

COMMISSIONING OF FIRE ALARM SYSTEMS

OWNER FURNISHED

The owner directly contracts an independent third party commissioning agent for this project. This Commissioning Plan has been included for reference to define roles and responsibilities.

RELATED DOCUMENTS

Contract drawings and specifications, general provisions of the contract, including general and supplementary conditions, architectural, electrical, and mechanical provisions and Division-1 Specification sections apply to work of this section.

DESCRIPTION OF WORK

The purpose of the commissioning process is to provide the owner/operator of the facility with a high level of assurance that the building systems have been installed in the prescribed manner, and operate within the performance guidelines set in the Design Intent Documents (DID). The Commissioning Agent (CA) shall provide the owner with an unbiased, objective view of the systems' installation, operation, and performance. This process is not intended to take away or reduce the responsibility of the design team or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for beneficial use by the owner. The CA will be a member of the construction team, administrating and coordinating commissioning activities with the design team, General Contractor, subcontractors, manufacturers and equipment suppliers.

REFERENCES

ASHRAE Guideline 0 – 2005: *The Commissioning Process*

ACG Commissioning Guideline - 2005

NECA 90-2004: *Recommended Practices for Commissioning Building Electrical Systems*

NFPA-2005: *Commissioning Fire Protection Systems*

ROLES AND RESPONSIBILITIES OF THE COMMISSIONING AGENCY

1. **Mission:** The primary point of responsibility is to inform the General Contractor, the owner and design team on the status, integration, and performance of the fire alarm system within the facility.

2. **Information:** The CA shall function as a catalyst and initiator to disseminate information and assist the design and construction teams in implementing completion of the construction process. This shall include system verification, functional performance testing, and conformance with the intended design of each system. Services include documenting construction observations, verification and functional performance testing, and documenting proper distribution of performance and operating information to the owners O&M staff.
3. **Quality Assurance:** Assist the responsible parties to maintain a high quality level of installation by meeting or exceeding prevailing standards and specifications.
4. **Observation of Tests:** The CA shall observe and coordinate testing as required to assure system performance meets the design intent.
5. **Documentation of Tests:** The CA shall document the results of the performance testing directly and/or assure that the appropriate technicians document testing. The CA shall compile standard forms to be used by the commissioning team for consistency of approach and type of information to be recorded.
6. **Deficiencies:** The CA shall provide technical expertise to facilitate and verify the correction of deficiencies found during the commissioning process.
7. **Resolution of Deficiencies:** The CA is to remain an independent party with specific technical knowledge of the project. The CA shall investigate the scope and extent of problems and facilitate communication to determine responsibilities by delineating specifications. The CA shall monitor resolution for conformance with design intent and prevailing industry standards.
8. **Acceptance:** The CA shall document the date of acceptance as determined by the General Contractor, owner and design team. System Verification Checklists and Functional Performance Test results may be used in determining the start of the warranty period for the fire alarm system.
9. **O&M Material:** The CA will review operating and maintenance materials for fire alarm systems.
10. **Phasing:** The CA will review phasing plans as provided by the GC relating to O&M considerations, warranty issues, impact of construction sequencing on occupied areas, and interruption of services from the existing equipment.
11. **Independence:** The CA shall be an independent third party agency and shall work under a separate contract, and report directly to the owner. The CA shall not be financially associated with any of the Division 2 through 16 installing contractors on this project to avoid potential conflicts of interest.

ROLES AND RESPONSIBILITIES OF THE OWNER

Assign maintenance personnel and schedule them to participate in the various meetings, training sessions and inspections as follows:

1. Contractors' commissioning kick-off meeting.
2. Pre-testing.
3. Owners training session.
4. Verification demonstrations and Functional Performance Tests.
5. Acceptance of extra materials.
6. Final review and acceptance meeting.

ROLES AND RESPONSIBILITIES OF THE DESIGN TEAM

1. Provide fire alarm system Design Intent and Basis of Design Narrative. Incorporate in the appropriate sections of the O&M Manual.
2. Review the Factory Authorized Fire Alarm Service Representative training session agenda.
3. Review O&M Manuals submitted by the Fire Alarm Contractor.
4. Review the written record of inspections and test results.

FIRE ALARM SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS

1. Fire Alarm Control Panel
2. Fire Alarm Control Panel Internet Interface
3. Fire fighter's Telephone Communication
4. Fire Alarm Initiating Devices
5. Addressable Manual Pull Stations
6. Smoke Detectors
7. Duct Mounted Smoke Detectors
8. Heat Detectors
9. Magnetic Door Holders
10. Fire Alarm Notification Devices
11. Fire Suppression Flow and Tamper Switches
12. Automatic Voice Evacuation
13. Remote and Graphic Annunciators
14. Elevator Interface

COMMISSIONING PLAN

1. Commissioning Team

A. The Commissioning Team (CT) shall consist of key parties involved in design, construction and testing of this facility. It is necessary for each agency to appoint team members that will have long-term commitments to this project. Switching team members during the project will reduce the ability of the CT to provide continuity and acceptable results to the building owner. Team members must maintain an ongoing supervisory position on this project. One team member shall be provided by each of the parties listed below:

- 1) Owner – Commonwealth of Kentucky Division of Engineering
- 2) Facilities Management Division – Owner’s Maintenance Engineer (FMD)
- 3) Commissioning Agent (CA) – Facility Commissioning Group (FCG)
- 4) Design Team – Engineer of Record (DT)
- 5) General Contractor – General Construction Trade Representative (GC)
- 6) Mechanical Contractor – Mechanical Trade Representative (MC)
- 7) Electrical Contractor – Electrical Trade Representative (EC)
- 8) Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)
- 9) Fire Protection Contractor – Fire Protection Trade Representative (FPC)
- 10) Elevator System Contractor – Elevator Trade Representative (ESC)

2. Design Intent Document

A. The Design Intent Document (DID) represents a composite of design drawings, project specifications, submittals, change orders and industry standards, prepared by the designer of record, that describe the systems of this facility. References to design intent will be taken from the DID. The DID is an evolving manuscript maintained by the design professional to track and incorporate design alterations that occur throughout the construction process. Any industry standards used for this project will be specifically noted when referenced.

B. The CA will review the DID documents for commissioning provisions, functional performance, optimization of performance, accessibility, and O&M considerations.

3. Commissioning Meetings

A. Commissioning meetings will be held in conjunction with progress meetings as necessary. The CA will be on site for the Cx meetings. Commissioning meetings will be used to address any problems that alter the design intent or affect the commissioning process. These meetings provide an open forum for exchange of ideas between contractors, vendors, designers, users and owners.

4. Resolution Tracking Forms (RTF)

- A. The use of Resolution Tracking Forms is a method employed by the CA to monitor and record problems, their causes, and solutions. The use of these lists promotes communication between the installing contractors, design team, commissioning agent, and owner, in order to expedite their resolution in a timely manner.
- B. The CA will regularly submit RTF's to the CT in order to document and resolve deficiencies as quickly as possible. The frequency of RTF submission will be adjusted as project conditions dictate.

5. System Verification Checklists (SVC) / Manufacturer's Checklists

- A. The CA will write SVC's based on the DID. These tests will be created for systems and subsystems. See *SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS* above. Draft copies will be submitted to the CT for review and comment prior to placement on the job site. A master copy of the SVC's will be bound in a three-ring binder and placed on the job site for use by the installing contractors. No system will be started until the appropriate SVC's have been completed.
- B. The CA will review the SVC for each piece of equipment prior to start-up. Equipment will be released for start-up only after these checklists have been completed by the installing contractor and reviewed by the CA.
- C. Prior to start-up, the CA must also review the equipment manufacturer's checklists. These lists must be completed by the installing contractor, and reviewed by the CA before start-up can commence.

6. Pre-testing

- A. The FAC will perform the pretesting of the fire alarm system. The FAC will include the factory authorized service representative to supervise. Deficient items observed during pre-testing will be corrected and the system will be retested. Final tests will not occur until pre-testing is completed.
- B. The CA will witness the pre-testing of the fire alarm system. The appropriate contractors and/or manufacturer's representative will be required on site to perform pre-testing. Pre-testing will not start until the appropriate SVC's have been completed and the manufacturer's checklists have been completed. The CA will visit the site to review completeness of installation in conjunction with progress meetings prior to pre-testing.

7. Functional Performance Tests (FPT)

- A. The CA will write FPT's based on the DID. These tests will be created for systems and subsystems. See SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS above.
- B. Each major system will be tested. This will be coordinated and witnessed by the CA and the owner's maintenance staff. Witnessing the FPT's will serve as a compliment to the O&M Training. No FPT's will be performed until the system pre testing documentation is completed.
- C. The Functional Performance Tests shall include fire alarm systems.
 - 1) Fire Alarm Control Panel: The fire alarm trade representative, with the CA and AHJ present, will demonstrate fire alarm control panel conformance to the project contract documents and prevailing code requirements. The fire alarm trade representative, with the CA and AHJ present, will field test and verify all initiating devices connected to the fire alarm system, documenting the date, type of device, device location, response time, and sensitivity.
 - 2) Fire Alarm Control Panel Internet Interface: The fire alarm trade representative with the CA present will demonstrate fire alarm control panel Internet interface conformance to the project contract documents and prevailing code requirements. The fire alarm trade representative with CA present will field test and verify all initiating devices connected to the fire alarm system are recorded.
 - 3) Fire Fighter's Telephone Communication System: The fire alarm trade representative, with the CA and AHJ present, will test the operation of each phone at each jack location to demonstrate conformance to the project documents. The fire alarm trade representative, with the CA and AHJ present, will test each location by demonstrating two-way communications between the FACP and each remote location.
 - 4) Fire Alarm Initiation Devices: The fire alarm trade representative, with the CA and AHJ present, will field test and verify all initiating devices connected to the fire alarm system, documenting the date, type of device, device location, response time, and sensitivity. The fire alarm trade representative, with the CA present, will field test for correct labeling of circuits and equipment by breaking current and observing loss of power at circuits or equipment.
 - 5) Addressable Manual Pull Stations: The fire alarm trade representative will demonstrate to the CA and AHJ a simple and systematic check-off documentation approach whereby each manual pull station is activated and subsequently reset following confirmation of specified notification at the alarm panel and any other specified alarm recipient locations. For the special case of "break-glass" manual pull stations, the FAC will remove all glass rods before functional performance testing.

- 6) Smoke Detectors: The fire alarm trade representative, with the CA and AHJ present, will field test all smoke detectors using either a listed canned aerosol smoke approved by the manufacturer or other method approved by the manufacturer. The method used in field-testing will be as determined by project documents and the AHJ. Every smoke detector will be tested and its actuation verified at the fire alarm control panel. Test poles, ladders, high lifts, and any other equipment required to access smoke detectors will be furnished by the FAC. In addition, the FAC, with the CA and AHJ present, will verify wiring trouble indications and smoke detector head removal at the fire alarm panel.
- 7) Duct-Mounted Smoke Detectors: The fire alarm trade representative, with the CA and AHJ present, will field-test all duct-mounted smoke detectors by inducing smoke directly into the sampling tube within the ductwork in which the detector is installed or according to the manufacturer's recommendations. Devices equipped with test buttons will not be acceptance tested (functional performance tested) with the test buttons, which are provided for future re-inspections after the test methods approved by the AHJ have been demonstrated. Every duct-mounted smoke detector will be tested and its actuation verified at the fire alarm control panel. Test poles, ladders, high lifts, and any other equipment required to access smoke detectors will be furnished by the FAC. In addition, the FAC, with the CA and AHJ present, will verify wiring trouble indications and smoke detector head removal at the fire alarm panel.
- 8) Heat Detectors: The fire alarm trade representative will furnish and use a heat gun to test the rate-of-rise portion of the heat detector following the manufacturer's recommended temperature setting and distance between the heat gun and detector head. The FAC will demonstrate this test for all heat detector devices to the CA and AHJ, verifying and documenting actuation at the fire alarm control panel.
- 9) Magnetic Door Holders: The fire alarm trade representative, with the CA and AHJ present, will field test all magnetic door holder devices. The fire alarm trade representative shall initiate the fire alarm system. The fire alarm trade representative shall coordinate with the fire suppression contractor to simulate the water flow through an inspector's test connection indicating flow equal to a single sprinkler head orifice installed in the system. Each fire suppression device will be tested and its actuation verified at the fire alarm control panel.
- 10) Fire Alarm Notification Devices: The fire alarm trade representative will demonstrate to the CA and AHJ a simple and systematic check-off documentation approach whereby the system is activated and confirmation of specified notification devices at each location is documented.
- 11) Fire Suppression Flow and Tamper Switches: The fire alarm trade representative, with the CA and AHJ present, will field test all tamper and flow switch fire suppression devices. The fire alarm trade representative shall initiate the tamper switch by rotating the position of each fire protection valve. The fire alarm trade representative and verify each magnetic is dropped and the door is released.

- 12) Automatic Voice Evacuation: The fire alarm trade representative, with the CA and AHJ present, will demonstrate the automatic voice evacuation conformance to the project contract documents and prevailing code requirements. The fire alarm trade representative, with the CA and AHJ present, will field test and verify all speaker devices connected to the fire alarm system, documenting the date, type of device, device location, response time, and sensitivity. The fire alarm trade representative, with the CA present, will field test for correct labeling of circuits and equipment by breaking current and observing loss of power at circuits or equipment.
- 13) Fire Alarm Remote Annunciator: The fire alarm trade representative, with the CA and AHJ present, will demonstrate fire alarm remote annunciator conformance to the project contract documents and prevailing code requirements. The fire alarm trade representative, with the CA and AHJ present, will field test and verify all initiating devices connected to the fire alarm system, documenting the date, type of device, device location, response time, and sensitivity.
- 14) Elevator Interface: The fire alarm trade representative, with the CA and AHJ present, will demonstrate Phase 1 emergency elevator recall operation as defined in ASME 17.1. The fire alarm trade representative, with the CA and AHJ present, will field test and verify all smoke detectors in the lobbies, machine rooms and hoistways initiate Phase 1 emergency elevator recall operation.

8. Building Turn-Over / Owner Orientation / User Training

- A. The CA will assist contractors prepare, coordinate and review O&M manuals, working closely with each contractor to achieve specificity and completeness.
- B. The CA will review as-built drawings, working closely with each contractor to achieve specificity and completeness.
- C. Owner training will be coordinated with the assistance of the CA. The installing contractor or manufacturer's representative will provide the training, witnessed by the CA. This training should include both classroom training and hands-on operational training. The owner may choose to videotape this training for future use. The CA will visit the site during the Turnover and Training period to assure that any on-going fire alarm related problems are being addressed and corrected in a timely and efficient manner.
- D. The CA will assist the owner/user with warranty issues.
- E. The CA will assist in the coordination of calibrating and servicing as specified in the contract documents.

F. Training of Owner's Operators

1. The owners shall be given comprehensive training in the operating, troubleshooting, servicing, and preventative maintenance of the system.
2. The Commissioning Agent, in cooperation with the Engineer of Record and Contractor, will be responsible for scheduling the training.
3. Training shall be conducted for a minimum of 8 hours.
4. The training sessions shall follow contract document requirements.
5. The factory authorized service representative shall demonstrate the system.
6. The Contractor shall attend all training sessions and shall add to each session any special information relating to the details of installation of the equipment as it might impact the operation and maintenance.
7. The Commissioning Agent shall conduct a final session summarizing the commissioning program.

9. Warranty Review

- A. The CA will participate in an 11th month walk-through to observe the operation of the building systems. This will include a review meeting with the owner's personnel, a discussion of warranty issues, maintenance practices, usage changes, and chronic problems, as well as other issues affecting the owner and the operation of the fire alarm systems.

RESPONSIBILITIES OF INSTALLING CONTRACTORS

1. General Contractor – General Construction Trade Representative (GC)
2. Mechanical Contractor – Mechanical Trade Representative (MC)
3. Electrical Contractor - Electrical Trade Representative (EC)
4. Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)
5. Fire Protection Contractor – Fire Protection Trade Representative (FPC)
6. Elevator System Contractor – Elevator Trade Representative (ESC)

1. General Contractor - General Construction Trade Representative (GC)

- A. Assure acceptable representation, with the means and authority to prepare and coordinate execution of the fire alarm system commissioning program as described in the contract documents.
- B. Attend commissioning meetings scheduled by the CA.
- C. Coordinate inclusion of commissioning activities in the construction schedule.
- D. Complete System Verification Checklists and manufacturer's pre-start checklists prior to scheduling pre-testing of the fire alarm system.
- E. Issue a notice that fire alarm pre-testing has been scheduled.

- F. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
- G. Facilitate resolution of deficiencies identified by observation or performance testing.
- H. Participate in the Functional Performance Tests as required to achieve design intent.
- I. Participate in O&M Training as required by project specifications.

2. Mechanical Contractor - Mechanical Trade Representative (MC)

- A. Assure participation of duct smoke detector testing for each pertinent air-handling unit.

3. Electrical Contractor - Electrical Trade Representative (EC)

- A. Review design for provision of power to the fire alarm system.
- B. Attend commissioning meetings scheduled by the CA.
- C. Verify proper installation and performance of all fire alarm services provided.
- D. Complete System Verification Checklists and manufacturer's pre-start checklists prior to scheduling fire alarm pre-testing.
- E. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
- F. Participate in the functional performance tests as required to achieve design intent.
- G. Coordinate with the Fire Alarm Trade Representative.

4. Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)

- A. Review design for provision of power to the fire alarm equipment.
 - 1) Verify proper fire alarm specifications exist for performance as defined by the DID.
 - 2) Verify proper safeties and interlocks are included in the design of fire alarm connections for HVAC and other building equipment.
- B. Attend commissioning meetings scheduled by the CA.
- C. Verify proper installation and performance of all fire alarm services provided.
- D. Complete System Verification Checklists and manufacturer's pre-start checklists prior to scheduling startup of fire alarm equipment.

- E. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
- F. Provide a fire alarm system technician to assist during functional performance testing.
- G. Participate in the functional performance tests as required to achieve design intent.
- H. Participate in O&M Training as required by project specifications.
- I. Ensure cooperation and participation of specialty sub-Trade Representatives.
- J. Ensure participation of the fire alarm system factory authorized service representative.
- K. Coordinate with the General, Electrical, and Mechanical Trade Representative.
- L. Attend initial pre-commissioning coordination meeting scheduled by the Commissioning Agent. Prepare necessary preliminary schedule for maintenance orientation and inspections, O & M manual submission, training sessions, test, and job completion for use by the Commissioning Agent. Update schedule as appropriate throughout the construction period.
- M. Obtain O & M data on all equipment and assemble in binders using tabs as required. Submit to Engineer of Record for approval prior to the distribution completion stage.
- N. Participate in and schedule vendors and other Trade Representatives to participate in the training sessions set up by the Commissioning Agent.
- O. Conduct a maintenance orientation and inspection with hands on training. Update drawings to the record condition to date and review with the Commissioning Agent prior to the orientation.
- P. Provide written certification and completed Field Installation Verification forms and system verification checklists documenting that the following work has been completed in accordance with the plans and specifications and that they are functioning as designed. Where the work has been sub-contracted, the sub-Trade Representative shall be responsible for the initial certification with the Fire Alarm Trade Representative re-certifying that he has inspected the work and that it has been completed and functioning as designed. This certification must be submitted to the Commissioning Agent prior to the final verification.
 - 1) Written record of inspections and tests.
 - 2) Prevailing code compliance certified performance of fire alarm system.
 - 3) Reporting characteristics and installation of fire alarm system complete and fully functional per contract documents.

- Q. Demonstrate the performance of each piece of equipment to the Commissioning Agent. Schedule sub-Trade Representatives as may apply to demonstrate the performance of the equipment and systems.
- R. Provide set of record as-built drawings to the Engineer of Record for inclusion into record documents.

5. Fire Protection Contractor – Fire Protection Trade Representative (FPC)

- A. Participate in the functional performance testing of the fire alarm system with tamper and flow switch initiation.

6. Elevator System Contractor – Elevator Trade Representative (ESC)

- A. Participate in the functional performance testing of the fire alarm system in conjunction with Emergency Recall Operation.