



## Technical Article

### Automatic Sprinkler Systems: Commissioning vs. Acceptance Testing

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## INTRODUCTION

Since the early 1980's automatic sprinkler systems have gradually increased in complexity. Advances in sprinkler technology have led to the development of extended coverage, residential, quick response, ESFR sprinklers to name a few. The most common sprinkler system to be installed is still the basic wet pipe system; however, dry systems, preaction, deluge and foam water sprinkler systems have seen steady growth as well. All of these systems must be put through acceptance testing by the installing contractor to ensure proper operation, but individual acceptance testing may not verify interconnections and operation with other building fire protection systems. In buildings where the sprinkler systems are intended to work with other fire protection systems, such as fire alarm systems or smoke control systems, a more complete commissioning program may be the more appropriate method to ensure the owner's expectations are met.

While advances in technology have greatly improved fire protection system capabilities; the individual system components and related building designs have become more complex. This has resulted in more demanding acceptance testing, more challenging installation process and in some cases difficult long term system maintenance for many sprinkler systems. This can be especially true if the sprinkler system requires interconnection and operation with other fire protection systems. Many times in newly constructed buildings automatic sprinkler systems are treated as autonomous within the structure's overall fire protection scheme during the design, construction and long-term operation. In some cases the building owner may consider this acceptable. In other cases, the building owner may seek assurance that the building's fire protection features work together as intended when the building was designed.

Within the fire protection industry, confusion exists between the terms "commissioning" and "acceptance testing," and in some cases the terms are thought of as interchangeable. This is not the case and a distinction needs to be made between the two terms to help ensure the individual fire protection systems--in this case the automatic sprinkler system--receive the proper acceptance testing; and if desired a separate building commissioning process can be completed.

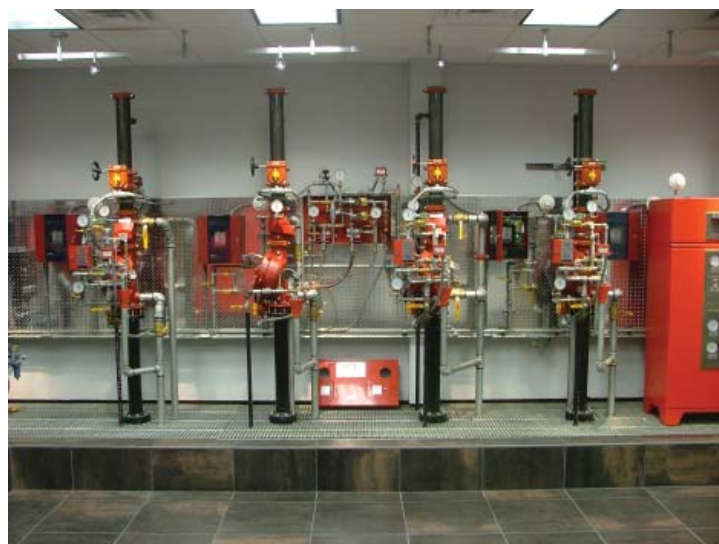


Figure 1 - Viking Sprinkler System Demo Room

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To help define and clarify what is involved in the commissioning process, the National Fire Protection Association (NFPA) has embarked on a project to develop a new document entitled “NFPA 3-Commissioning Fire Protection Systems” to clarify and describe the building commissioning process for the fire protection features. The acceptance testing for the individual sprinkler system will be found with “NFPA 13 Standard for Installation for Sprinkler Systems.”

## **SPRINKLER SYSTEM ACCEPTANCE TESTING**

To complete the installation of a sprinkler system, the installing contractor must complete the acceptance steps required in NFPA 13, “These final steps in the design and installation of sprinkler systems are to confirm that the basic requirements of NFPA 13 are satisfied, that the work was completed in an acceptable manner, and that the customer is receiving a system that performs as intended<sup>1</sup>.”

The contractor must notify the Authority Having Jurisdiction (AHJ) who will then decide if they wish to witness the testing or not. The contractor then conducts the individual system acceptance and operational testing described in NFPA 13. The specific item tested will vary depending on what type of sprinkler system is installed but may include all or some of the following:

1. Flushing the underground pipe.
2. Hydrostatic test.
3. The air test for Dry systems. Non-Interlock Preaction or Double Interlock Preaction systems.
4. The system operational test.
5. Submit the Contractor’s Material and Test Certificate.

Typically the sprinkler contractor will be contractually obligated to perform acceptance testing only on the sprinkler systems they install. Testing the interface between systems to ensure the building’s overall fire protection scheme has been achieved and the fire protection systems work together is commonly overlooked in the construction documents. Coordinating all the trades and testing at the same time can be extremely difficult under the best circumstances.



Figure 2 - Viking Wet System



Figure 3 - Viking Dry System

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Figure 4 - Viking Deluge System



Figure 5 - Viking TotalPac System

## **SPRINKLER SYSTEMS AS PART OF A COMMISSIONING PROCESS**

Today more property owners are requesting that their sprinkler systems be commissioned as part of “a quality assurance or quality control process that will verify the fire protection systems perform together as intended.”<sup>2</sup> Too many buildings have systems that do not work properly due to any number of reasons; poor initial design, poor installation, inadequate testing, no owner’s manual, no trained personnel unfortunately are not uncommon problems. These and other problems are driving the establishment of the comprehensive commissioning program for the building fire protection systems that is being developed in NFPA 3-Commissioning Fire Protection Systems.

What differentiates commissioning from acceptance testing? The commissioning of a sprinkler system involves more than the acceptance testing described within NFPA 13-Standard for Installation of Sprinkler Systems. “Commissioning begins at project inception and continues through design, construction and project closeout and then throughout the facility’s operation.”<sup>3</sup> Commissioning can be defined as “a systematic process that provides documented confirmation that fire and life safety systems function according to the intended design criteria set forth in the project documents and satisfy the owner’s operational needs”.

“NFPA statistics indicate that sprinkler systems function exceptionally well when properly maintained. The few instances of system failure are found to be directly related to shut water supply control valves and inadequate maintenance, which can be construed as a misunderstanding of the operational needs of the system.”<sup>4</sup>

The object of commissioning is to:

1. Clearly document the building owner’s needs.
2. Provide an organized, documented approach to verify quality of deliverables.
3. Verify through documentation that systems and equipment perform according to specification and the building owner’s needs.

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4. Provide improved training of maintenance personnel.
5. Provide for improved documentation of operation and maintenance requirements for systems and equipment.<sup>5</sup>

If the property owner requests a complete commissioning program, consideration should be given to adding specific language to the construction documents that identifies key areas of interface between systems. The basis for the design should include the owner's expectations for how all fire protection and life safety systems will work together. Specific language should be considered for all system interconnections to ensure compatibility and operation. Responsibility for testing during the construction phase of the project needs to be clearly identified and language requiring specific testing of interconnections should be considered.



Figure 6 - Viking Foam System Testing

## **CONCLUSION**

Acceptance testing and a commissioning program are two very different things. Not all buildings may require the more complete commissioning process; however, where complex interconnections and multiple fire protection systems are installed, in addition to the sprinkler system consideration should be given to taking a step beyond the standard sprinkler system acceptance testing. Sprinkler systems and fire protection systems as a whole will continue to increase in complexity. Ensuring the building's fire protection features operate as designed may not be limited to individual systems any longer.

## **REFERENCES**

- <sup>1</sup> Dubay, C. *Automatic Sprinkler Systems Handbook*, 2007 Edition, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 2007, pg 857
- <sup>2</sup> Hague, D. *Commissioning Fire Protection Systems*, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 2005, pg 1
- <sup>3</sup> Hague, D. *Commissioning Fire Protection Systems*, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 2005, pg 1
- <sup>4</sup> Hague, D. *Commissioning Fire Protection Systems*, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 2005, pg 49
- <sup>5</sup> Hague, D. *Commissioning Fire Protection Systems*, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, 2005, pg 2