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Public Works and Government Services Canada
ATB Place North Tower
10025 Jasper Ave./10025 ave. Jasper
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**SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION**

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Comments - Commentaires

**Vendor/Firm Name and Address
Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

Public Works and Government Services Canada
ATB Place North Tower
10025 Jasper Ave./10025 ave Jasper
5th floor/5e étage
Edmonton
Alberta
T5J 1S6

Title - Sujet Greenstone Building Fit-Up	
Solicitation No. - N° de l'invitation EW038-171054/A	Amendment No. - N° modif. 001
Client Reference No. - N° de référence du client DND EW038-171054	Date 2016-08-18
GETS Reference No. - N° de référence de SEAG PW-\$PWU-107-10836	
File No. - N° de dossier PWU-6-39120 (107)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2016-09-08	
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Anthony, Mary	Buyer Id - Id de l'acheteur pwu107
Telephone No. - N° de téléphone (780) 237-7582 ()	FAX No. - N° de FAX (780) 497-3510
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction:	

Instructions: See Herein

Instructions: Voir aux présentes

Delivery Required - Livraison exigée	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

This amendment 001 has been raised to post Addendum 001

1.0	GENERAL	NOT USED
2.0	ARCHITECTURAL	
.1	Subject:	Specifications
	Refer:	Contract Documents
	Instructions:	Refer to revised Sections 01 91 13, 01 91 31 and 01 91 33.
3.0	STRUCTURAL	NOT USED
3.0	MECHANICAL	
.1	Subject:	Specifications
	Refer:	Contract Documents
	Instructions:	Refer to mechanical Addendum M-01-Cx test forms
4.0	ELECTRICAL	
.1	Subject:	Specifications
	Refer:	Contract Documents
	Instructions:	Refer to electrical Addendum E-01-Cx test forms.

END OF ADDENDUM No. 01

1 GENERAL

1.1 Related Requirements

- .1 Section 01 77 00 Closeout Procedures

1.2 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, 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 PI Product Information
 - .6 PV Performance Verification.
 - .7 TAB Testing, Adjusting and Balancing.

1.3 General

- .1 Cx is a planned process of tests, procedures and checks carried out systematically on systems and integrated systems of the finished project. Cx is performed after systems and integrated are completed 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 System to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency 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.

1.4 Commissioning Overview

- .1 Section 01 91 31 - Commissioning Cx Plan.
- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning Cx Plan.
- .3 Cx to be a line item of Contractor's Schedule of Values.
- .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 Substantial completion certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
 - .2 Equipment, components, systems and integrated systems have been fully commissioned and functional as per design intent within the context of the Owner requirement.
 - .3 Final O & M and Training Manual received, reviewed and approved by Design Consultant for suitability.
 - .4 Completion of Training session to all Operational and Maintenance staffs.

1.5 Non-Conformance to performance verification requirements

- .1 Should systems, 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 reduction or hold-back assessments.

1.6 Pre-Cx Review

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.

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- .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent special features.
 - .6 Submit complete start-up documentation to Departmental Representative.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete the TAB procedures systems, submit TAB reports to Departmental Representative for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished work.

1.7 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.

1.8 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 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

1.9 Commissioning Documentation

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

1.10 Commissioning Schedule

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- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 29 16. - Construction Progress Schedules - Bar (GANTT) Chart.
 - .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.11 Commissioning Meetings

- .1 Convene Cx meetings following project meetings: Section 01 29 00 - Construction Progress Schedules - Bar (GANTT) Chart and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage. Section 01 29 00 - Construction Progress Schedule - Construction Progress Schedules - Bar (GANTT) Chart. Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.12 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.

1.13 Witnessing of Starting and Testing

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

1.14 Manufacturer's Involvement

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.15 Procedures

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

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- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
 - .4 Document require tests on approved PV forms.
 - .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
 - .1 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .2 Rejected equipment to be remove from site and replace with new.
 - .3 Subject new equipment/systems to specified start-up procedures.

1.16 Start-Up Documentation

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

1.17 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.

1.18 Test Results

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

1.19 Start of Commissioning

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.20 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.

1.21 Commissioning Performance Verification

- .1 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.22 Witness Commissioning

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

1.23 Authorities having Jurisdiction

- .1 Where specified start-up, testing or commissioning procedures duplicate verification

requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

1.24 Commissioning Constraints

- .1 Access to some of the space(s) will be difficult after occupancy, Cx procedures are to be completed prior to Substantial completion.

1.25 Extrapolation of Results

- .1 Not used.

1.26 Extent of Verification

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

1.27 Repeat Verifications

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

1.28 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.

1.29 Completion of Commissioning

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification, activities specified in Cx specifications, complete Cx prior to issuance of Substantial 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 91 41 - Commissioning (cx) Training.

1.32 Maintenance Materials, Spare parts, Spacial Tools

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- .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 spaces.

1.34 Installed Instrumentation

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

1.35 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 data.

1.36 Owner's Performance Testing

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

2 **Products Not Used**

3 **Execution Not Used**

**Project No.
R.0734565**

**General
Commissioning
Requirements**

**Section 01 91 13
Page 11**

END OF SECTION

1 GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.

1.2 References

- .1 National Fire Protection Association (NFPA)
 - .1 NFPA-13-02, Installation of Sprinkler Systems Handbook.
 - .2 NFPA-14-02, Automatic Sprinkler Systems Handbook..
- .2 Public Works and Government Services Canada (PWGSC)
 - .1 PWGSC - Commissioning Guidelines -3rd edition-03.
- .3 Underwriters' Laboratories of Canada (ULC)
- .4 CSA-Z320-11- Building Commissioning Standard.
- .5 ASHRAE 202-2013 - Commissioning Process for Building and System.

1.3 General

- .1 Provide a fully functional Tenant Space(s):
 - .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.
 - .1 O&M personnel have been fully trained in aspects of installed systems.
 - .2 Optimized life cycle costs for new equipment.
 - .3 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 design 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 MSDS - Material Safety Data Sheets.
- .5 PI - Product Information.
- .6 PV - Performance Verification.
- .7 TAB - Testing, Adjusting and Balancing.
- .8 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

- .1 Bumping: short term start-up to prove ability to start and prove correct rotation.
- .2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, need for heating/cooling loads

1.4 Development of a 100 % Cx Plan

- .1 Cx Plan 95% completed by the Design Consultant and transmitted to the Contractor..
- .2 Cx Plan to be 100% completed within 4 weeks of award of contract to take into account:
 - .1 Approved shop drawings and product data.
 - .2 Approved changes to contract.
 - .3 Contractor's project schedule.
 - .4 Cx schedule.
 - .5 Contractor's, sub-contractor's, suppliers' requirements.
 - .6 Project construction team's and Cx team's requirements.
- .3 Submit 100 % completed Cx Plan to Departmental Representative and obtain written approval.

1.5 Refinement of Cx Plan

- .1 During construction phase, revise, refine and update Cx Plan to include:
 - .1 Changes resulting from Client program modifications.
 - .2 Approved design and construction changes.
- .2 Revise, refine and update every 2 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

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- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 Composition, roles and Responsibilities of Cx Plan

- .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 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 PWGSC Quality Assurance Commissioning Manager: confirm Cx processes, forms, sequence of operation and control logic are developed in the Cx Plan by the Prime Design Consultant to deliver a fully operational project:
 - .1 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .2 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.
 - .9 Monitoring of Cx activities, training, development of Cx documentation, and Protection of health, safety and comfort of occupants and O&M personnel
 - .10 Work closely with members of Cx Team.
- .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Departmental Representative and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.
- .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.
 - .2 Day-To-Day operation and maintenance of facility.

1.7 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 Client: responsible for intrusion and access security systems.
 - .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 1 month prior to starting date of Cx for review and approval.

1.8 Extent of Cx

- .1 Doors, windows, related hardware:
 - .1 new door and window hardware.
 - .2 electro/mechanical door hardware and button control
- .2 Commission mechanical systems and associated equipment:
 - .1 Plumbing systems:
 - .1 Lav heaters.
 - .2 Regular sanitary waste systems.
 - .3 Sewage pumps lift stations.
- .3 HVAC and exhaust systems: underfloor
 - .1 HVAC systems under floor air distribution.
 - .2 General exhaust systems - room air return.
 - .3 Exhaust systems and related systems.

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- .4 Fire and life safety systems:
 - .1 Special fire suppression systems identified herein:
 - .2 Wet pipe sprinkler systems.
 - .3 Fire extinguishers.
 - .5 Noise and vibration control systems.
 - .6 EMCS:
 - .1 See Section 00 00 00.
 - .7 Commission electrical systems and equipment:
 - .1 Lighting systems:
 - .2 Lighting equipment.
 - .3 Distribution systems.
 - .4 Emergency lighting systems, including battery packs.
 - .5 Fire exit emergency signage.
 - .8 Other systems and equipment:
 - .1 Intrusion and access security and safety systems as follows:
 - .1 Coordination with Departmental Representative installer.
 - .2 Sound Masking underfloor acoustic system commissioning by factory personnel.

1.9 Deliverables Relating to O & M Perspective

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

1.10 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.

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- .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
 - .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).
 - .4 Completed product information (PI) report forms.
 - .5 Completed performance verification (PV) report forms.
 - .6 Results of Performance Verification Tests and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Tests of following witnessed by PWGSC Design Quality Review Team:
 - .1 Fire Alarm verification.
 - .10 Tests performed by Departmental Representative
 - .11 Training Plans.
 - .12 Cx Reports.
 - .13 Prescribed activities during warranty period.
 - .4 Departmental Representative to witness and certify tests and reports of results provided to Departmental Representative.
 - .5 Departmental Representative to participate.

1.11 Pre-Cx Activities and Related Documentation

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
 - .2 Departmental Representative to use approved check lists.
 - .3 Departmental Representative will monitor some of these pre-start-up inspections.
 - .4 Include completed documentation with Cx report.
 - .5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
 - .6 Departmental Representative will monitor some of these inspections and tests.
 - .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL :
 - .1 Doors, windows, related hardware:
 - .1 Overhead doors: Vertical grilles.
 - .2 Door and window hardware: electro/mechanical and sliding doors.

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- .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 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.
 - .2 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.
 - .3 EMCS:
 - .1 EMCS trending to be available as supporting documentation for performance verification.
 - .2 Perform point-by-point testing in parallel with start-up.
 - .3 Carry out point-by-point verification.
 - .4 Demonstrate performance of systems, to be witnessed by Departmental Representative prior to start of 15 day Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period and 15 day test period.
 - .6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
 - .4 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include equipment and systems identified above.
 - .2 Reports of test results to be witnessed and certified by Departmental Representative before verification.
 - .5 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .1 Requires independent testing agency to perform pre- energization and post-energization test.
 - .2 Lighting systems:
 - .1 Emergency lighting systems:
 - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .3 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones to Departmental Representative.
 - .4 Low voltage systems: these include:
 - .1 Low voltage lighting control systems and data communications systems.
 - .5 Security, surveillance and intrusion alarm systems: to include verification by Departmental

1.12 Representative
Start-up

- .1 Start up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
 - .1 As indicated.
- .3 Departmental Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to witness and certify reported results using approved PI and PV forms.
 - .4 Departmental Representative to approve completed PV reports and provide to Departmental Representative.
 - .5 Departmental Representative reserves right to verify up to 30 % of reported results at random.
 - .6 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.13 **Cx Activities and Related Documentation**

- .1 Perform Cx by specified Cx agency using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .4 Departmental Representative to witness, certify reported results of, Cx activities and forward to Departmental Representative.

-
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.14 Cx of Integrated Systems and Related Documentation

- .1 Cx to be performed by specified Cx specialist, using procedures developed by Departmental Representative and approved by Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative and documented on approved report forms.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report, to be certified by Departmental Representative and submitted to Departmental Representative for review.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 HVAC and associated systems forming part of integrated HVAC systems: As indicated.
 - .2 Fire alarm systems: System verification.
 - .3 Emergency lighting systems: As indicated.
- .6 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance Departmental Representative and Cx Manager to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 Installation Check lists (ICL)

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 Product Information (PI) Report Forms

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 Performance Verification (PV) Report

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 Deliverables Relating to Administration of Cx

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

1.19 Cx Schedules

- .1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:
 - .1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:
 - .1 Design criteria, design intents.
 - .2 Pre-TAB review: 28 days after contract award, and before construction starts.
 - .3 Cx agents' credentials: 30 days before start of Cx.
 - .4 Cx procedures: 1 month after award of contract.
 - .5 Cx Report format: 1 month after contract award.
 - .6 Discussion of heating/cooling loads for Cx: 1 month before start-up.
 - .7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.
 - .8 Notification of intention to start TAB: 21 days before start of TAB.
 - .9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .10 Notification of intention to start Cx: 14 days before start of Cx.
 - .11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.
 - .12 Identification of deferred Cx.
 - .13 Implementation of training plans.
 - .14 Cx reports: immediately upon successful completion of Cx.
 - .15 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.
 - .2 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 Departmental Representative, Contractor, Contractor's Cx agent will monitor progress of Cx against this schedule.

1.20 Cx Reports

- .1 Submit reports of tests, witnessed and certified by Departmental Representative to Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.

-
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.21 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.
 - .3 Full-scale emergency evacuation exercises.

1.22 Training Plans

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.23 Final Settings

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

2 Products Not Used

3 Execution Not Used

END OF SECTION

1 GENERAL

1.1 Summary

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

1.2 Installation / Start-Up Check Lists

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

1.3 Product Information (PI) Report Forms

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

1.4 Performance Verification (PV) Forms

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

1.5 Samples of Commissioning Forms

- .1 Departmental Representative will develop and provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data. Sound Masking supplier to provide Commissioning forms for system start-up.

1.6 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.

1.7 Commissioning Forms

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

- .12 Maintain copy on site during start-up, testing and commissioning period.
- .13 Forms to be both hard copy and electronic format with typed written results in Building Management Manual in accordance with Section 01 77 00.

1.8 Language

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

2 Products Not used

3 Execution Not Used

END OF SECTION

TEST 0 General

0.1 SYSTEM TEST PURPOSES

- .1 The intent is to test all system components and the EMCS components through a series of checks and procedures designed to exercise the control system, as it would be used in normal and abnormal operating procedures.
- .2 To ensure system operation as per contract documents
- .3 To make adjustments to system components as required to the design intent and operational requirements.
- .4 Abbreviations:
 - .1 "C" denotes contractor sign off.
 - .2 "E" denotes Engineers verification.

TEST 1 Fan Coil System Test

1.1 TEST PURPOSES

- .1 To test the operation of the fan coils and variable air volume controllers.

1.2 TEST PRE-REQUISITES

- | | | |
|---|-----|-----|
| | C | E |
| .1 Contractor's component verifications are complete. Engineers' component verification will be done simultaneous with system test. | [] | [] |
| .2 Preliminary Air and water balance is complete. | [] | [] |
| .3 Ventilation system test is complete | [] | [] |

1.3 REQUIRED ITEMS

- | | | |
|---|-----|-----|
| | C | E |
| .1 Verify each fan coil thermostat is correctly associated with its fan coil | [] | [] |
| .2 Verify each fan coil opens the cooling coil control valve on a call for cooling and closes the heating coil valve. | [] | [] |
| .3 Verify that each fan coil heating control valve opens on a call for heating and the cooling control valve closes. | [] | [] |
| .4 Verify that lighting occupancy sensors correctly map to the fan coils. | [] | [] |
| .5 Verify that the VAV controller opens to control ventilation air to minimum position when the area is occupied. | [] | [] |
| .6 Verify that the during nite set back the fan coils shutoff and a nite setback temperature is established and the fan coils provide heating to maintain the nite setback temperature. | [] | [] |
| .7 Verify fan and VAV operation during night flush and purge modes. | [] | [] |
| .8 Verify that fans revert to night operation on power failure. | [] | [] |
| .9 Verify that fans shut off on fire alarm. | [] | [] |
| .10 Verify low temperature alarm is associated with each fan coil | [] | [] |

Project No:
R.073456

COMMISSIONING FORMS

Section 01810A
Page 3 of 5

Item	Location	1 Thermostat matches fan coil	2 Cooling valve operates correctly	3 Heating control operates correctly	4 Lighting occupancy sensors correctly map.	5 VAV controller operates correctly,	6 Nite setback operation	7 Free cooling and purge modes.	8 Night mode on power failure.	9 Shut off on fire alarm.	10 Low temperature alarm
FC-1-1											
FC-2-1											
FC-3-1											
FC-5-1											
FC-7-1											
FC-1-2											
FC-4-2											
FC-8-3											

Remarks/Comments:.....

Signature of Contractor Date.....

Name of Contracting Firm.....

Signature of Consultant Date.....

Name of Consultant Firm.....

TEST 2 Sanitary Lift Station System Test

2.1 TEST PURPOSES

- .1 To test the operation of the loading sanitary lift station.

2.2 TEST PRE-REQUISITES

- | | C | E |
|---|-----|-----|
| .1 All component verifications are complete and approved. | [] | [] |
| .2 Vendor start-up and testing has been completed | [] | [] |

2.3 REQUIRED ITEMS

- | | C | E |
|--|-----|-----|
| .1 Verify correct operation of the floats and pump | [] | [] |
| .2 Verify that the high level alarm (PL-SAN-HLA) causes an alarm in the CCMS system. | [] | [] |

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm.....

Signature of Consultant..... Date.....

Name of Consultant Firm

TEST 3 Sprinkler System Test

3.1 TEST PURPOSES

- .1 To test the operation of the fire protection systems.

3.2 TEST PRE-REQUISITES

- .1 Flushing of system mains is complete

C E
[] []

3.3 REQUIRED ITEMS

- .1 Demonstrate operation of each flow alarm and correct annunciation of the alarm at the fire alarm system.

C E

Zone	Time to Alarm	Comments
Main Floor West	37 sec	
Main Floor East	35 sec	
2 nd Floor East	36 sec	
3 rd Floor West	30 sec	

[] []

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm.....

Signature of Consultant Date.....

Name of Consultant Firm

END OF SECTION

TEST 0 General

0.1 SYSTEM TEST PURPOSES

- .1 The intent is to test the functionality of all new electrical system components that were added and existing components that were relocated. Series of checks and procedure will be exercised on the equipment testing and commissioning.
- .2 To ensure system operation as per contract documents
- .3 To make adjustments to system components as required to the design intent and operational requirements.
- .4 Abbreviations:
 - .1 "C" denotes contractor sign off.
 - .2 "E" denotes Engineers verification.

TEST 1 Lighting and Control Test

1.1 TEST PURPOSES

- .1 To test the operations of the lights and it's control.

1.2 TEST PRE-REQUISITES

- | | C | E |
|---|-----|-----|
| .1 Contractor's component verifications are complete. Engineers' component verification will be done simultaneous with system test. | [] | [] |
| .2 Installation of lighting and its control are complete. | [] | [] |

1.3 REQUIRED ITEMS

- | | C | E |
|--|-----|-----|
| .1 Verify each light if installed on location as shown on the drawing. | [] | [] |
| .2 Verify each light functionality (relocated, reuse and new). | [] | [] |
| .3 Verify each lighting control location per drawing. | [] | [] |
| .4 Verify each lighting control if following the design intend. | [] | [] |
| .5 Verify each lighting occupancy sensors if installed correctly. | [] | [] |
| .6 Verify day light saving sensor functionality (existing). | [] | [] |
| .7 Verify re-used lighting control functionality. | [] | [] |
| .8 Verify and measure light output and recorded. | [] | [] |
| .9 Verify that fans shut off on fire alarm. | [] | [] |

Project No:
R.073456

COMMISSIONING FORMS
(ELECTRICAL)

Section 01810A
Page 5 of 13

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm..... Electrical Contractor.....

Signature of Consultant Date.....

Name of Consultant Firm Williams Engineering Inc.

TEST 2 Emergency Lighting and Exit Lighting

2.1 TEST PURPOSES

- .1 To test the operation of the emergency lighting system

2.2 TEST PRE-REQUISITES

- | | C | E |
|---|-----|-----|
| .1 All component verifications are complete and approved. | [] | [] |
| .2 Existing components has been reconnected and tested (type 105 light and exit light – new and existing) | [] | [] |
| .3 Existing generator is tested and ready for final testing- will be used to check the relocated type 105 lights. | [] | [] |

2.3 REQUIRED ITEMS

- | | C | E |
|---|-----|-----|
| .1 Verify locations as per design intent | [] | [] |
| .2 Verify and record lighting level during testing (other lights should be off) | [] | [] |
| .3 Verify connections and circuit home run. | [] | [] |
| .4 Verify exit light direction arrow | [] | [] |
| .5 Verify over all functionality | [] | [] |

Project No:
R.073456

COMMISSIONING FORMS
(ELECTRICAL)

Section 01810A
Page 7 of 13

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm..... Electrical Contractor.....

Signature of Consultant..... Date.....

Name of Consultant Firm Williams Engineering Inc.

TEST 3 Receptacle and equipment power

3.1 TEST PURPOSES

- .1 To test the operation receptacle and equipment power allocation

3.2 TEST PRE-REQUISITES

- | | C | E |
|---|-----|-----|
| .1 General outlet receptacles should be all installed and functioning. | [] | [] |
| .2 Hot and neutral wire connections should be tested and connected properly. | [] | [] |
| .3 GFI plug should be working. | [] | [] |
| .4 Z32 receptacles testing in medical clinic area should be scheduled and conducted. Test certification to be submitted to electrical commissioning lead. | [] | [] |
| .5 Relocated receptacles should be all installed and functioning. | [] | [] |
| .6 Receptacles circuit label should be all installed clearly. | [] | [] |
| .7 Panel schedule should be updated. | [] | [] |

3.3 REQUIRED ITEMS

- | | C | E |
|--|-----|-----|
| .1 Verify locations as per design intent | [] | [] |
| .2 Verify and record functionality | [] | [] |
| .3 Verify connections and circuit home run. | [] | [] |
| .4 Verify hot-neutral, polarity connections | [] | [] |
| .5 Verify GFI functionality | [] | [] |
| .6 Verify isolated ground cable connection in medical areas | [] | [] |
| .7 Verify panel board isolated ground installation allocated for medical areas | [] | [] |
| .8 Verify equipment functionality. | [] | [] |

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm..... Electrical Contractor.....

Signature of Consultant..... Date.....

Name of Consultant Firm Williams Engineering Inc.

TEST 4 Data and telephone

4.1 TEST PURPOSES

- .1 To test the allocated data and telephone system outlets

4.2 TEST PRE-REQUISITES

- | | C | E |
|--|-----|-----|
| .1 General data and telephone should be all installed and functioning. | [] | [] |
| .2 Cat cable should be all installed connected on both ends. | [] | [] |
| .3 Cat cable testing should be done; test result report should be submitted to electrical commissioning lead. | [] | [] |
| .4 If possible; telephone unit and computer should be all installed and functioning. | [] | [] |
| .5 Server rack cat cable home run should be properly laid out. | [] | [] |

4.3 REQUIRED ITEMS

	C	E
.1 Verify locations as per design intent	[]	[]
.2 Verify and record functionality if possible	[]	[]
.3 Verify connections and cat cable home run.	[]	[]

Remarks/Comments:.....

Signature of Contractor Date.....
 Name of Contracting Firm..... Electrical Contractor.....
 Signature of Consultant..... Date.....
 Name of Consultant Firm Williams Engineering Inc.

TEST 5 Security Access System

5.1 TEST PURPOSES

- .1 To test the allocated security components noted on the design

5.2 TEST PRE-REQUISITES

	C	E
.1 General security component devices as noted on the drawing should be all installed and functioning.	[]	[]
.2 Security cable should be all installed connected on both ends.	[]	[]

Project No:
R.073456

COMMISSIONING FORMS
(ELECTRICAL)

Section 01810A
Page 11 of 13

- | | C | E |
|---|-----|-----|
| .3 Cat cable testing should be done; test result report should be submitted to electrical commissioning lead. | [] | [] |
| .4 Connection and cabling from end to end should be all installed and tested | [] | [] |
| .5 General functionality should be conducted prior to final testing and commissioning | [] | [] |

5.3 REQUIRED ITEMS

- | | C | E |
|---|-----|-----|
| .1 Verify locations as per design intent | [] | [] |
| .2 Verify and record functionality. | [] | [] |
| .3 Verify connections and cat cable home run. | [] | [] |

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm..... Electrical Contractor.....

Signature of Consultant..... Date.....

Name of Consultant Firm Williams Engineering Inc.

TEST 6 Fire Alarm System

6.1 TEST PURPOSES

- .1 To test relocated and new horn strobe.

6.2 TEST PRE-REQUISITES

- | | C | E |
|---|-----|-----|
| .1 General location of relocated and new fire alarm horn strobe as noted on the drawing should be all installed and functioning. | [] | [] |
| .2 Fire alarm verification testing from fire alarm supplier should be scheduled and conducted. Test report should be submitted to electrical commissioning lead. | [] | [] |
| .3 Connection and cabling from end to end should be all installed and tested | [] | [] |
| .4 General functionality should be conducted prior to final testing and commissioning | [] | [] |

6.3 REQUIRED ITEMS

- | | C | E |
|--|-----|-----|
| .1 Verify locations as per design intent | [] | [] |
| .2 Verify and record functionality. | [] | [] |
| .3 Verify connections and data loop home run. | | |
| .4 Verify decibel level – run the fire alarm condition stage to record “db” level on the renovated area | [] | [] |

Project No:
R.073456

**COMMISSIONING FORMS
(ELECTRICAL)**

**Section 01810A
Page 13 of 13**

Remarks/Comments:.....
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Signature of Contractor Date.....

Name of Contracting Firm..... Electrical Contractor.....

Signature of Consultant..... Date.....

Name of Consultant Firm Williams Engineering Inc.

END OF SECTION