A#05: Refer to Amendment 001, Point #3.
- .2 Q#06: Request for equals for Section 10 28 00 – Washroom Accessories?
- A#06: Refer to Addendum item A-2-1
- .3 Q#07: Is work to be performed during regular hours?
- A#07: Refer to Section 01 11 00 – Summary of Work and Section 01 14 00 – Work Restrictions.
- .4 Q#08-1: Vibra-Sonic Control is a sound masking company in Calgary, AB. We would like to present our quote for the sound masking scope of work for this project, as an alternate and equivalent system specified in the tender.
- Q#08-2: I noted that the sound masking speakers are specified in the open office areas of the main floor plan only. The ambient sensing microphones are not specified on the drawing though it is mentioned in the specifications. Are you looking for the standard sound masking system or the standard system with ambient sensing? Please clarify.
- Q#08-1: Please let me know the list of general contractors or the electrical contractors working on this project, so that I can forward our pricing to them to include it in their pricing package. Or you may please direct me to the person from whom I can get that information?

A#08-1: The specifications are performance based specifications. The manufacturer must meet the specified requirements for the basis of design. All alternate equipment that meets or exceeds the performance, quality, or design intent of that specified will be accepted and only those products that may alter the design intent must be submitted for review. It is the contractor's sole responsibility to ensure that all products they propose to use meets the requirement of the project in full.

A#08-2: The locations of the sound masking speakers indicated on the plans are correct. Refer also to Addendum item A-2-11.

A#08-3: Refer to Amendment 001 for list of contractors who attended the site walk through.

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Q#09-1: Is an arc flash/coordination study required for this tender? 26 05 00 – 1.32/1.33?

- a. All distribution is existing with exception of one new sub-feed electrical panel.
- b. If so, please confirm scope of work/requirements as this renovation area is only a small portion of the entire building/tower electrical distribution grid.

Q#09-2: E2.2 – Lighting fixture schedule.

- a. Some fixtures are missing manufacturer specs.

Q#09-3: Section 283100.02 Item 3.4 Integrated Life Safety Systems Test

- a. As the renovation project is a very small portion of the building is this testing required as part of the tender or will the owners be taking care of it?
- b. If this testing is required, please provide clarification and list of requirements that need to be tested or a cash allowance.
  - (These tests can be substantial as they can involve turning the main power off to the entire building and testing all life safety systems throughout the entire building)

Q#09-4: Are the light fixtures connected to an emergency circuit supposed to be controlled, dimmed where applicable by the lighting control system?

- a. Drawing E2.2 does not have any of these fixtures tagged with a "LZ-?" zone. (Typical)
- b. Drawing E3.1 – Lighting Control – Sequence of Operation schedule makes reference to these fixtures rising to 100% output in the event of a power failure which implies they might be. (Typical)
- c. Can you confirm?

A#09-1: Refer to Addendum item A-2-10.

A#09-2: This is a performance based specification and all details of the light fixtures must comply with what are indicated on the drawings.

A#09-3: Refer to Addendum item A-2-10.

A#09-4: Refer to Addendum item A-2-17.

**END OF SECTION**

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**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.

**1.2 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

**1.3 INSTRUCTORS**

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

**1.4 TRAINING OBJECTIVES**

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

**1.5 TRAINING MATERIALS**

- .1 Contractor to be responsible for content and quality.

- .2 Training materials to include:
  - .1 As-Built Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Management Manual.
  - .5 TAB and FPT Reports.
- .3 Departmental Representative will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
  - .1 Multimedia presentations.
  - .2 Manufacturer's training videos.
  - .3 Equipment models.

## **1.6 SCHEDULING**

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, each training session to be max 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

## **1.7 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative

## **1.8 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
  - .1 Review of facility and occupancy profile.
  - .2 Functional requirements.
  - .3 System philosophy, limitations of systems and emergency procedures.
  - .4 Review of system layout, equipment, components and controls.
  - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

- .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Inter-Action among systems during integrated operation.
- .10 Review of O M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

## **1.9 VIDEO-BASED TRAINING**

- .1 Manufacturer's videotapes to be used as training tool with Departmental Representative review and written approval 3 months prior to commencement of scheduled training.
- .2 On-Site training videos:
  - .1 Videotape training sessions for use during future training.
  - .2 To be performed after systems are fully commissioned.
  - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be high quality.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 Execution**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**



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**Part 1            General**

**1.1            SUMMARY**

- .1    Section Includes:
  - .1        General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2    Acronyms:
  - .1        BMM - Building Management Manual.
  - .2        Cx - Commissioning.
  - .3        EMCS - Energy Monitoring and Control Systems.
  - .4        O M - Operation and Maintenance.
  - .5        IVC – Installation Verification Checklist
  - .6        FPT – Functional Performance Testing
  - .7        PI - Product Information.
  - .8        PV - Performance Verification.
  - .9        TAB - Testing, Adjusting and Balancing.
  - .10      Cx Issues Log – Commissioning Issues Log. This document is provided by the Departmental Representative and contains a record of the issues found during commissioning which are to be addressed by the contractor.

**1.2            GENERAL**

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

- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements and construction documentation.

### **1.3 COMMISSIONING OVERVIEW**

- .1 Section 01 91 13.13 - Commissioning Plan.
- .2 For Cx responsibilities refer to Section 01 91 13.13 - Commissioning Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .6 Departmental Representative will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been fully commissioned and functional as per design intent to meet contractor specifications and project functional and operational requirements.
  - .3 Completion of O&M training session to Operational and Maintenance staffs.
  - .4 Final O&M and Training manual receive, review and approve by Departmental Representative for suitability.
  - .5 When systems and integrated systems tests have been successfully completed and life safety support systems tests are completed.
  - .6 When all requirements of authority having jurisdiction have been be met.

### **1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS**

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

### **1.5 PRE-CX REVIEW**

- .1 Before Construction:
  - .1 Review Contract Documents, confirm by writing to Departmental Representative.

- .1 Adequacy of provisions for Cx.
  - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
  - .2 Complete and submit required commissioning documentation.
    - .1 Refer to Section 01 91 31 Commissioning (Cx) Plan
  - .3 Complete testing requirements identified in this specification as well as the specific specification section relevant to the equipment being tested.
- .3 Before start of Cx:
  - .1 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .2 Fully understand Cx requirements and procedures.
  - .3 Have Cx documentation shelf-ready.
  - .4 Understand completely design criteria and intent and special features.
  - .5 Submit complete start-up documentation to Departmental Representative.
  - .6 Have Cx schedules up-to-date.
  - .7 Ensure systems have been cleaned thoroughly.
  - .8 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
  - .9 Ensure As-Built system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

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

## **1.7 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Preliminary Cx schedule.
  - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8]weeks prior to start of Cx.
  - .3 Provide additional documentation relating to Cx process required by Departmental Representative.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists and Product Information (PI)/Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Provide completed Cx documentation to the Departmental Representative.

## **1.9 COMMISSIONING SCHEDULE**

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

## **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

## **1.11 STARTING AND TESTING**

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

## **1.12 WITNESSING OF STARTING AND TESTING**

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

## **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .2 Integrity of warranties:

- .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
- .2 Verify with manufacturer that testing as specified will not void warranties.
- .3 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System FPT: include repetition of tests after correcting deficiencies.
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved IVC and Start-up forms.
  - .1 Refer to Section 01 91 13.16 Commissioning Forms
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.

- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Signed installation/start-up check lists.
  - .3 Start-up reports,
  - .4 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

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

#### **1.17 TEST RESULTS**

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

#### **1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 5 days prior to start of Functional Performance Testing (FPT).
- .2 Start FPT after elements of building affecting start-up and performance verification of systems have been completed.

#### **1.19 INSTRUMENTS/EQUIPMENT**

- .1 Submit to Departmental Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.
  - .3 Equipment as required to complete work.

#### **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Functional Performance Testing:

- .1 Following procedures illustrated in the approved functional performance testing sheets.
- .2 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.
- .3 On independent systems and interacting systems.
- .2 Departmental Representative will develop functional performance testing forms.
- .3 Departmental Representative will complete functional performance testing forms while witnessing testing.
- .4 Follow equipment manufacturer's operating instructions.
- .5 EMCS trending to be available as supporting documentation for performance verification.

#### **1.21 WITNESSING COMMISSIONING**

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

#### **1.22 AUTHORITIES HAVING JURISDICTION**

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

#### **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas could be difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

#### **1.24 EXTRAPOLATION OF RESULTS**

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

#### **1.25 EXTENT OF VERIFICATION**

- .1 Terminal Equipment:
  - .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of Departmental Representative.

- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .4 Review and repeat commissioning of systems if inconsistencies found in more than 20 % of reported results.
- .5 Perform additional commissioning until results are acceptable to Departmental Representative.

#### **1.26 REPEAT VERIFICATIONS**

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

#### **1.27 SUNDRY CHECKS AND ADJUSTMENTS**

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

#### **1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.
- .3 A Cx Issues Log will be created and maintained by the Departmental Representative throughout the project, identifying issues from installation, start-up, and functional testing of systems and integrated systems.
- .4 Correct and respond in writing to the items identified on the Cx Issues Log, clearly identifying how the issue has been resolved. Written responses shall be provided to the Departmental Representative.

#### **1.29 COMPLETION OF COMMISSIONING**

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



**1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

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

**1.31 TRAINING**

- .1 In accordance with Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

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

**1.33 OCCUPANCY**

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

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and FPT if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Departmental Representative
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 % of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

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

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

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**Part 1            General**

**1.1            SUMMARY**

- .1    Section Includes:
  - .1      Description of overall structure of Plan and roles and responsibilities of commissioning team.

**1.2            REFERENCE STANDARDS**

- .1    Underwriters' Laboratories of Canada (ULC)
- .2    Commissioning Plan developed by the Departmental Representative has been attached to these specifications and clearly defines the commissioning process.
- .3    CSA-Z320-11- Building Commissioning Standard
- .4    ASHRAE 202-2013-Bommissionioing Process for Building and System.

**1.3            GENERAL**

- .1    Provide a fully functional facility:
  - .1      Systems, equipment and components meet user's functional requirements before date of acceptance and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
  - .2      Facility user and O M personnel have been fully trained in aspects of installed systems.
  - .3      Optimized life cycle costs.
  - .4      Complete documentation relating to installed equipment and systems.
- .2    Term "Cx" in this section means Commissioning.
- .3    Use this Cx Plan as master planning document for Cx:
  - .1      Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
  - .2      Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
  - .3      Sets out deliverables relating to O M, process and administration of Cx.
  - .4      Describes process of verification of how built works meet Owner's requirements.
  - .5      Produces a complete functional system prior to issuance of Certificate of Occupancy.
  - .6      Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
    - .1          Overview of Cx.
    - .2          General description of elements that make up Cx Plan.
    - .3          Process and methodology for successful Cx.
- .4    Acronyms:

- .1 Cx - Commissioning.
- .2 BMM - Building Management Manual.
- .3 EMCS - Energy Monitoring and Control Systems.
- .4 SDS - WHMIS Safety Data Sheets.
- .5 PI - Product Information.
- .6 PV - Performance Verification.
- .7 IVC – Installation Verification Checklist
- .8 FPT – Functional Performance Testing
- .9 TAB - Testing, Adjusting and Balancing.
- .10 WHMIS - Workplace Hazardous Materials Information System.
- .5 Commissioning terms used in this Section:
  - .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
  - .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

#### **1.4 DEVELOPMENT OF 100% CX PLAN**

- .1 Submit completed Cx Plan to Departmental Representative and obtain written approval.

#### **1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM**

- .1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.
- .2 Project Manager will select Cx Team consisting of following members:
  - .1 Departmental Representative: during construction, will conduct periodic site reviews to observe general progress.
  - .2 Departmental Representative: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
    - .1 Review of Cx documentation from operational perspective.
    - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
    - .3 Protection of health, safety and comfort of occupants and O M personnel.
  - .3 Departmental Representative is responsible for:
    - .1 Organizing Cx.
    - .2 Monitoring operations Cx activities.
    - .3 Witnessing, certifying accuracy of reported results.
    - .4 Witnessing and certifying TAB and other tests.
    - .5 Developing BMM.
    - .6 Ensuring implementation of final Cx Plan.
    - .7 Performing verification of performance of installed systems and equipment.
    - .8 Implementation of Training Plan.

- .4 Construction Team: contractor, subcontractors, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:
  - .1 Testing.
  - .2 TAB.
  - .3 Performance of Cx activities.
  - .4 Delivery of training and Cx documentation.
  - .5 Assigning one person as point of contact with Departmental Representative for administrative and coordination purposes.
- .5 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
  - .1 Day-To-Day operation and maintenance of facility.

## 1.6 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
  - .1 Installation contractor/subcontractor:
    - .1 Equipment and systems except as noted.
  - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
    - .1 To include performance verification.
  - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.
  - .4 Specialist Cx agency:
    - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
  - .5 Ensure that Cx participant:
    - .1 Could complete work within scheduled time frame.
    - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O M personnel, including:
      - .1 Modify ventilation rates to meet changes in off-gassing.
      - .2 Changes to heating or cooling loads beyond scope of EMCS.
      - .3 Changes to EMCS control strategies beyond level of training provided to O M personnel.
      - .4 Redistribution of electrical services.
      - .5 Modifications of fire alarm systems.
      - .6 Modifications to voice communications systems.
  - .6 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

## **1.7 EXTENT OF CX**

- .1 Commission mechanical systems and associated equipment:
  - .1 HVAC and exhaust systems:
    - .1 HVAC systems (Fancoils).
    - .2 Local exhaust systems (Exhaust fans).
    - .3 Supplementary heating systems (force flow heaters, radiant heating).
  - .2 EMCS:
    - .1 BMS controls relating to above systems.
- .2 Commission electrical systems and equipment:
  - .1 Lighting systems:
    - .1 Lighting equipment.
    - .2 Distribution systems.
    - .3 Emergency lighting systems, including battery packs.
    - .4 Fire exit emergency signage.
    - .5 Lighting controls.
  - .2 Electrical Distribution
    - .1 Electrical Panels.
    - .2 Receptacles.
  - .3 Fire Alarm System
  - .4 Access Control (including doors)
  - .5 Security
  - .6 Sound Masking

## **1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES**

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

- .10 Contractor's and sub-contractor's as built drawings.

## **1.9 DELIVERABLES RELATING TO THE CX PROCESS**

- .1 General:
  - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
- .2 Definitions:
  - .1 Cx as used in this section includes:
    - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
    - .2 Factory inspections and performance verification tests.
- .3 Deliverables: provide:
  - .1 Cx Specifications.
  - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
  - .3 Completed installation verification checklists (IVCs).
  - .4 Completed functional performance test (FPT) report forms.
  - .5 Results of Functional Performance Tests and Inspections.
  - .6 Training Plans.
  - .7 Cx Reports.
  - .8 Prescribed activities during warranty period.

## **1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION**

- .1 Items listed in this Cx Plan include the following:
  - .1 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
  - .2 Departmental Representative will monitor some of these inspections and tests.
  - .3 Include completed documentation in Cx report.
- .2 Pre-Cx activities - MECHANICAL:
  - .1 HVAC equipment and systems:
    - .1 Bump each item of equipment in its stand-alone mode.
    - .2 At this time, complete pre-start-up checks and complete relevant documentation.
    - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
    - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
  - .2 EMCS:
    - .1 EMCS trending to be available as supporting documentation for performance verification.

- .2 Perform point-by-point testing in parallel with start-up.
- .3 Submit point-by-point testing results to Departmental Representative
- .4 Carry out point-by-point verification.
- .5 Demonstrate performance of systems, to be witnessed by Departmental Representative prior to start of 30-day Final Acceptance Test period.
- .6 Perform final Cx and operational tests during demonstration period and 30-day test period.
- .7 Only additional testing after foregoing have been successfully completed to be Off-Season Tests.
- .3 Plumbing Systems:
  - .1 Verify design flow of at each newly installed fixture.
  - .2 Verify proper operation of all new fixture controls.
  - .3 Verify hot water recirculation is properly balanced and hot water is delivered to fixtures quickly.
  - .4 Demonstrate system operation to Departmental Representative.
- .3 Pre-Cx activities – ELECTRICAL:
  - .1 Lighting systems:
    - .1 Emergency lighting systems:
      - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
    - .2 Normal lighting systems:
      - .1 Tests to include verification of lighting levels and coverage
      - .2 Tests to include verification of lighting system control functionality.
  - .2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Demonstrate devices and zones to Departmental Representative.
  - .3 Electrical distribution equipment:
    - .1 Tests to include verification of installation, wiring, phasing. Refer to checklists provided within Commissioning Plan.
  - .4 Access Control Systems:
    - .1 Demonstrate full operation of Access Control system to Departmental Representative.
    - .2 Provide Project specific report confirming operation of all systems and devices.
  - .5 Sound Masking Systems:
    - .1 Provide Project specific report confirming operation of sound masking systems
    - .2 Demonstrate complete operation of system to Departmental Representative.



## **1.11 START-UP**

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's directions all commissioned equipment
- .3 Departmental Representative to monitor some of these start-up activities.
  - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Functional Performance Testing (FPT):
  - .1 Functional performance testing to commence once installation verification and start-up forms have been reviewed and approved.
  - .2 Functional performance testing forms to be developed by Departmental Representative.
  - .3 Contractor to operate equipment as required for all functional performance testing.
  - .4 Departmental Representative will witness functional performance testing and record results.

## **1.12 INSTALLATION VERIFICATION CHECK LISTS (IVCs)**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists, Start-up and Functional Performance Test (FPT) Forms.

## **1.13 EQUIPMENT START-UP FORMS**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists, Start-up and Functional Performance Test (FPT) Forms.

## **1.14 FUNCTIONAL PERFORMANCE TESTING FORMS**

- .1 Refer to Section 01 91 13.16 - Commissioning Forms: Installation Check Lists, Start-up and Functional Performance Test (FPT) Forms.

## **1.15 DELIVERABLES RELATING TO ADMINISTRATION OF CX**

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

## **1.16 CX SCHEDULES**

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
  - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
    - .1 Design criteria, design intents.
    - .2 Pre-TAB review: 28 days after contract award, and before construction starts.

- .3 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
- .4 Notification of intention to start TAB: 21 days before start of TAB.
- .5 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
- .6 Notification of intention to start Cx: 14 days before start of Cx.
- .7 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
- .8 Identification of deferred Cx.
- .9 Implementation of training plans.
- .2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
- .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

#### **1.17 ACTIVITIES DURING WARRANTY PERIOD**

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
  - .1 Fine tuning of HVAC systems.
  - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

#### **1.18 TRAINING PLANS**

- .1 Refer to Section 01 79 00.13 - Demonstration and Training for Building Commissioning.

#### **1.19 FINAL SETTINGS**

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

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

---

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

---

**Part 1            General**

**1.1               SUMMARY**

- .1    Section Includes:
  - .1       Commissioning forms to be completed for equipment, system and integrated system.

**1.2               INSTALLATION/START-UP CHECK LISTS**

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

**1.3               FUNCTIONAL PERFORMANCE TESTING (FPT) FORMS**

- .1    FPT forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
- .2    FPT report forms are developed by the Departmental Representative.
- .3    Assist in the development of FPT forms where required.
- .4    Operate equipment for all systems and integrated systems for functional performance testing witnessed by the Departmental Representative.
- .5    Forms are completed by the Departmental Representative.

- .6 Refer to sample forms provided at the end of this specification, refer to appended WSP Commissioning Plan.

#### **1.4 SAMPLES OF COMMISSIONING FORMS**

- .1 Required commissioning forms will be provided by the Departmental Representative.
- .2 Revise items on Commissioning forms as required to suit project requirements.
- .3 Samples of Commissioning forms are provided at the end of this specification, refer to appended WSP Commissioning Plan.

#### **1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

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

#### **1.6 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Contractor to complete IVC and Start-up forms and verify correct installation and operation of items indicated on these forms.
  - .3 Confirm operation as per design criteria and intent.
  - .4 Identify variances between design and operation and reasons for variances.
  - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .6 Record analytical and substantiating data.
  - .7 Verify reported results.
  - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
  - .9 Submit immediately after tests are performed.
  - .10 Reported results in true measured SI unit values.
  - .11 Provide Departmental Representative with originals of completed forms.
  - .12 Maintain copy on site during start-up, testing and commissioning period.

### **Part 2 Products**

#### **2.1 NOT USED**

- .1 Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

SEPW ARCHITECTURE INC.

# SERVICE CANADA CENTRE FOR EMPLOYMENT SOCIAL DEVELOPMENT CANADA AND PASSPORT CANADA COMMISSIONING PLAN









# SERVICE CANADA CENTRE FOR EMPLOYMENT SOCIAL DEVELOPMENT CANADA AND PASSPORT CANADA COMMISSIONING PLAN

SEPW ARCHITECTURE INC.

DRAFT VERSION

DATE: MARCH 11, 2021

PREPARED BY: NATASHA SKEA, P.ENG

## **DISCLAIMER**

*The role of the (Commissioning Agent / Commissioning Authority / Testing Coordinator) is to coordinate, observe, and document the results of equipment testing as demonstrated by contractors or other operations staff. WSP's mandate excludes design, construction, or operation of systems, including operation in normal, emergency, or untested conditions. Consequently, WSP disclaims any responsibility for the rectification of deficiencies whether observed or hidden as those are the responsibility of other parties associated with the project.*

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# 1 SUMMARY

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## 1.1 COMMISSIONING

Commissioning is the quality assurance process of moving the facility from the ‘static completion’ to the optimal ‘dynamic’ operating state. Building systems are checked for proper and complete installation, and then tested to verify proper functioning of both individual components and the total systems. The goal and overriding purpose is to verify that the building performs as per the design intent and meets the Owner’s operational needs.

The Commissioning Plan provides the details for the implementation of the commissioning process.

- Outlines and describes the commissioning process and the objectives of the commissioning
- Identifies the members of the commissioning team and their roles and responsibilities in the commissioning process
- Documents the commissioning process for future references in operating and maintaining the facility
- Schedules the commissioning activities for testing, verification, and training of O/M staff

This Commissioning Plan was developed for the Service Canada Centre for Employment Social Development Canada and Passport Canada fit-out project. We understand that that project consists of the fit up 1,096.3 m<sup>2</sup> of special purpose space (SPS) and office space for a joint requirement for Passport Canada and Employment Services and Development Canada in the Alvin Hamilton building located at 1783 Hamilton St., Regina, SK. An additional 294m<sup>2</sup> adjacent to the reconfigured Service Canada Center, is to be renovated to base building standards for potential use of a future tenant.

---

## 1.2 COMMISSIONING TASKS

- Review the OPR and the basis of the design documentation
- Incorporate commissioning requirements into the construction documents
- Develop and utilize a commissioning plan
- Develop construction checklists
- Develop a system test procedure
- Verify system test execution
- Review contractor submittals
- Verify inclusion of operator and occupant training requirements in construction documents
- Produce systems manual
- Verify operator and occupant training delivery and effectiveness
- Maintain an issues and benefits log throughout the commissioning process
- Verify seasonal testing
- Review building operations 10 months after substantial completion
- Complete a commissioning report

---

## 1.3 COMMISSIONING OBJECTIVES

- Support quality management through monitoring and checking of the installation
- Verify system performance through testing and commissioning of the completed installation

- Move the completed facility from the ‘static completion’ state to the optimal ‘dynamic’ operating state
- Optimize operating and maintenance through delivery of comprehensive quality training and instruction to the Owner’s operating personnel
- System debugging and optimization
- Completion of testing and verification through seasonal review

## 2 COMMISSIONING PROCESS AND WORK PRODUCTS

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### 2.1 DESIGN PHASE

The design intent is established by the Owner and the basis of design is provided by the consulting team. The commissioning requirements are developed and incorporated into the contract documents.

---

#### 2.1.1 OWNERS PROJECT REQUIREMENTS (OPR) (BY OWNER, ARCHITECT)

The OPR is prepared or assembled by the Owner and Architect to properly reflect the Owner's intent and requirements for the services the building will deliver. The OPR documents the owner's requirements for the building and systems including HVAC, lighting, indoor environment, energy efficiency, siting, water and environmental responsiveness. This is a living document that will evolve as the project and design evolve.

---

#### 2.1.2 BASIS OF DESIGN (BOD) (BY ARCHITECT, DESIGN ENGINEERS)

BOD (or Design Brief) is prepared in three parts by Architect, Mechanical Engineer and Electrical Engineer. The BOD documents the designers' proposals for meeting the requirements of the OPR, and includes information on items that influence design decisions such as occupancy, space and process requirements, codes and standards, load and climatic assumptions. This is a living document that will evolve as the project and design evolve. The Commissioning Authority (CxA) reviews and verifies that the basis of design and proposed systems and strategies meet the OPR, and will prepare a summary of issues that may require attention to confirm all OPR needs are appropriately addressed.

---

#### 2.1.3 SPECIFICATIONS (BY ARCHITECT, DESIGN ENGINEERS)

Commissioning specifications are developed by the architect and design engineers with assistance from the CxA. Specifications outline the responsibilities of the contractors in the commissioning process. This includes requirements in meetings participation, submittals for review, installation verification, deficiency remediation, equipment start-up, Testing, Adjusting & Balancing (TAB), and functional performance testing complete with commissioning forms and check sheets.

---

#### 2.1.4 COMMISSIONING PLAN (BY CxA)

The commissioning plan (this document) is developed by the CxA and summarizes the tasks involved at each stage of the commissioning process. The document also outlines the responsibilities of each member of the commissioning team. The Cx Plan is initially developed during the design phase of the project, but is a living document and is updated as the project evolves.

---

### 2.2 CONSTRUCTION PHASE

Periodic commissioning meetings are held with trades throughout the construction phase so that commissioning requirements are understood, deficiencies are reviewed as necessary, and equipment start-ups, pre-functional testing and functional performance testing are all coordinated.

---

### 2.2.1 SUBMITTAL REVIEW (BY CXA)

The CxA reviews the mechanical and electrical submittals for commissionability and performance. Comments are provided to the design team for inclusion in their official reviews. The reviews are commissioning focused and checks that sequences do not compromise the overall intent, will run as efficiently as possible, and will adequately meet the Owner's requirements and environmental objectives.

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### 2.2.2 INSTALLATION VERIFICATION CHECKLISTS (IVC) (BY CXA)

Installation (Pre-Functional) Verification Checklists (IVCs) are developed by the CxA and completed by the contractors with spot checks by the CxA. IVCs assist in reviewing the quality of the installation including equipment condition, accessibility, serviceability, adherence to installation requirements, completeness, and operational preparedness. On major pieces of equipment, basic start-up parameters are also included such as voltage, motor amps, on/off control, and motor rotation direction. Pre-balancing inspection reports also constitute part of installation verification.

- CxA provides periodic inspections of the systems to be commissioned to assist with identification of potential installation issues of concern
- Periodic commissioning meetings held with trades to confirm commissioning requirements are understood, review deficiencies as necessary, coordinate equipment start-ups, pre-functional testing and functional performance testing.
- Contractors submit completed Installation Verification Checklists.

---

### 2.2.3 EQUIPMENT START-UP & BALANCING

Equipment start-up and testing dates are established and incorporated into the construction schedule. Start-up procedures, equipment start-up and balancing work are all witnessed by the CxA, as necessary.

- Contractor submits installation verification checklists and all manufacturer start-up reports
- TAB (Balancing) contractor submits a draft and final balancing reports.

---

### 2.2.4 FUNCTIONAL PERFORMANCE TESTING (FPT) (BY CXA)

FPT forms and procedures are developed by the CxA. On-site testing is performed by the contractors under direction of the CxA. Performance testing is a collection of dynamic tests that evaluates the systems through all modes of operation. FPT verifies operation of the equipment, controls sequences and interconnected systems comply with the design intent. Some functional performance testing is seasonally dependant and deferred until weather conditions permit.

---

## 2.3 POST-CONSTRUCTION PHASE

---

### 2.3.1 O&M MANUALS (BY CONTRACTORS)

Contractors are responsible for compiling the O&M manuals for all equipment supplied. The CxA will review and comment on completeness and to check the information is specific to the equipment installed on-site. The main sections required include; preventative maintenance schedule, troubleshooting guide, spare parts list, contact information, shop drawings and warranty information.

---

### 2.3.2 O&M TRAINING (BY CONTRACTORS / MANUFACTURER'S REP)

O&M training timetable is developed by the PM and contractor in conjunction with the CxA and delivered by the contractor or manufacturer's rep for each major piece of equipment or equipment type installed. The party performing the training shall provide complete and relevant handouts to attendees. Topics covered in the training session should include:

- General description of the system and its operation including identification of major components
- Identification of operating controls and safeties including normal and abnormal sensor readings
- Review of the O&M manuals for identification of service requirements, procedures, wiring diagrams, parts identification, safety procedures, etc.
- Operational review for start-up, normal operation, shut down, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting and alarms
- Interactions with other systems and adjustments and optimizing methods for energy conservation
- Regular maintenance requirements including frequency, parts and equipment, and tools needed, replacement parts sources
- Identification of contacts for service support and maintenance parts

---

### 2.3.3 COMMISSIONING REPORT (BY CXA)

Prepared by the CxA, the commissioning report will be submitted to the Owner soon after testing is complete. The commissioning report will contain the following:

- Final copies of OPR and BOD
- Copy of commissioning specifications
- Completed IVC and FPT checklists (Appendix)
- Value of commissioning process
- Outstanding commissioning issues
- Issues log/site reports history of deficiencies and corrective actions (Appendix)

---

## 2.4 OCCUPANCY PHASE

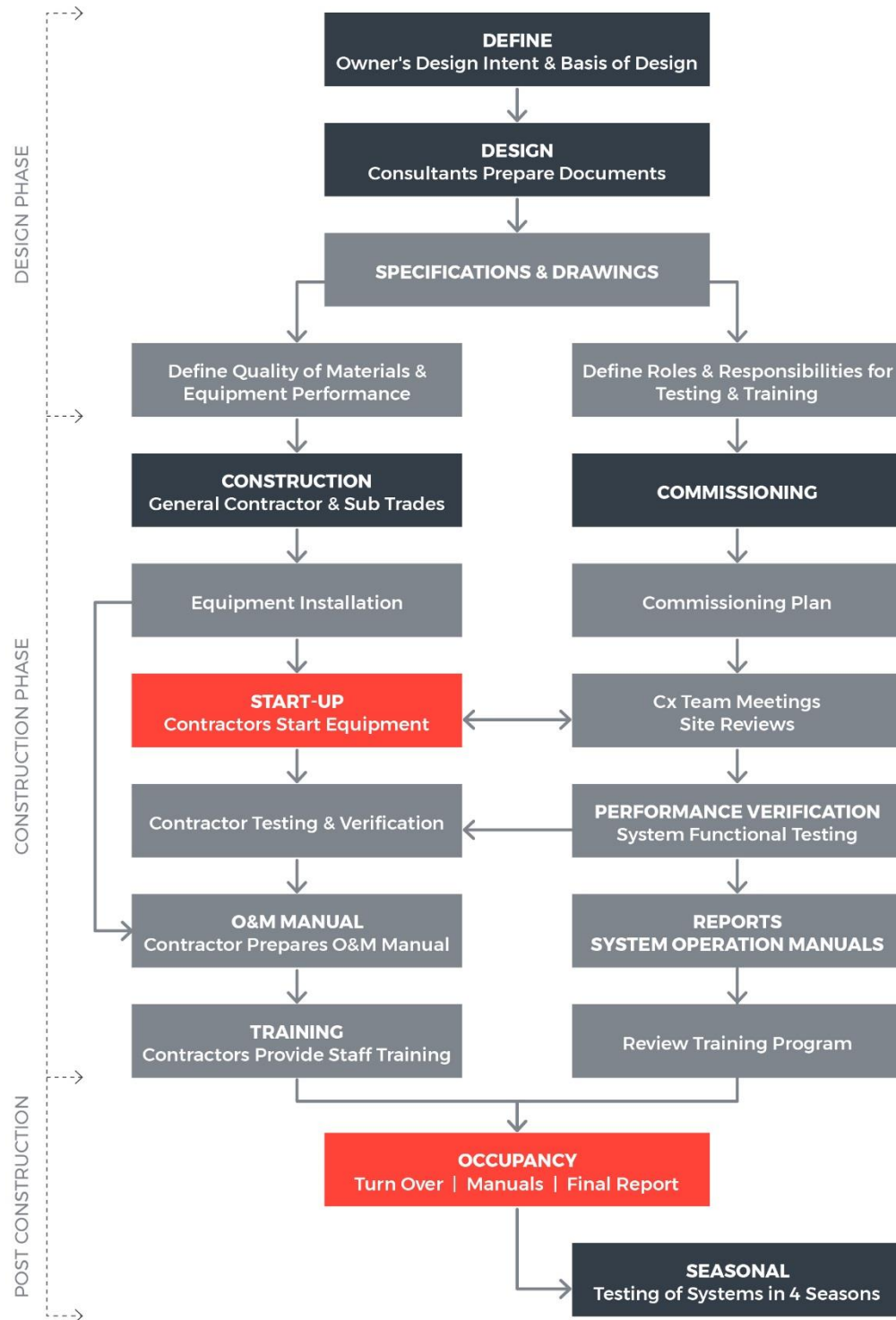
---

### 2.4.1 BUILDING REVIEW AFTER 10 MONTHS (BY CXA)

The CxA will provide a plan for reporting of occupant concerns to the operating staff. The CxA will also work with the contractor to verify deficiencies are resolved before the end of the warranty period. At approximately two (2) months before warranty expiry, the CxA will review any outstanding deficiencies and occupant concerns with the Owner, occupants, their maintenance staff and contractor. The meeting will serve to finalize solutions to any outstanding issues yet to be resolved. A final deficiency and action list will be developed. Suggestions for operational improvements will also be documented. A commitment will be obtained from the contractor as to the actions to be undertaken and the timeline for remediation of any and all warranty issues.



## 2.5 COMMISSIONING PROCESS FLOW CHART



# 3 PROJECT TEAM MEMBERS & RESPONSIBILITIES

---

## 3.1 COMMISSIONING TEAM MEMBERS

Commissioning team members with roles and responsibilities for this project are listed below. A list of responsibilities for commissioning and construction team members is also provided in the Commissioning Specification. Each team member will be asked to designate a representative to attend regularly scheduled Cx meetings.

The commissioning team involves the following members:

- WSP (Commissioning Authority – CxA)
  - SEPW Architecture (Architect)
  - WSP (Mech Design Consultants)
  - WSP (Elec Design Consultants)
  - Owners Rep/Project Manager (Owner Representative)
  - TBD (General Contractor, Project Manager)
  - TBD (Mechanical Contractors)
  - TBD (Electrical Contractors)
  - Controls Contractor/Operator
  - Testing and Balancing Contractor
- 

## 3.2 ROLES & RESPONSIBILITIES

---

### 3.2.1 MECHANICAL CONTRACTOR

- 1 Attend initial commissioning coordination meeting.
  - 2 Provide a complete set of all submittals for mechanical equipment to the CxA
  - 3 Provide complete equipment and systems start-up including personnel and tools, as required for safe, proper and complete start-up of all mechanical equipment.
  - 4 Perform installation verification, start-up and TAB and complete required documentation as directed by CxA.
  - 5 Correct all deficiencies found during installation verification, start-up and TAB to ensure that all equipment and systems are fully functional and ready for functional performance testing.
  - 6 Notify CxA a minimum of two weeks in advance of equipment and system start-up and/or installation verification testing.
  - 7 Set-up and schedule vendors and contractors required to participate in the owner training sessions for all equipment and systems.
  - 8 Provide a complete set of as-built record drawings and schematics with a copy to the CxA.
  - 9 Provide documentation required in specifications for the Systems Manual and O&M Manuals
- 

### 3.2.2 TAB CONTRACTOR

- 1 Attend initial commissioning coordination meeting.

- 2 Submit TAB procedures to CxA and Mechanical Consultant for review and acceptance.
  - 3 Provide a preliminary TAB report showing that the system is complete and capable of being balanced. Provide an additional copy of the report labeled "For CxA".
  - 4 Attend TAB review meeting scheduled by the CxA. Be prepared to discuss procedures that shall be followed in TAB and findings of preliminary TAB.
  - 5 Submittal of final TAB report showing all flows, pressures, motor speeds, voltages and amperages etc., as required for a full and complete balancing report on all systems. Provide an additional copy of the TAB final report labeled "For CxA", and include as-built distribution systems schematics.
  - 6 Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB report where required by the CxA for verification or diagnostic purposes.
- 

### 3.2.3 BUILDING CONTROLS & AUTOMATION SYSTEM CONTRACTOR(S)

- 1 Attend initial commissioning coordination meeting.
  - 2 Attend Sequence of Operation and Graphics review meeting scheduled by the CxA. Be prepared to discuss all sequences including all changes, and provide a schematic for each proposed graphic.
  - 3 Provide the following submittals to the CxA at time of FPT. (Note: The following shall be updated to as-built conditions).
  - 4 Hardware and software submittals and shop drawings.
  - 5 Narrative description of each control sequence for each piece of equipment or system controlled.
  - 6 Point-to-point and sensor calibration verification checklists
  - 7 As-built diagrams showing all control points, sensor locations, point names, actuators, controllers and, where necessary, points of access, superimposed on diagrams of the physical equipment.
  - 8 Printout of panel layouts including all analog input, analog output, digital input, and digital output connections. Provide a separate list for each stand-alone control unit.
  - 9 Printout of final control programming algorithms, include current values of all parameters for each system point.
  - 10 Provide thorough training to operating personnel on hardware, operation and programming, and the application program for the system.
  - 11 Demonstrate system performance to CxA. including all modes of system operation. (e.g. normal, abnormal, emergency).
  - 12 Provide control system technician to operate systems as required by and under the direction of the CxA during system verification and functional performance testing.
  - 13 Provide support and coordination with TAB contractor on all interfaces between their scopes of work. Provide all devices, such as portable operators' terminals, for TAB use in completing TAB procedures.
  - 14 Provide any trend logs as may be required by the CxA.
  - 15 Provide documentation required in specifications for the Systems Manual and O&M Manuals
- 

### 3.2.4 ELECTRICAL CONTRACTOR

- 1 Attend commissioning meetings scheduled by the CxA.
- 2 Provide a complete set of all submittals for electrical equipment to the CxA
- 3 Provide a copy of the electrical Coordination Study (if any).
- 4 Correct all deficiencies found during Installation Verification Inspection (IVI), start-up, TAB and FPT to ensure all equipment and systems are fully functional and in complete and proper working order.
- 5 Prior to occupancy, but following the completion of all changes, certify that all protection devices have been checked and reset to conform to the Coordination Study settings.
- 6 Participate in the verification of all protective device settings.

- 7 Prepare O&M manuals and supplementary information on all equipment and assemble in binders tabbed and indexed. Supplementary information may include, but is not limited to, such items as power/control field wiring diagrams, equipment maintenance schedule, vendor and maintenance contact lists.
- 8 Provide electrical system technicians to assist during system verification and functional performance testing as required by the CxA.
- 9 Provide a complete set of as-built record drawings and schematics with a copy to the CxA.
- 10 Provide documentation required in specifications for the Systems Manual and O&M Manuals

### 3.3 COMMUNICATIONS PROTOCOL

The following protocols will be used on this project. Requests for information or formal documentation by the CxA are handled through the normal communication channels. Minor issues may be handled through more informal discussions between the contractor, the designers or other parties directly involved and/or the CxA as appropriate.

ISSUE	PROTOCOL
Requests for information or formal documentation.	CxA goes first through the PM.
Minor or verbal information and clarifications	CxA goes direct to the informed party.
Notifying contractors of deficiencies	CxA documents deficiencies through the PM, but may discuss deficiency issues with contractors and Design Consultants prior to notifying the PM.
Scheduling functional tests or training	CxA provides input and schedule review of testing and training. Scheduling is done through the GC / PM.
Scheduling commissioning meetings	CxA requests the date and schedules through the GC / PM.
Request for significant changes	CxA has no authority to issue change orders.
Making minor changes to the installed sequences of operations	<b>Minor</b> changes in sequences of operations and graphical representations required to correct or enhance system operations may be requested by the CxA, but must be documented
Making significant changes to the installed sequences of operations	The CxA may recommend to the design engineer PM changes in sequences of operation to improve efficiency or control.
Subcontractors disagreeing with requests or interpretations by the CxA	Resolve issues at the lowest level possible. First with the CxA, then with the GC and PM. Some issues may require input from the A/E team.

The Primary Consultant/PM will ensure that the appropriate Design Consultants respond in writing to all documents issued by the CxA. The Primary Consultant/PM shall issue copies of the following documents to the CxA:

- Updated Construction drawings, specifications and addendums
- Contemplated Changes c/w all related sketches
- Change Orders c/w all related sketches

- Site instructions
  - Field review reports
  - Construction meeting minutes
  - Request for information with response
- 

## 3.4 MEETINGS

The CxA attends selected planning and job-site meetings to remain informed on construction progress and to update parties involved in commissioning. The Construction Manager and the General Contractor provide the CxA with information regarding substitutions, change orders, and any Engineer/ Architect supplemental instructions that may affect the commissioning of equipment, systems, or the commissioning schedule. The CxA may review construction minutes, change orders, or site instructions for the same purpose.

Commissioning meetings may also be scheduled during construction by the CxA to include all the commissioning team members. Those meetings shall address commissioning related responsibilities and the preparation for all specified testing, documentation, O&M manuals, training, and post-construction requirements.

---

## 3.5 PROGRESS REPORTING AND ISSUES LOG

The CxA provides the Owner and project team with regular commissioning progress reports. These Issues Logs generally contain a list of new and outstanding deficiencies and a description of commissioning progress corresponding to the plan. The CxA maintains a log of all commissioning related issues that require current or future attention. This record allows for clear tracking of the status of documentation and testing for each piece of equipment and each system. Information can include installer, party responsible for start-up, approval dates for check lists and test forms, their completion, training, O&M documentation review, etc.

---

## 3.6 WORK PLAN

This Commissioning Plan illustrates the commissioning deliverables and how they will be achieved. The commissioning process typically follows the project schedule. Commissioning deliverables are dependent upon documentation being ready for review or systems being ready to test. Delays in construction can lead to delays in the commissioning process. Once construction starts, WSP will work with the contractors to incorporate commissioning activities and milestones into the overall project schedule. During site visits, the CxA will monitor the construction against the schedule and flag any items that we feel may impact the commissioning schedule.

# 4 SYSTEMS TO BE COMMISSIONED

---

## PLUMBING EQUIPMENT

- WC-01
  - SK-01
  - LAV-01
- 

## 4.1 TERMINAL EQUIPMENT

- Fancoil units
  - Exhaust fans
- 

## 4.2 ELECTRICAL SYSTEMS

- Lighting systems and controls
  - Lighting fixtures
  - Emergency Lightning
  - Electrical Panels
- 

## 4.3 BUILDING AUTOMATION SYSTEMS (BAS)

- Direct digital control (DDC) systems operating any of the above systems.
- 

## 4.4 SPECIALTY ELECTRONIC SYSTEMS

- Fire alarm System\*
- Access Control System (including doors)\*
- Security\*
- Sound Masking\*

*\*Note that for these systems, WSP will review the reports provided by the installing contractors and/or the authorities having jurisdiction. Reports will be included in the final commissioning report.*

---

END OF DOCUMENT

# APPENDIX

## A SYSTEMS TO BE COMMISSIONED



# APPENDIX

Note: this table will be updated and revised as the project progresses

## SYSTEMS TO BE COMMISSIONED

TAG	EQUIPMENT	SERVICE
FC-*	Fancoils (relocated)	Fitup area
FC-*	Fancoils (new)	Fitup area
EX-	Exhaust fans	Washrooms
BMS	Control System	Fitup area
AC-*	DX cooling units	LAN/IT rooms
Lighting	Lighting System	Fitup area
Panel 1E2	Electrical Distribution	Fitup area
Panel 1D2	Electrical Distribution	Fitup area
Panel 1FC	Electrical Distribution	Fitup area
Panel 1A6	Electrical Distribution	Fitup area
Panel 1H2	Electrical Distribution	Fitup area
Panel 1B6	Electrical Distribution	Fitup area
Emergency Lighting	Lighting System	Fitup area
Fire Exit Signage	Signage	Fitup area
Fire Alarm	Fire Alarm	Fitup area
Access Control System	Access Control	Fitup area
Security	Security	Fitup area
Sound Masking	Sound Masking	Fitup area



# APPENDIX

**B**

SAMPLE

INSTALLATION

VERIFICATION

CHECKLISTS

# HVAC COMMISSIONING

## INSTALLATION VERIFICATION CHECKLIST

### FAN COILS

PROJECT: AHB - ESDC and PPT

Unit Tag Number				
Location				
Area served				
Make/Model				
<b>General Installation</b>				
Unit tag & certification labels affixed				
Casing free of damage and paint scratches				
Unit properly suspended, mounted and secured				
Doors open, close, lock & seal properly				
Insulation complete and not damaged				
Service access for unit is maintained				
Shipping locks removed				
Vibration isolation free, no rubbing				
Equipment clean up complete inside and out				
Proper filters installed				
<b>Piping, Coils and Accessories</b>				
Pipes properly supported				
Piping insulation complete & sealed				
Piping labelled for duty & direction				
Coils clean, no fin or tube damage				
Valves installed (isolation, 2-way, balance, etc)				
Thermometers, pressure gauges, test plugs				
Coil pump installation and operation verified				
Condensate drain/trap installed properly				
<b>Fans, Ducts &amp; Dampers</b>				
Duct connections properly sized				
Duct connections & joints completely sealed				
Duct insulation complete and sealed.				
Ducts labelled for duty & direction				
Accessories installed (balancing damper, flex conn)				
Fan rotates freely in proper direction				
Belt tension and alignment verified				
<b>Checks By</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	
<b>Witness to Testing</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	

Comments:

# HVAC COMMISSIONING

## START-UP CHECKLIST

### FAN COILS

PROJECT: AHB - ESDC and PPT

Unit Tag Number				
Safeties, controls & interlock operation verified				
Factory electrical schematic posted in unit.				
Field wiring complete & drawing provided				
Power disconnects labelled and tested				
Electrical connections tested & tight.				
Actual overload setting (Amps)				
<b>Checks By</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	
<b>Witness to Testing</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	

Comments:

SAMPLE

# HVAC COMMISSIONING

## DETAILS

### FAN COILS

*Please verify unit has been setup as per the detail page (initial each component) and sign below*

SAMPLE

Checks By	Company	Signature	Date
Witness to Testing	Company	Signature	Date

Comments:

# HVAC COMMISSIONING

## INSTALLATION VERIFICATION CHECKLIST

### FANS

PROJECT: AHB - ESDC and PPT

Unit Tag Number				
Location				
Area served				
Make/Model				
<b>General Installation</b>				
Unit tag & certification labels affixed				
Casing free of damage and paint scratches				
Doors open, close lock & seal properly				
Unit properly suspended, mounted and secured				
Flexible connectors installed				
Belt alignment and tension verified				
Fan rotates freely in proper direction				
Equipment clean up complete inside and out				
Duct connections & joints completely sealed				
Duct insulation completed and sealed				
Ducts labelled for duty and direction				
Free of noise and vibration				
Accessories installed (motorized damper, etc)				
<b>Checks By</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	
<b>Witness to Testing</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	

**Comments:**

# HVAC COMMISSIONING

## START-UP CHECKLIST

### FANS

PROJECT: AHB - ESDC and PPT

Unit Tag Number				
Safeties, controls & interlock operation verified				
Factory electrical schematic posted in unit				
Field wiring complete & drawing provided				
Power disconnects labelled and tested				
Electrical connections tested & tight				
Actual overload setting (Amps)				
<b>Note: Only required if not included in TAB report</b>	<b>1</b>		<b>2</b>	
	<b>Rated</b>	<b>Measured</b>	<b>Rated</b>	<b>Measured</b>
Volts / Amps p1		/		/
Volts / Amps p2	/	/	/	/
Volts / Amps p3		/		/
	<b>3</b>		<b>4</b>	
	<b>Rated</b>	<b>Measured</b>	<b>Rated</b>	<b>Measured</b>
Volts / Amps p1		/		/
Volts / Amps p2	/	/	/	/
Volts / Amps p3		/		/
<b>Checks By</b>	<b>Company</b>		<b>Signature</b>	<b>Date</b>
<b>Witness to Testing</b>	<b>Company</b>		<b>Signature</b>	<b>Date</b>

Comments:

# HVAC COMMISSIONING

## DETAILS

FANS

PROJECT: AHB - ESDC and PPT

Please verify unit has been setup as per the detail page (initial each component) and sign below

SAMPLE

Checks By	Company	Signature	Date
Witness to Testing	Company	Signature	Date

Comments:



### Electrical Commissioning - Lighting Prefunctional/Start-up Checklist

[illegible]

\* Indicates that lighting and associated switching has been found to be operating properly

**Fixture Schedule (for Fixtures Noted on this checklist)**[illegible]

**Sign Off is Required by Installing Contractor, General Contractor and Commissioning Agent**

Checked By	Company	Signature	Date





## HVAC COMMISSIONING INSTALLATION VERIFICATION CHECKLIST

### ELECTRICAL DISTRIBUTION EQUIPMENT (Transformers, Switches, Panels, etc.)

PROJECT:

EQUIPMENT I.D.	1	2		
Unit Tag Number				
Unit Description / Type				
Location				
Area served				
<b>General Installation</b>				
Unit tag permanently affixed & visible				
ESA inspection sticker *				
Casing not damaged				
Equipment clean up complete				
Doors / covers operate & seal properly				
Shipping packaging removed				
Required access for unit is maintained				
<b>Instrumentation and Controls</b>				
As-Built electrical schematic included in unit, and displaying control elements and settings				
All control elements specified are installed, accessible, & operational, including buttons, indicator lights, selector switches, etc.				
Metering installed, visible, accessible, & operational				
<b>Electrical</b>				
Wiring complete, including grounding				
Electrical connections checked for tightness				
Disconnects labelled and operational				
Supply fuse or breaker size (in Amps)				
Load balanced across all phases				
<b>Measurements **</b>	<b>Rated</b>	<b>Measured</b>	<b>Rated</b>	<b>Measured</b>
Volts phase 1-2				
Volts phase 2-3				
Volts phase 3-1				
Amps phase 1				
Amps phase 2				
Amps phase 3				
<b>Checks By</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	
<b>Witness to Testing</b>	<b>Company</b>	<b>Signature</b>	<b>Date</b>	

#### Comments:

\* If ESA inspection sticker is not applicable for item, then attach ESA inspection certificate which covers inspection of the referenced item.

\*\* Measurements shall be taken of the supply (line side) for all drives and load centres (distribution panels, control panels, etc.), but are not required for individual breakers and disconnects.

# APPENDIX

## C SAMPLE FUNCTIONAL PERFORMANCE TEST FORMS

## Fan Coil A (Htg/Clg) - Functional Test Form

System:		Location:	
Drawing Reference:		Area Served:	

Witness (Print)	Company	Signature	Date

### Pre-Verification Check List

Item	Received		Comment
	Yes	No	
Air System TAB Report			
Hydronic System TAB Report			
BAS Graphics are Complete and Accurately Displayed			
BAS Point to Point Verification Report			

### Operational Verification

Item	Status		Comment
	Pass	Fail	
<b>Heating Coil</b>			
Manually command control valve to 100% at BAS and witness action of the valve actuator			
Manually command control valve to 50% at BAS and witness action of the valve actuator			
Manually command control valve to 0% at BAS and witness action of the valve actuator			
<b>Cooling Coil</b>			
Manually command control valve to 100% at BAS and witness action of the valve actuator			
Manually command control valve to 50% at BAS and witness action of the valve actuator			
Manually command control valve to 0% at BAS and witness action of the valve actuator			
<b>Supply Fan</b>			
Enable unit at BAS on low speed			
Supply fan shutdowns with starter			
Alarm at BAS for single fan failure.			

### Verification Safeties & Alarms

Item	Status		Comment
	Pass	Fail	
<b>Alarms</b>			
Space high temperature			
Space low temperature			
Fan failure			

## Sequence of Operation Verification

Setpoint	Design	Current At BAS	Comment
Occupied Cooling SP			
Occupied Heating SP			
Unoccupied Cooling SP			
Unoccupied Heating SP			

## Sequence of Operations Verification

Item	Status		Comment
	Pass	Fail	
Verify the occupied schedule is setup per the spec- 7AM to 5PM Mon-Fri			
Confirm ramped start-up times for warm-up/ cool-down based off Oat to achieve occupied temperatures during normal building occupancy. (based off an east zone			
Enable unit into occupied mode and confirm the unit starts			
Move the cooling setpoint to be less than the actual temperature by less than 1°C (cooling differential) and confirm the cooling valve modulates open and the supply fan			
Move the cooling setpoint to be less than the actual temperature by more than 1° and confirm the unit goes to high speed with the cooling valve still modulating to cool.			
Move the setpoint back to less than actual by less than differential and confirm it stays in high speed cooling.			
Move the cooling setpoint to be more than actual and confirm the cooling valve closes and the fan speed returns to low .			
Move the heating setpoint to be more than the actual temperature by less than 1°C (heating differential) and confirm the heating valve modulates and the supply fan			
Move the heating setpoint to be more than the actual temperature by more than the differential and confirm the unit goes to high speed with the heating valve continuing to			
Move the heating setpoint to be more than the actual by less than the differential and confirm the unit stays in high speed.			

Move the heating setpoint to be less the actual and confirm the heating valve closes and the fan speed returns to low.			
Put the cooling setpoint higher than the actual temperature and the heating setpoint lower than the actual and confirm the unit runs at low speed with both valves closed. Move all			
Put the fan coil in unoccupied mode with the night setback setpoint below the actual temperature and cofirm the fan is disabled with both heating and cooling valves closed.			
Move the night setback setpoint above the actual temperature and confirm the unit turns on at high speed and the heating valve modulates open. Confirm it stays on			
While in unoccupied mode, press the override switch and confirm the unit runs in occupied mode for 2 hours per the sequence above. Also confirm the associated ventilation			
Confirm the fan coil can be start/stopped of the graphic as an individual or globally			
Put the system in fire mode and confirm the fan coils on the fire floor shut off and the remaining units stay on normal operation.			
Confirm in emergency generator operation, the 4 corner zone fan coils on floors 3-10 and every 3rd perimeter zone main and 2nd floor fan coils operate.			
Confirm all the following alarms: Space high temp @25°C Space Low temp @ 19°C (all alarms adjustable)			
<i>Verify the following information is displayed at the BMS</i>			

Commissioned by:

Company:

Date:

Signature:

## Typical Automated Exhaust Fans - Functional Test Form

System:	<input style="width: 95%;" type="text"/>	Location:	<input style="width: 95%;" type="text"/>
Drawing Reference:	<input style="width: 95%;" type="text"/>	Area Served:	<input style="width: 95%;" type="text"/>

Witness (Print)	Company	Signature	Date

### Pre-Verification Check List

Item	Location	Serves	Manufacturer Start-Up Report	Duct Leakage Test Report	Air System TAB Report

### Sequence of Operation Verification

Item										
Automated Fans	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail
Confirm schedule is setup per operator's requirements.										
Enable fan and confirm fan responds properly.										
Turn the unit off at starter and confirm alarm (based off status).										

### Comments

Commissioned by:	<input style="width: 95%;" type="text"/>
Company:	<input style="width: 95%;" type="text"/>
Date:	<input style="width: 95%;" type="text"/>
Signature:	<input style="width: 95%;" type="text"/>

# APPENDIX

**D**

SAMPLE

COMMISSIONING

ISSUES LOG



## COMMISSIONING ISSUES LOG

### Site Report #\_\_\_\_\_

**Project Name:** Project Name  
**Report No.:** Site Report #\_\_\_\_\_  
**Subject:** Enter title of document being reviewed  
**Project No.:** Project Number  
**Report Date:** Date  
**Prepared By:**  
**Distribution:** Client Client Name Client@client.ca  
WSP Project Manager

**NOTE:** The comments in this report are WSP opinions and are not to be considered as directives. The recommendations are provided to help achieve systems that better meet the owner's project requirements with respect to functionality, energy performance, water performance, maintainability, sustainability, cost, indoor environmental quality and local codes.

The role of the Commissioning Agent / Commissioning Authority / Testing Coordinator is to coordinate, observe, and document the results of equipment testing as demonstrated by contractors or other operations staff. WSP's mandate excludes design, construction, or operation of systems, including operation in normal, emergency, or untested conditions. Consequently, WSP disclaims any responsibility for the rectification of deficiencies whether observed or hidden as those are the responsibility of other parties associated with the project.

Our recommendations are to be considered by the Owner at their discretion. The Consultant is to instruct the Contractor accordingly for any and all necessary action. Comments herein are directed to the applicable consultant for acceptance or rejection. A response and explanation is required. Please use the spaces provide and marked "Consultant Comment". To meet project timelines, responses are requested within 2 weeks of the report date unless otherwise noted.

#### Description:

Briefly describe document being reviewed, who prepared it and when it was received...(ex. WSP reviewed a copy of the TAB Report prepared by Fake HVAC Company. The report was received on October 21, 2020. The following was noted: )

Item	Reference	Comment	Action By
1.1			
		[Consultant Comment]	
1.2			
		[Consultant Comment]	

#### End of Report



RECORD DRAWING INDICATE THE EXISTING  
ROOF CONSTRUCTION TO BE:

50 STONE BALLAST  
SCRIM SHEET  
EPDM MEMBRANE  
TAPERED INSULATION  
100 RIGID INSULATION  
VAPOUR BARRIER  
13 EXTERIOR GYPSUM BOARD  
CONCRETE ROOF SLAB

CARRY VAPOUR RETARDER ONTO FACE OF CURB  
TO A POINT 50mm ABOVE ROOF SURFACE, LAP  
ROOFING MEMBRANE OVER AND SEAL

ROOF MEMBRANE PATCH AT  
OPENING LOCATION (TYP)

REPLACE INSULATION WITH NEW  
TO MATCH EXISTING

LAP NEW VAPOUR RETARDER  
OVER EXISTING ROOF VAPOUR  
BARRIER, 200mm MIN

REPLACE UNDERLAY AT OPENING  
WHERE REQUIRED, MATCH EXISTING

EXHAUST DUCTWORK AND CAP.  
REFER TO MECHANICAL

CARRY ROOF MEMBRANE CONTINUOUS OVER TOP  
OF CURB CURB AND LAP OVER VAPOUR BARRIER

REUSE EXISTING CURB IF SUITABLE.  
ENSURE CONSTRUCTION BELOW IS MET  
AS MINIMUM REQUIREMENT:

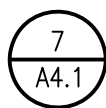
13 EXTERIOR GLASS MAT SHEATHING  
152 (18ga) STEEL STUDS @ 400 o.c.  
INFILL CAVITY WITH BATT INSULATION  
13 EXTERIOR GLASS MAT SHEATHING

VAPOUR BARRIER

REPLACE BALLAST AND SCRIM SHEET

EXISTING ROOF CONSTRUCTION SHOWN  
SHADED

REUSE EXISTING OPENING IN ROOF DECK



## ROOF CURB DETAIL

1:10

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**SEPW Architecture Inc.**

■ 206 - 1275 Broad Street, Regina, SK, S4R 1Y2 ph: (306) 569-2255  
□ 102 - 3718 Kinnear Place, Saskatoon SK, S7P 0A6 ph: (306) 652-6457  
■ website: www.sepw.ca

PROJECT TITLE  
**ESDC - PPT REGINA AMALGAMATION**  
1783 HAMILTON STREET  
REGINA, SK

DRAWING TITLE  
**ROOF CURB DETAIL**

DATE  
**2021-07-14**

SCALE  
**AS NOTED**

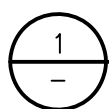
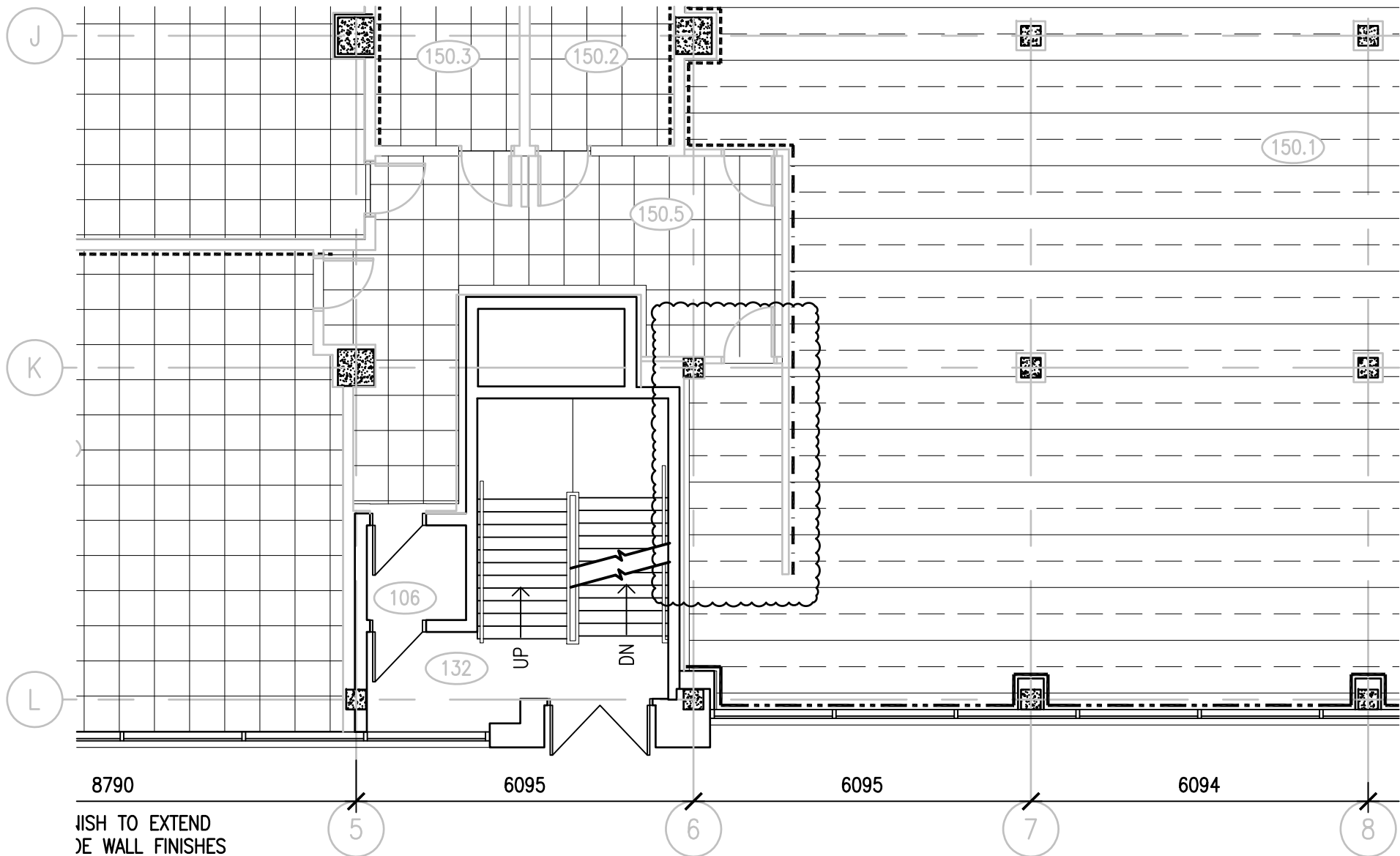
DRAWN  
**RP/RHM**

CHECKED  
**RP**

PROJECT NO.  
**R.060346**

DRAWING NO.

**AR01**



## PARTIAL FINISHES PLAN

1:100

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**PROJECT TITLE**  
ESDC - PPT REGINA AMALGAMATION  
1783 HAMILTON STREET  
REGINA, SK

**DRAWING TITLE**  
PARTIAL MAIN FLOOR FINISHES PLAN

**DATE**  
2021-07-14

**SCALE**  
AS NOTED

**DRAWN**  
RP/RHM

**CHECKED**  
RP

**PROJECT NO.**  
R.060346

**DRAWING NO.**

**AR02**