

NORTHWESTERN UNIVERSITY
PROJECT NAME _____
JOB # _____

FOR: _____
ISSUED: 03/29/2017

SECTION 25 0800 - COMMISSIONING OF INTEGRATED AUTOMATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section defines responsibilities of the Integrated Automation Contractor to facilitate the Commissioning process for the Building Automation System (BAS).
- B. Commissioning is the process of ensuring that building systems are installed and perform interactively according to the design intent, the systems are efficient and cost effective and meet the Owner's operational needs, and the installation is adequately documented and that the Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance the building

4. *Commissioning Record.* The complete set of commissioning documentation for the project, which is turned over to Northwestern facilities at the end of the construction phase.
5. *Functional Testing.* Tests performed to verify compliance with manufacturers' specifications, applicable codes and standards, and the project Basis of Design (BOD) and Owner's Project Requirement (OPR).

1.2 RELATED SECTIONS

- A. Division 01 Section 01 9113 - General Commissioning Requirements
- B. Division 21 Section 21 0800 - Commissioning of Fire Suppression
- C. Division 22 Section 22 0800 - Commissioning of Plumbing Systems
- D. Division 23 Section 23 0800 - Commissioning of HVAC Systems
- E. Division 26 Section 26 0800 - Commissioning of Electrical Systems
- F. Individual Division 01, 21, 22, 23, 25, and 26 sections contain requirements related to the commissioning process.

1.3 ROLES AND RESPONSIBILITIES

- A. Refer to Section 01 9113 for Commissioning Authority, Owner, Architect, and General Contractor roles and responsibilities.
- B. Refer to Section 21 0800 for fire protection contractor roles and responsibilities.
- C. Refer to Section 22 0800 for plumbing contractor roles and responsibilities.
- D. Refer to Section 23 0800 for mechanical contractor roles and responsibilities.
- E. Refer to Section 26 0800 for electrical contractor roles and responsibilities.
- F. Integrated Automation Contractors
 1. Include cost for commissioning requirements in the contract price, including assisting the Commissioning Authority with implementation of Functional Test Procedures and reviewing control system operation with the Commissioning Authority.
 2. Review design for controllability with respect to selected manufacturers equipment:
 - a. Verify proper hardware specification exists for functional performance required by 0 Tw 10.554 0 T

3. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
4. Provide the following submittals to the GC:
 - a. Hardware and software submittals.
 - b. Control panel construction shop drawings.
 - c. Narrative description of each control sequence for each piece of equipment controlled.
 - d. Diagrams showing all control points, sensor locations, point names, actuators, controllers and, where necessary, points of access, superimposed on diagrams of the physical equipment.
 - e. Logic diagrams showing the logic flow of the system.
 - f. A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each stand-alone control unit.
 - g. A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should also explain individual math or logic operations that are not clear from reading the software listing.
 - h. Hardware operation and maintenance manuals.
 - i. Application software and project applications code manuals.
5. Verify proper installation and performance of controls/BAS hardware and software provided by others.
6. Integrate installation and programming schedule with construction and commissioning schedules.
7. Provide thorough training to operating personnel on hardware operations and programming, and the application program for the system.
8. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, and emergency).
9. Provide control system technician for use during Pre-functional Checklists and Functional Performance Testing.
10. Provide system modifications as required.
11. Provide support and coordination with TAB contractor on all interfaces between their scopes of work. Provide all devices, such as portable operator terminals, for TAB use in completing TAB procedures.
12. Provide trend logs as required to facilitate the Commissioning Process.

1.4 SEQUENCING

- A. The following list outlines the general sequence of events for submittals and commissioning of the BAS.
 1. Submit Product data and Shop Drawings, and receive A/E and Owner acceptance.
 2. Submit Control Logic Documentation, and receive A/E and Owner acceptance.
 3. Submit startup checklists and manufacturers startup procedures for all equipment provided by the BAS contractor.
 4. Install BAS controls.
 5. Submit BAS startup test Agenda/schedule to CxA and GC for review and acceptance.
 6. Submit Training Plan.
 7. Place systems under BAS control.
 8. Prepare and initiate Trend Log data storage and format trend graphs.

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- C. A Commissioning Plan shall be developed by the Commissioning Authority. The Contractor shall assist the Commissioning Authority in preparing the Commissioning Plan by providing all necessary information pertaining to the actual equipment and installation. If contractor-initiated system changes have been made that alter the Commissioning Process, the Commissioning Authority shall notify the Owner.
- D. Acceptance procedures are normally intended to begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Division 25 contractor. Start of acceptance procedures before system completion does not relieve the contractor from completing those systems as per the schedule.

3.2 PARTICIPATION IN COMMISSIONING

- A. The Contractor shall provide skilled technicians to start-up and debug all systems within Divisions 21, 22, 23, 25, and 26. These same technicians shall be made available to assist the Commissioning Authority in completing the commissioning program. Work schedules, time required for testing, etc., shall be requested by the Commissioning Authority and coordinated by the contractor. Contractor shall ensure that the qualified technician(s) are available and present during the agreed upon schedules and of sufficient duration to complete the necessary tests, adjustments, and/or problem resolutions.
- B. System performance problems and discrepancies may require additional technician time, Commissioning Authority time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.
- C. The Commissioning Authority reserves the right to question the appropriateness and qualifications of the technicians relative to each item of equipment.

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Commissioning Authority time and expenses required for retests beyond two, if required, due to incomplete installation or otherwise, will be paid by the Owner and reimbursed by the contractor.

3.4 ADDITIONAL COMMISSIONING

- A. Additional commissioning activities may be required after system adjustments, replacements, etc., are completed. The contractor(s), manufacturers, and Commissioning Authority shall include a 5% contingency allowance to complete this work as part of their contractual obligations.

3.5 SEASONAL COMMISSIONING

- A. Seasonal commissioning pertains to testing under full load conditions during peak heating and

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- O&M s meet specifications and are included for all equipment furnished by the contractor, and that the instructions and wiring diagrams are project specific (edited where necessary) to the actual equipment provided for this project.
2. Published literature shall be specifically oriented to the provided equipment indicating required operation and maintenance procedures, parts lists, assembly/disassembly diagrams, and related information.
 3. The contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting O&M information shall be project and system specific, concise, to the point, and tailored specifically to this facility. The CxA shall review and edit these documents as necessary for final corrections by the contractor.
- C. The O&M manual review, and coordination efforts MUST be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.
- D. In addition to the O&M manual requirements within specification Divisions 21, 22, 23, 25, and 26, O&M manuals shall include at a minimum the following:
1. An equipment data sheet with the equipment name tag, model#, serial # and any other relevant information for the equipment for entry into the owner's central maintenance management system (CMMS).
 - a. The format of the data entry sheets will be provided by the owner and/or CxA.
 - b. Data entry of the equipment information into the CMMS will be the responsibility of the owner.
 2. A copy of the approved submittal, indicating the exact make and model of the equipment installed.
 3. A copy of the manufacturer's IOM manual
 4. A copy of all warranties
 - a. If not included on warranty certificate, provide the start/end dates of warranty period, descriptions of what is and isn't covered and contact information for warranty claims.

3.14 TRAINING

A. General

1. The Contractor shall train the Owner's personnel in the operation and maintenance of systems and equipment listed in this Section and as mentioned in other sections.
2. The required training and demonstration required in the technical sections of the specifications is supplemental or in addition to the training required in this Section (where not a duplication).

B. Scope of Training

1. Training must be conducted in two parts and include both classroom and on-the-job (hands-on) instruction by qualified manufacturer's representatives, vendors, installation/service technicians and operation personnel having the necessary knowledge, experience, and teaching skills.
2. The training shall provide comprehensive instruction on the operation and maintenance of building components, equipment, controls, and systems including procedures for startup,

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2. The contractor shall work closely with the Owner's personnel and the CxA in the development and implementation of the training program. This may include preliminary meetings to map out the direction the training will take and development, with Owner acceptance, of the written training materials.
3. The minimum specific hours of training time provided for equipment and systems shall be in accordance with the requirements in the individual equipment spec sections.
4. All training shall include two identical training sessions. The first training session shall include

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3.15 RECORD DRAWINGS

- A. The Commissioning Authority shall review the as-built contract documents to verify incorporation of both design changes and as-built construction details. Discrepancies noted shall be corrected by the appropriate party.

3.16 EXCLUSIONS

- A. Responsibility for construction means and methods: The CxA is not responsible for construction means, methods, job safety, or any construction management functions on the job site.
- B. Hands-on work by the CxA: The contractors shall provide all services requiring tools or the use of tools to start