Introduction

Who am I and why am I talking?
Typical fire sprinkler approval, design, and installation
What is Acceptance Testing
Why perform Acceptance Testing
Activities performed during Acceptance Testing
Documentation of Acceptance Testing
Perils of not performing Acceptance Testing
Open discussion and questions
Closing

Objectives

- Explain code requirements for acceptance testing
- Explain hydrostatic pressure testing
- Explain system operational tests
- Identify information on Contractor’s Material and Test Certificate for Underground Piping and Aboveground Piping
- Explain the requirements for flow testing a backflow prevention assembly
- Describe components inspected in field inspection
- Explain required end user information
Title 19 (NYCRR)  
Chapter XXXV – Uniform Code: Minimum Standards for Administration and Enforcement  
1203.3 Minimum features of a program for administration and enforcement of the Uniform Code.

A program for administration and enforcement of the Uniform Code shall, include all features described in subdivision (a) through (j) of this section. A government or agency charged with or accountable for administration and enforcement of the code must provide each of the listed features through legislation or other appropriate means.

(a) Building permits.
(b) Construction inspections.
(c) Stop work orders.
(d) Certificates of occupancy; certification of compliance.
(e) Notification regarding fire or explosion.
(f) Procedures regarding unsafe structures and equipment.
(g) Operating permits.

Chapter 1 – Administration  
Section 209 – Administration and Enforcement  
1203.3 Administration and enforcement. Administration and enforcement of the New York State Uniform Fire Prevention and Building Code shall be in accordance with local law, subject to the minimum requirements set forth in the "Official Compilation of Codes Rules and Regulations of the State of New York," 19 NYCRR Part 293, "Minimum Standards for Administration and Enforcement." State agencies shall comply with the minimum requirements set forth in 19 NYCRR Part 293, "Administration and Enforcement by State Agencies."

1203.4 Modification. No town, village, city or county, nor any State agency charged with the administration and enforcement of this code may waive, modify or otherwise alter any provision of this code unless approved by the State Fire Prevention and Building Code Council in accordance with Section 729 of Article 8 of the Executive Law.
Code Requirements for Sprinklers
Fire Code of NYS
Chapter 9 – Fire Protection Systems
Section 901 – General
901.5 Installation acceptance testing. Fire detection and alarm systems, fire-extinguishing systems, fire hydrant systems, fire standpipe systems, fire pump systems, private fire service mains as all other fire protection systems and appurtenances thereto shall be subject to acceptance tests as contained in the installation standards and as approved by the code enforcement official. The code enforcement official shall be notified before any required acceptance testing.
901.5.A Occupancy. It shall be unlawful to occupy any portion of a building or structure until the required fire detection, alarm and suppression systems have been tested and approved.

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Objectives
- Explain code requirements for acceptance testing
- Explain hydrostatic pressure testing
- Explain system operational tests
- Explain acceptance testing of the main system drain
- Identify information on Contractor’s Material and Test Certificate for Underground Piping and Aboveground Piping
- Explain the requirements for flow testing a backflow prevention assembly
- Describe components inspected in field inspection
- Explain required end user information

Hydrostatic Pressure Testing
NFPA 25 – Standard for the Installation of Sprinkler Systems
Chapter 24 – Acceptance Requirements
24.2.1 Hydrostatic Tests
24.2.1.1 Unless permitted... all piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 100 psi and shall maintain that pressure without loss for 2 hours.
24.2.1.2 Portions of systems normally subjected to system working pressures in excess of 150 psi shall be tested as described in 24.2.1.1 at a pressure of 50 psi in excess of system working pressure.
24.2.1.3 Where cold weather will not permit testing with water, an alternate air test shall be permitted to be conducted as described in 24.2.2. This provision shall not remove the or replace the requirement for conducting the hydrostatic test as described in 24.2.1.1.
Question:
Is it acceptable to utilize compressed gas to provide the required test pressure when completing a hydrostatic test?

Answer:
The use of nitrogen or other inert gases to increase the water pressure to the required test pressure is an acceptable test method; however, for reasons of safety, these gases can only be used in conjunction with water-filled piping. Dry piping should never be pressurized with gases beyond 40 psi.

Question:
Where is the hydrostatic test pressure measured during the test?

Answer:
The hydrostatic test pressure is measured at the lowest elevation within the system or portion of the system being tested. Testing at a high point of the system, which due to static head, would increase the test pressure significantly, is not considered necessary. The procedure is carried out in this way due to the fact that application of pressure typically occurs at the lower elevation, and these high pressures would not be anticipated at the higher elevations within the system.

Chapter 24 – Systems Acceptance

24.3.1.4 Modifications affecting 20 or fewer sprinklers shall not require testing in excess of system working pressure.

24.3.1.5 Where addition or modification is made to an existing system affecting more than 20 sprinklers, the new portion shall be isolated and tested at not less than 200 psi for 2 hours.

24.3.1.6 Modifications that cannot be isolated, such as relocated drop, shall not require testing in excess of system working pressure.

24.3.1.7 Loss shall be determined by a drop in gauge pressure or visual leakage.

24.3.1.8 The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Is it required that the fire department connection (FDC) piping be</td>
<td>The FDC piping, including the portion between the exterior FDC</td>
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<td>hydrostatically tested?</td>
<td>and the check valve in the connection’s inlet pipe, must be tested.</td>
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<td>Because the piping from the check valve to the hose connection is not</td>
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<td>normally subjected to water pressure, this could lead the contractor</td>
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<td>to mistakenly believe that testing of that portion is not required.</td>
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<td>Is the testing process different for a new installation of piping</td>
<td>For repair or replacement work on FDC piping, a 2-hour hydrostatic</td>
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<td>than it is for piping that is being repaired or replaced?</td>
<td>test is required at not less than 150 psi. Other portions of pipe,</td>
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<td>such as the inspector’s test connection and drain and auxiliary drains,</td>
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<td>are not typically subject to high pressure and do not have to be tested</td>
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<td>to ensure integrity of the entire system.</td>
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<tr>
<td>What is the process for hydrostatically testing a remote FDC?</td>
<td>Any buried piping connecting the FDC to the system can be tested</td>
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<tr>
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<td>in accordance with the requirements of 10.10.2.2 and 10.10.2.4 (</td>
</tr>
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<td></td>
<td>hydrostatic test for underground piping).</td>
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Hydrostatic Pressure Testing
**NFPA 13 – Standard for the Installation of Sprinkler Systems**

Chapter 24 – Systems Acceptance

24.2 Acceptance Requirements

24.2.1 Hydrostatic Tests

24.2.1.15 Test Blanks

24.2.1.15.1 Test blanks shall have painted lugs protruding is such a way as to clearly indicate their presence.

24.2.1.15.2 The test blanks shall be numbered, and the installing contractor shall have a record keeping method ensuring their removal after work is completed.

24.2.1.15.3 When subject to hydrostatic test pressures, the clipper of a differential-type valve shall be held off its seat to prevent damaging the valve.

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Pneumatic (Air) Pressure Testing

**NFPA 13 – Standard for the Installation of Sprinkler Systems**

Chapter 24 – Systems Acceptance

24.2 Acceptance Requirements

24.2.2 Dry Pipe and Double Interlock Prewarn System(s) Air Test

24.2.2.1 In addition to the standard hydrostatic test, an air pressure test at 40 psi shall be conducted for 24 hours. Any leakage that results in a loss of pressure in excess of 5.5 psi for the 24 hours shall be corrected.

24.2.2.2 Where systems are installed in spaces that are capable of being operated in temperatures below 70°F, air pressure leakage tests required in 24.2.2 shall be conducted at the lowest nominal temperature of the space.

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Hydrostatic Pressure Testing
**NFPA 13 – Standard for the Installation of Sprinkler Systems for Residential Occupancies up to and Including Four Stories in Height**

**Question:**

Are NFPA 13R sprinkler systems required to be hydrostatically tested to a pressure of at least 200 psi?

**Answer:**

All NFPA 13R sprinkler systems must be hydrostatically tested to a pressure of at least 200 psi in accordance with NFPA 13, unless the system has 20 or fewer sprinklers with no FDC.

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System Operational Tests

**NFPA 13 – Standard for the Installation of Sprinkler Systems**

Chapter 24 – Systems Acceptance

24.2 Acceptance Requirements

24.2.3 System Operational Tests

24.2.3.1 Waterflow Devices

24.2.3.2 Dry Pipe Systems

24.2.3.3 Deluge and Prewarn Systems

24.2.3.4 Main Drain Valves

24.2.3.5 Operating Test for Control Valves

24.2.4 Pressure Reducing Valves

24.2.6 Exposure Systems
**Question:**

What is meant by “first evidence of workflow?”

**Answer:**

The measurement of time for water to be discharged from the inspector's test connection is based on the first evidence of workflow, because it would be subject to interpretation if a wait was required to determine when a steady flow rate was achieved. During testing, the water discharging from the inspector's test connection will initially be erratic, with spurring and momentary stoppages, due to mixing with air that is still in the system.
System Operational Tests
NFPA 13 – Standard for the Installation of Sprinkler Systems

Chapter 24 – Systems Acceptance
24.2 Acceptance Requirements
24.2.3 System Operational Tests

24.2.3.4 Main Drain Valves
24.2.3.4.1 The main drain valve shall be opened and remain open until the system pressure stabilizes.

24.2.3.3.2 That static and residual pressures shall be recorded on the contractor’s material and test certificate.

Question:
What is the purpose of the main drain test?

Answer:
The main drain test is an important part of the acceptance for a sprinkler system because it establishes baseline data regarding the water supply against which future tests can be compared.

Question:
How do you determine the flow from a main drain during the main drain test?

Answer:
The results of the main drain test are used to track the relative condition of the water supply and to determine if the water flow to the system has a major obstruction, but it is not used as a measure of the actual capacity of the water supply. Even though water is discharged during the test, the main drain is not considered to be a water flow test and the actual flow rate is not measured.
**System Operational Tests**

**Chapter 24: Systems Acceptance**

24.4 Acceptance Requirements

24.4.1 Each pressure-reducing valve shall be tested upon completion of installation to ensure proper operation under flow and no-flow conditions.

24.4.2 Testing shall verify that the device properly regulates outlet pressure at both maximum and normal inlet pressure conditions.

24.4.3 The results of the flow test of each pressure-reducing valve shall be recorded on the contractor's material and test certificate.

24.4.4 The results shall include the static and residual inlet pressures, static and residual outlet pressures, and the flow rate.

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**Contractor’s Material and Test Certificate for Aboveground Piping**

- Explain code requirements for acceptance testing
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**Objectives**

- Explain code requirements for acceptance testing
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- Explain the requirements for flow testing a backflow prevention assembly
- Describe components inspected in field inspection
- Explain required end user information
Backflow Prevention Assembly Tests
NFPA 13 – Standard for the Installation of Sprinkler Systems

Chapter 24 – Systems Acceptance
24.2 Acceptance Requirements
24.2.5 Backflow Prevention Assemblies
24.2.5.1 The backflow prevention assembly shall be forward flow tested to
ensure proper operation.
24.2.5.2 The minimum flow rate shall be the system demand, including hose
stream appliances where applicable.

Objectives

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  Certificate for Underground Piping and Aboveground
  Piping
- Explain the requirements for flow testing a backflow
  prevention assembly
- Describe components inspected in field inspection
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Field Inspections
NFPA 13 – Standard for the Installation of Sprinkler Systems

Fire Sprinkler Final Inspection Checklist

6. Observe Main Drain Test and verify pressures at the base of the riser meet or exceed the
   required system demand pressure listed on the hydraulic calculation information plate
   attached to the riser. (Test should flow for at least two minutes)
7. Observe activation of the fire alarm notification devices on water flow thru inspector’s test,
   including:
   (a) Electric water flow ball on the exterior of the building
   (b) General alarm devices in the building (within 60 seconds of open inspector’s test)

*Note: Confirm "Alarm" status at the control panel and observe description of activated device.

8. Confirm "Supervisory" signal and description of activated device at the control panel for:
   (a) Tamper switches on valves (indicating a closed or partially [1/4 turn] closed valve)
   (b) Low pressure on dry pipe systems (if applicable)
   (c) Fire pump requirement (if applicable)

*Note: All sprinkler systems are required to be monitored by a listed supervising station unless
otherwise approved. Confirm receipt of all signals at the supervising station.

Field Inspections
NFPA 13 – Standard for the Installation of Sprinkler Systems

Fire Sprinkler Final Inspection Checklist

1. Verify the installing contractor has a valid permit. Approved plans should be at site.
2. Obtain Contractor's Material and Test Certificate for Aboveground Piping for each system
   installed. Signatures of installing contractor and building owner's representative must be on
   the form.
3. Verify proper signage on riser components:
   (a) Control valve
   (b) Main drain
   (c) Inspector's test
   (d) Hydraulic design information plate
4. Verify spare sprinkler cabinet is installed and has the correct number of sprinklers, a sprinkler
   wrench, and any special tools required for the system. (A copy of NFPA 25 should be provided
   to the owner, as well)
5. Verify proper reading where piping penetrates floors and walls.
Question: Why are inspections, testing, and maintenance (ITM) so important to the effectiveness of a sprinkler system?

Answer: ITM are especially important because of the inactive nature of sprinkler systems. Unlike other types of building systems that are used on a routine basis, the sprinkler system is only used during emergency situations. The system’s proper operating condition is not verifiable through day-to-day operations, as are HVAC, plumbing, and process systems.

Question: How many spare sprinklers are required for an NFPA 13 installation?

Answer: A supply of at least six spare sprinklers (never fewer than six) shall be maintained on the premises so that any sprinkler that have operated or have been damaged in any way can be promptly replaced. A minimum of two sprinklers of each type and temperature rating should be provided. The larger the facility, the more sprinklers required.

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Owner Information
Chapter 24 – Systems Acceptance
24.4 Instructions
The installing contractor shall provided the property owner or the property owner’s authorized representative with the following:
(a) All literature and instructions provided by the manufacturer describing proper operation and maintenance of any equipment and devices installed
(b) NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
Chapter 24 – Systems Acceptance

24.5 Hydraulically Designed Information Sign

24.5.1 The installing contractor shall identify a hydraulically designed sprinkler system with a permanently marked weatherproof metal or rigid plastic sign secured with corrosion resistant wire, chain, or other approved means. Such signs shall be placed at the alarm valve, dry pipe valve, preaction valve, or deluge valve supplying the corresponding hydraulically designed area.

24.5.2 The sign shall include the following information:

1. Location of the design area or areas
2. Discharge densities over the design area or areas
3. Required flow and residual pressure demand at the base of the riser
4. Occupancy classification or commodity classification and maximum permitted storage height and configuration
5. Flow demand allowance included in addition to the sprinkler demand
6. Name of the installing contractor

24.6 General Information Sign

24.6.1 The installing contractor shall provide a general information sign used to determine system design basis and information relevant to the inspection, testing, and maintenance requirements required by NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. Such general information shall be provided with a permanently marked weatherproof metal or rigid plastic sign secured with corrosion resistant wire, chain, or other acceptable means. Such signs shall be placed at each system control valve, antifreeze loop, and auxiliary system control valve.
Acceptance Testing of Sprinklers

And finally.....

Why is this important?

Closing

Presentation Take Away:
- All sprinkler systems require acceptance testing
- CEO's should witness acceptance testing
- Understand what you are looking at
- Ask questions throughout the process

- Questions
- Open Discussion
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