

# **COMMISSIONING OF FIRE PROTECTION 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  
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 fire protection systems 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 protection system.
9. **O&M Material:** The CA will review operating and maintenance materials for the fire protection system.
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. Owners training session.
3. Verification demonstrations and Functional Performance Tests.
4. Acceptance of extra materials.
5. Final review and acceptance meeting.

## **ROLES AND RESPONSIBILITIES OF THE DESIGN TEAM**

1. Provide fire protection system Design Intent and Basis of Design Narrative. Incorporate in the appropriate sections of the O&M Manual.
2. Attend initial pre-commissioning coordination meeting to be scheduled by the Commissioning Agent within 30 days of the award of the contract.
3. Review O&M Manuals submitted by the Fire Protection contractor. Insert Design Narrative.
4. Witness the hydrostatic testing of the entire system.

## **FIRE PROTECTION SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS**

1. Sprinkler System
2. Fire Pump
3. Jockey Pump
4. Stand Pipe
5. Fire Protection Vault

## **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) Fire Protection Contractor – Fire Protection Trade Representative (FPC)
- 7) Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)

## **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. Start-Up**

- A. The CA will witness start-up of the fire pump and jockey pump. The appropriate contractors and/or manufacturer's representative will be required on site to perform start-up. No system will be started until the appropriate SVC's have been completed. No system will be started until the manufacturer's checklists have been completed. Start-up will be performed according to the manufacturer's recommended procedures. The CA will visit the site to review completeness of installation in conjunction with progress meetings prior to starting equipment.
- B. CT members involved in installation, fabrication, manufacturer, control, or designs of equipment are required to be present at the time of start-up. A factory-authorized technician will be on site to start equipment when required by the specifications. This will minimize delays in bringing equipment on line and expedite acceptable functional performance in accordance with the DID.

## **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 and related subsystems have been started and documented through point-to-point checklists and other documentation.

C. The Functional Performance Tests shall include fire protection equipment.

- 1) Sprinkler System: The fire protection trade representative, with the CA and AHJ present, will demonstrate hydrostatic, operational and main drain testing of the system. These tests shall meet the requirements of NFPA 13 and the AHJ. The fire protection trade representative shall hydrostatically test the system, placing the system under a working water pressure of 200 psi for a period of 2 hours or by an approved method from the AHJ. A visual loss in gauge pressure or visual leakage shall be considered a failure in testing. The leak in the system shall be repaired and the system will require testing again in the same manner. The fire protection trade representative shall coordinate the operational testing with the fire alarm contractor. The fire protection trade representative shall open the inspector's test connection, the water gong shall sound within 5 minutes and the fire alarm shall be initiated within 90 seconds. The fire alarm trade representative shall conduct a main drain test. The fire protection trade representative shall open the main drain and it shall remain open until the system stabilizes. The static and residual pressures shall be recorded.
- 2) Fire Pump: The fire protection trade representative, with the CA and AHJ present, will demonstrate acceptance testing of the fire pump system. The fire protection trade representative shall conduct the field acceptance test with the manufacturer's representative according to NFPA 20. The fire protection trade representative shall provide all testing equipment. The fire protection trade representative, with the CA and AHJ, will demonstrate fire pump controller acceptance testing.
- 3) Jockey Pump: The fire protection trade representative, with the CA and AHJ present, will demonstrate acceptance testing of the jockey pump. The fire protection trade representative shall conduct the field acceptance test with the manufacturer's representative according to NFPA 20. The fire protection trade representative shall provide all testing equipment. The fire protection trade representative, with the CA and AHJ, will demonstrate jockey pump controller acceptance testing.
- 4) Standpipe: The fire protection trade representative, with the CA and AHJ present, will demonstrate hydrostatic and flow testing of the system. These tests shall meet the requirements of NFPA 13, 14 and the AHJ. To hydrostatically test the system the fire protection trade representative shall place the system under a working water pressure of 200 psi for a period of 2 hours or by an approved method from the AHJ. The pressure shall be monitored using a pressure gauge installed at the top of each standpipe. A visual loss in gauge pressure or visual leakage shall be considered a failure in testing. The leak in the system shall be repaired and the system will require testing again in the same manner. The fire alarm trade representative shall coordinate the flow test with the local fire department. The flow test shall meet the requirements of NFPA 14 and the AHJ.
- 5) Fire Protection Vault: The fire protection trade representative, with the CA and AHJ present, will demonstrate a hydrostatic and flow test of the system. These tests shall meet the requirements of NFPA 13, 14 and the AHJ.

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

- A. The CA will assist with, coordinating and review of 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 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 protection 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 yearly testing, 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 understanding of the systems and the operation and maintenance of each major piece of equipment.
  - 2. The Commissioning Agent, in cooperation with the Engineer of Record and Contractor, will be responsible for scheduling the training. Hands on training shall include start-up, operation in all modes possible, shut-down and any emergency procedures.
  - 3. This training session will include a review of all systems using the simplified system schematics including riser diagrams, valve locations and equipment locations.
  - 4. The training sessions shall follow contract document requirements.
  - 5. The manufacturer's representative shall provide the instructions on each major piece of equipment. These sessions shall use the printed installation, operation and maintenance instruction material included in the O&M manuals and shall include a review of the written O&M installations emphasize safe and proper operating requirements and preventative maintenance. Qualified service engineers employed by the manufacturers or their qualified sales representatives shall do equipment training. The operation and function of the equipment in the system shall be discussed. The start-up and shut-down modes of operation shall be demonstrated. Emergency operations shall be demonstrated.
  - 6. The Contractor shall attend all 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 11<sup>th</sup> 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, energy usage, maintenance practices, usage changes, and chronic problems, as well as other issues affecting the owner.

## **RESPONSIBILITIES OF INSTALLING CONTRACTORS**

- 1. General Contractor – General Construction Trade Representative (GC)
- 2. Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)
- 3. Fire Protection Contractor – Fire Protection Trade Representative (FPC)

### **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 protection 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 startup of the fire protection pumps.
- E. Monitor and respond to Resolution Tracking Forms distributed by the CA in order to expedite corrective actions necessary to achieve design intent.
- F. Facilitate resolution of deficiencies identified by observation or 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.

### **2. Fire Alarm Contractor – Fire Alarm Trade Representative (FAC)**

- A. Review design for provision of fire alarm connections to the fire protection system.
- B. Verify proper installation and performance of all fire alarm services provided.
- C. Ensure cooperation and participation of fire protection operation testing.

### **3. Fire Protection Contractor – Fire Protection Trade Representative (FPC)**

- A. Review design for provision of power and fire alarm system connection to the fire protection equipment.
  - 1) Verify proper hardware 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 fire protection equipment.
- B. Attend commissioning meetings scheduled by the CA.
- C. Verify proper installation and performance of all fire protection services provided.
- D. Complete System Verification Checklists and manufacturer's pre-start checklists prior to scheduling startup of fire protection 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 protection system technician and manufacturers' service representative 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 major equipment manufacturers and their representatives.
- K. Coordinate with the Fire Alarm Trade Representative and Electrical 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. Update drawings to the record condition, to date, and review with the Commissioning Agent prior to the maintenance orientation and inspection meeting.

- N. 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.
- O. Conduct a maintenance orientation and inspection at the distribution completion stage. Update drawings to the record condition, to date, and review with the Commissioning Agent prior to the inspection.
- P. Participate in and schedule vendors and other Trade Representatives to participate in the training sessions set up by the Commissioning Agent.
- Q. 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.
- R. 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 Protection 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) Correct labeling equipment, valves, drains and test locations.
  - 2) Prevailing code compliance certified performance of fire protection system.
  - 3) Reporting characteristics and installation of fire protection system complete and fully functional per contract documents.
  - 4) Fire protection contractor's material and test certificate for aboveground and below ground piping.
- S. 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.
- T. Provide set of record as-built drawings to the Engineer of Record for inclusion into record documents.