

PART 1 – GENERAL

1.1 GENERAL

1.1.1 Related Requirements: All sections

1.1.2 Provide all labour, materials, products, equipment and services for the commissioning process and all associated building systems to ensure building is operating according to requirements of Contract Documents.

1.1.3 Third party commissioning authority has been retained by the Owner. The contractor shall meet the requirements of the specifications to enable successful completion of the commissioning process.

1.2 REFERENCES

1.2.1 CSA Z320-11 - Building Commissioning Standard and Check Sheets

1.2.2 ASHRAE Guideline 0-2005 - The Commissioning Process

1.2.3 LEED Canada NC v2009 - Green Building Rating System Reference Guide

1.2.4 ASHRAE Guidelines 1-19 - Guidelines for Commissioning of Specific Systems

1.2.5 National Building Code - Latest version of National Building Code

1.3 RELATED SECTIONS

1.3.1 Specific start-up and testing requirements identified in specification sections applicable to all commissioned equipment and systems

1.3.2 Section 01 91 14 – Facility Commissioning – Mechanical

1.3.3 Section 01 91 15 – Facility Commissioning – Electrical

1.3.4 Section 01 91 19 – Facility Commissioning – Envelope

1.4 COMMISSIONING SUMMARY

1.4.1 Perform commissioning activities in accordance with requirements of Contract Documents. Commissioning activities are in addition to field quality and testing procedures described in relevant technical sections, and include, but are not limited to the following:

1.4.1.1 Commissioning process shall be performed by Contractor, in accordance with Contract Documents. Contractor shall fully cooperate with Commissioning Authority. Commissioning shall be demonstrated to satisfaction of Commissioning Authority. Work will be divided into the following phases:

1.4.1.1.1 Stage 1: Activities performed by Contractor on all building items, components, equipment and systems unless otherwise stated. It includes, without limitation, activities such as static verifications, startup and paperwork, testing and verification, air and water testing adjusting and balancing, 100% issue free dry run completion of functional performance testing (Performance Verification) and instructions of Owner's authorized representative(s) or other personnel designated by Consultant or Commissioning Authority regarding each building system.

1.4.1.1.2 Stage 2: Contractor and/or manufacturer representative to be present and assist the Commissioning Authority during functional performance testing, fine tuning of systems through all seasonal modes, or other operational conditions to achieve requirements of contract. Functional Performance Testing is to be performed after systems and integrated systems are completely installed, functional, and Contractor's performance responsibilities have been completed and approved.

1.4.1.1.2.1 Systems to be operated at full capacity under various seasonal modes to determine if they function correctly and consistently at peak efficiency.

1.4.1.1.2.2 Systems to be operated interactively with each other as intended in accordance with Contract Documents and design criteria.

1.4.1.1.2.3 Design Criteria: as per client's requirements, or determined by designer, to meet Project functional and operational requirements.

1.4.1.1.2.4 Contractor shall assume costs incurred by Commissioning Authority for premature site visits, third and subsequent verifications where:

1.4.1.1.2.4.1 Verification of reported results fail to receive Commissioning Authority's approval.

1.4.1.1.2.4.2 Repetition of second verification again fails to receive approval.

1.4.1.1.2.4.3 Commissioning Authority deems Contractor's request for second verification or site visit was premature.

- 1.4.1.1.3 Stage 3: Activities performed by Contractor after Substantial Performance, which includes without limitation **training and fine tuning** of building systems through **all seasonal** occupancy, or other operational conditions to achieve requirements of Contract Documents during 12 months following Substantial Performance to end of Work. Training includes instructions to Owner's authorized representative(s) or other personnel designated by Consultant or Commissioning Authority regarding each building system.
- 1.4.1.2 Within four weeks of award, contractor to provide a written document outlining their commissioning plan within the project schedule to meet the requirements outlined in this specification section as well as the mechanical, electrical and envelope commissioning specifications. This plan is to be submitted to the Commissioning authority for review.
- 1.4.1.3 The contractor shall follow all manufacturer startup instructions. All equipment startup forms must be submitted to the Commissioning Authority prior to equipment startup. Completed startup forms must be legible, and a copy submitted to the Commissioning Authority. The Contractor shall make themselves familiar with the manufacturer recommended equipment startup requirements and expectations outlined in this Commissioning document.
- 1.4.1.3.1 Commissioning Authority may witness equipment startup but will not interfere with manufacturer representative's startup activities. Commissioning Authority will observe and may ask questions to the contractor and/or manufacturer representative during startup procedures. The contractor and/or manufacturer representative must provide all completed startup documentation, and other commissioning documentation to the Commissioning Authority. The Commissioning Authority must be satisfied with the startup, and startup documentation of these systems.
- 1.4.1.4 Contractor to provide 14 days notice prior to commencement of equipment start-up. Owner's appointed Commissioning Authority may witness some or all equipment startup performed and documented by sub-trades, suppliers, and equipment manufacturers.
- 1.4.1.5 In the event there is Owner supplied equipment, Owner to provide product information for this equipment. Owner/manufacturer to provide installation checklist lists, manufacturer start-up procedures, and operation and maintenance material to Commissioning Authority prior to equipment startup. Contractor to coordinate date and time of testing, and arrange for Commissioning Authority to witness tests. Commissioning Authority may witness some or all these equipment startup, but will not interfere with manufacturer representative's startup activities. Commissioning Authority will observe, and may ask questions to the contractor and/or manufacturer representative during startup procedures. The contractor and/or manufacturer representative must provide all completed startup documentation, and other commissioning documentation to the Commissioning Authority. The

Commissioning Authority must be satisfied with the startup, and startup documentation of these systems.

- 1.4.1.6 Contractor to provide product information for the contractor supplied equipment. Contractor/manufacturer to provide installation checklist lists, manufacturer start-up procedures, and operation and maintenance material to Commissioning Authority prior to equipment startup. Contractor to coordinate date and time of testing, and arrange for Commissioning Authority to witness tests.
- 1.4.1.7 Product information to be provided no later than 6 weeks after shop drawings approval. From the documentation provided, Commissioning Authority to develop and provide Functional Performance Testing Forms for contractor use. Contractor to perform Functional Performance Testing, and to provide completed and approved Functional Performance Testing forms, and any other requested documentation to Commissioning Authority. Examples of these Functional Testing Forms are included as an appendix to this section.
- 1.4.1.8 Contractor activities includes systematic testing, documentation of system in all scope of operations and providing performance data. Provide complete description of all systems operation as well as equipment and material information. Perform additional testing as requested by Consultant or Commissioning Authority to verify results without any extra cost to Owner.
 - 1.4.1.8.1 Commissioning Authority to provide installation verification checklists for all commissioned systems unless otherwise requested manufactured supplied documents. These specific requested documents typically include but not limited to the manufacturer installation and start-up documents, troubleshooting and maintenance procedures, full details of any owner-contracted tests, equipment shop drawings, full factory testing reports, full warranty information, and installation and checkout materials that are shipped inside the equipment, and the field checkout sheets to be used by the factory or field technicians. All checklists along with all other requested documentation are to be completed by the contractor and provided to the Commissioning Authority for review. These documents are to be completed prior to commencing Functional Performance Testing. Examples of the Commissioning Authority supplied checklist are included as an appendix to this section.
- 1.4.1.9 Contractor documentation of system includes system monitoring which includes tabulating at least for 21 Days of operation all significant system parameters. (such as current, temperatures, pressures, flow, energy input/output and/or similar items) Process may involve measurement of those parameters during operation and assessment of results by comparing design values against actual performance values.
- 1.4.1.10 CSA Z320-11 (Building Commissioning). The Contractor shall make themselves familiar with the requirements and expectations outlined in this Commissioning document.

1.5 SYSTEMS OPERATIONS MANUAL

1.5.1 Contractor to ensure all documentation is provided to the Commissioning Authority to develop this manual. The comprehensive list of what is to be provided is illustrated in Dalhousie's "Systems Operational Manual Creation Process and Expected Contents"; however, the below is a summary of the requirements:

- 1.5.1.1 Commissioning Authority to provide Final version of the owner's project requirements and basis of design.
- 1.5.1.2 Contractors to provide As-built sequences of operations for all equipment as provided by the design professionals and contractors, control drawings, including time-of-day schedules and schedule frequency, and detailed point listings with ranges and initial set points.
- 1.5.1.3 Controls Contractor to provide system single line diagrams for each system associated with the commissioning process.
- 1.5.1.4 Contractors to provide ongoing operation instructions for all energy and water saving features and strategies as part of Owner training sessions.
- 1.5.1.5 Controls Contractor to provide recommendations for recalibration frequency of sensors and actuators by type and use.
- 1.5.1.6 Contractors to provide troubleshooting table for each system or piece of equipment.
- 1.5.1.7 Contractors to provide feedback for continuous maintenance of the owner's project requirements (operational requirements) and basis of design (basis of operation).
- 1.5.1.8 Commissioning Authority to provide functional performance tests results (benchmarks), blank test forms, and recommended schedule for ongoing benchmarking.
- 1.5.1.9 Contractors to provide seasonal operational guidelines (if any).
- 1.5.1.10 Contractors to provide systems operational parameters, which includes critical setpoints and operating ranges to allow for the identification of operating problems.
- 1.5.1.11 Commissioning Authority and Controls contractor to provide unique systems characteristics determined during Functional Performance Testing, which describes any changes from the design intent, reasons why the changes were made, and why the system could not original meet the design intent.
- 1.5.1.12 Contactors to provide operational procedures from Normal, Abnormal, and Emergency Modes for all systems. This is not to be sequences but general operating procedures.

1.5.1.13 Balancing contractor to provide Testing, Adjusting, and Balancing (TAB) plan, which includes:

1.5.1.13.1 Lists of tests to be completed

1.5.1.13.2 Testing procedures

1.5.1.13.3 Testing Schedule

1.5.1.13.4 Requirements for TAB to commence.

1.5.1.14 Contractors to provide training on operations and maintenance of all systems that are part of the commissioning process.

1.5.1.14.1 Contactor to provide agenda and course outline summarizing the content and duration of each training session.

1.5.1.15 Contactors to provide Training instruction material that will permit future training to the depth that is conducted on site.

1.5.1.15.1 Training material to clearly relay:

1.5.1.15.1.1 Intent of the assembly / system.

1.5.1.15.1.2 Limitations of the assembly/systems.

1.5.1.16 Consultants/Architects to provide training on basis of design and operational philosophy of each building system/assembly.

1.5.1.17 Consultants/Architects to provide Final Basis of Design.

1.5.1.18 Contractors to provide As-Built documents for all systems/assemblies.

1.5.1.19 Contactors to provide extended warranty documents for each equipment/system that exceeds beyond one (1) year from substantial performance.

1.5.1.20 All other items identified in Dalhousie's "Systems Operational Manual Creation Process and Expected Contents"

1.6 OWNER'S VALUATION OF COMMISSIONING WORK

1.6.1 Completion of the commissioning requirements as described in this section as well as sections 01 91 14, 01 91 15, and 01 91 19 shall carry a value equal to 5% of the total mechanical and electrical contract amount. These requirements shall be clearly identified as a line item in the Contractor's schedule of values and may be drawn against upon successful completion of the related commissioning tasks.

- 1.6.2 The total amount equal to 5% of the construction budget will be sub-divided as follows for evaluation during the course of the project:

Project Documentation: 25%

Commissioning Meetings: 15%

Performance Verification: 50%

Training: 10%

- 1.6.3 The Consultant shall discuss commissioning progress with the Commissioning Authority prior to approving payment certificates containing Commissioning payments. The consultant will issue interim acceptance certificate when:

1.6.3.1 Completed Cx documentation has been received, reviewed for suitability and approved by Commissioning Authority.

1.6.3.2 Equipment, components and systems have been commissioned.

1.6.3.3 O&M documentation provision and training has been completed.

- 1.6.4 The University's Project Manager will withhold payment of a portion of funds in proportion to unfinished commissioning work, as detailed by the Commissioning Authority.

1.7 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- 1.7.1 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 Commissioning Authority, to ensure effective performance. Provide manpower and materials, and assume cost for re-commissioning.

- 1.7.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be born by contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.8 CONFLICTS

- 1.8.1 Report conflicts between requirements of this section and other sections to Consultant before start-up and obtain clarification.

- 1.8.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.9 INSTRUMENTS / EQUIPMENT

1.9.1 Submit to Commissioning Authority for review and approval:

1.9.1.1 Complete list of instruments proposed to be used

1.9.1.2 Listed data included serial number, current calibration certificate, calibration date, calibration expiry date, and calibration accuracy

1.9.2 Provide the following equipment, but not limited to:

1.9.2.1 2-way radios,

1.9.2.2 Ladders,

1.9.2.3 Equipment as required to complete work.

1.10 COMMUNICATION

1.10.1 The following communication protocol shall be used by the Commissioning Authority and Commissioning Team in the event that issues arise:

1.10.1.1 Requesting information or documentation:

1.10.1.1.1 Commissioning Authority will first contact the Project Manager

1.10.1.2 Verbal information or clarification:

1.10.1.2.1 Commissioning Authority will go directly to the informed party and document the outcome to be distributed to the commissioning team.

1.10.1.3 Notifying contractor deficiencies:

1.10.1.3.1 Commissioning Authority will document deficiencies on their chosen commissioning management system, which all team members will have access.

1.10.1.4 Scheduling commissioning meetings:

1.10.1.4.1 Commissioning Authority to suggest specific times; however, General Contractor to schedule these meetings.

1.10.1.5 Schedule Functional Performance Testing and Integrated Systems Testing:

1.10.1.5.1 Contractors to provide all required documentation indicating they are ready to begin testing and the Commissioning Authority will suggest a tentative schedule. The contractor will be responsible to organize this testing.

1.10.1.6 Making requests for significant changes:

1.10.1.6.1 Commissioning Authority is unable to issue change orders. If the Commissioning Authority identifies any recommended changes, the owner's project manager and design team are responsible to provide approved changes to the Contractor as deemed necessary.

1.10.1.7 Contractor disagreements with requests by Commissioning Authority or interpretations of the commissioning process:

1.10.1.7.1 Contractor shall try to resolve with Commissioning Authority, but the Owner's project manager shall be informed of all issues.

1.11 COMMISSIONING MEETINGS

1.11.1 Purpose: resolve issues, monitor progress, and identify deficiencies relating to commissioning.

1.11.2 Commissioning Authority to call a preliminary commissioning meeting 2 weeks after all mechanical, electrical & envelop related shop drawings have been approved, to discuss contractor's submitted commissioning schedule and their expected involvement in it.

1.11.3 Commissioning Authority to call a subsequent commissioning meeting at 60% construction completion stage to review contractor's submitted commissioning schedule, to discuss equipment start-up activities, and prepare for commissioning related activities. Meeting to include:

1.11.3.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

1.11.3.2 Determine the degree of involvement of trades and manufacturer's representative in the commissioning process.

1.11.3.3 Review a Function Performance Testing pre-requisites matrix that shall be completed and updated one week prior to each Commissioning meeting to illustrate the readiness of equipment & systems for Function Performance Testing in whole or in part.

1.11.4 Thereafter commissioning meetings will be held on a regular basis until project completion, and as required during equipment start-up, and functional testing period.

1.11.5 Contractor, or contractor representative having authority shall attend all commissioning meetings. Contractor will provide a report of commissioning activity progress versus commissioning schedule. Commissioning Authority will chair meetings, record and distribute minutes of meetings. Construction progress related items shall be recorded by the contractor and added to their construction progress meeting minutes.

1.11.6 Contractor to ensure subcontractors and relevant manufacturer representatives are present at the 60% construction completion and subsequent commissioning meetings as required.

1.12 STARTING AND TESTING

- 1.12.1 Contractor assumes liabilities and costs for inspections, including disassembly and reassembly, starting, testing and adjusting, including supply of testing equipment.
- 1.12.2 Provided 14 days notice prior to commencement of start-up individually to all parties attending.
- 1.12.3 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Owner or Commissioning Authority. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - 1.12.3.1 Minor equipment/systems: implement corrective measures approved by Consultant and/or Commissioning Authority.
 - 1.12.3.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Consultant and/or Commissioning Authority.
 - 1.12.3.3 If evaluation report concludes that major damage has occurred, Consultant or Commissioning Authority shall reject equipment.
 - 1.12.3.3.1 Rejected equipment to be removed from site and replaced with new.
 - 1.12.3.3.2 Subject new equipment/systems to specified commissioning activities.

1.13 MANUFACTURER'S INVOLVEMENT

- 1.13.1 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems, and review with Commissioning Authority.
- 1.13.2 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty. Verify with manufacturer that testing as specified will not void warranties.
- 1.13.3 Manufacturer's personnel must have experience in installation and operation of equipment and systems, must be able to interpret test results accurately, and must report results in clear, concise, logical manner.

1.14 DEMONSTRATION AND TRAINING

- 1.14.1 Instructions - Mechanical:
 - 1.14.1.1 Thoroughly instruct Owner's authorized representative(s) in safe operation of systems and equipment after installation of Work. Coordinate with Consultant and arrange commissioning program and schedule for instruction times. Submit a

training schedule and agenda for each session to the Consultant a minimum of 2 weeks prior to start of training.

- 1.14.1.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Consultant/Owner on specialized portions of installation, such as Boilers, chillers, and associated systems, heat recovery, refrigeration machines, and automatic controls.
- 1.14.1.3 Submit a complete record of instructions as part of maintenance instructions and data book given to Consultant. For each instructional period, supply following data:
 - 1.14.1.3.1 date.
 - 1.14.1.3.2 system or equipment involved.
 - 1.14.1.3.3 names of persons giving instructions.
 - 1.14.1.3.4 names of persons being instructed.
 - 1.14.1.3.5 other persons present.
- 1.14.1.4 Carry out instructional period during a continuous period agreed with Consultant.
- 1.14.1.5 Permit Consultant and authorized representative(s) usage of systems prior to Substantial Performance for purpose of testing and learning operational procedures. This usage shall not affect warranties and no claim for damage shall be made against Consultant for any injury or breakage to any part or parts of above due to aforementioned tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or quality of performance of any kind.
- 1.14.1.6 At end of training, obtain and submit to Consultant, signature of Owner's authorized representative(s) stating they understand system and equipment installation, operation and maintenance requirements.
- 1.14.1.7 Obtain and submit to Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.
- 1.14.1.8 Only exception to foregoing requirements for acceptance of equipment and systems, will be 'fine tuning' which may be performed prior to Completion of Contract.
- 1.14.1.9 In conjunction with foregoing requirements, Contractor shall arrange necessary inspections and obtain written approval and acceptance of equipment and systems requiring approval by authorities having jurisdiction, and subsequent correction of those unacceptable items to satisfaction of such authorities.

1.14.1.10 In conjunction with 01 91 14 Mechanical Commissioning Requirements

1.14.2 Instructions - Electrical:

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

1.14.2.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Consultant/Owner on specialized portions of installation, such as generators, automatic transfer switches, motor control centres, switchgears, transformers, inverters, etc.

1.14.2.3 Submit a complete record of instructions as part of maintenance instructions and data book given to Consultant. For each instructional period, Supply following data:

1.14.2.3.1 date.

1.14.2.3.2 system or equipment involved.

1.14.2.3.3 names of persons giving instructions.

1.14.2.3.4 names of persons being instructed.

1.14.2.3.5 other persons present.

1.14.2.4 Carry out instructional period during a continuous period agreed with Consultant.

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

1.14.2.6 At end of training, obtain and submit to Consultant, signature of Owner's authorized representative(s) stating they understand system and equipment installation, operation and maintenance requirements.

1.14.2.7 Obtain and submit to Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.

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

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

1.14.2.10 In conjunction with 01 91 15 Electrical Commissioning Requirements

1.14.3 Instructions - Envelope:

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

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

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

1.14.3.3.1 date.

1.14.3.3.2 system or equipment involved.

1.14.3.3.3 names of persons giving instructions.

1.14.3.3.4 names of persons being instructed.

1.14.3.3.5 other persons present.

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

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

1.14.3.5 At the end of training, obtain and submit to Commissioning Authority and Consultant, signature of the Owner's authorized representative(s) stating they understand the system and equipment installation, operation and maintenance requirements

1.14.3.6 Obtain and submit to Commissioning Authority and Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.

1.14.3.7 only exception to the foregoing requirements for acceptance of equipment and systems will be 'fine tuning' which may be performed prior to Completion of Contract.

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

1.14.3.9 In conjunction with 01 91 19 Envelope Commissioning Requirements

1.15 OPERATION AND MAINTENANCE

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

1.16 RECONSTRUCTION

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

1.17 CHANGES AS A RESULT OF COMMISSIONING ACTIVITIES

1.17.1 When changes are made to baseline components or system settings established during Commissioning activities, provide updated as-built documents to reflect these changes.

1.18 GENERAL EXTENT OF FUNCTIONAL PERFORMANCE TESTING

1.18.1 Provide manpower and instrumentation to verify reported results as per specification sections 01 91 14, 01 91 15, and 01 91 19., unless specified otherwise in other sections.

1.19 INTEGRATED SYSTEMS TESTING

1.19.1 Provide resources to conduct Integrated Systems Testing as per the National Building Code and the Commissioning Authorities testing forms. The National Building Code outlines the following for Integrated Systems Testing:

1.19.1.1 When life safety and fire protection systems are installed to comply with the

provisions of the National Building Code or the National Fire Code, the commissioning of these integrated systems must be performed to ensure the proper operation and inter-relationship between all equipment and systems. These systems include fire alarm systems, sprinkler and standpipe systems, smoke control system, ventilation systems, pressurization systems, door hold-open devices, elevator recall functions, smoke and fire shutters and dampers, emergency power system, emergency lighting system, and exit signage system.

- 1.19.1.2 Commissioning Authority to witness and document these tests and once deemed to be successful, the commissioning authority will provide sign-off to the owner.

1.20 FINAL SETTINGS

- 1.20.1 Upon completion of the commissioning process to satisfaction of Commissioning Authority, lock control devices in their final positions, update as-built drawings, and submit to the Commissioning Authority.

END OF SECTION