

2011 NFPA 25 Standpipe Testing Excerpts

6.3 Testing Where water damage is a possibility, an air test shall be conducted on the system at 25 psi (1.7 bar) prior to introducing water to the system.

Extreme care is needed when testing with pressurized air due to the amount of energy stored in the compressed air that can be released if a portion of the system fails catastrophically. Pressures in excess of the 25 psi (1.7 bar) recommended should therefore be avoided. This section relates to standpipe systems that are normally dry, such as manual dry or semiautomatic dry standpipe systems. An automatic dry system is already pressurized with air. Wet systems of all types do not require an air test, because leaks will be readily apparent in those systems.

6.3.1 Flow Tests.

6.3.1.1* A flow test shall be conducted every 5 years at the hydraulically most remote hose connections of each zone of an automatic standpipe system to verify the water supply still provides the design pressure at the required flow.

A.6.3.1.1 The hydraulically most remote hose connections in a building are generally at a roof manifold, if provided, or at the top of a stair leading to the roof. In a multizone system, the testing means is generally at a test header at grade or at a suction tank on higher floors.

The 2008 edition of NFPA 25 limited the 5-year flow test to automatic systems. This flow test is conducted to verify that the water supply for the system is still available and that all of the devices that could restrict flow in the standpipe are operating properly. These devices may include improperly installed or repaired check valves, gate valves, or physical failures in the pipe network that might render the supply unavailable.

The test is intended to verify the design flow and pressure. Design pressure varies depending on the age of the system. For example, systems installed prior to 1993 should be tested to verify 65 psi (4.5 bar) at the topmost outlet. Systems installed after 1993 should be tested to verify 100 psi (6.9 bar) at the topmost outlet. It may be necessary to confirm the age of the system and what edition of NFPA 14 was in effect at the time of the original installation.

Regardless of the pressure requirement, the test flow is based on a flow of 500 gpm (1892 L/min) for the most demanding riser and 250 gpm (946 L/min) for each additional riser up to a maximum of 1250 gpm (4731 L/min) for buildings that are partially or non-sprinklered, and 1000 gpm (3785 L/min) for buildings that are fully sprinklered. Note that NFPA 14 requires an additional outlet at the top of the most demanding standpipe for testing purposes. This requirement is intended to facilitate testing of the standpipe system at the design flow of 500 gpm (1892 L/min) [250 gpm × 2 × 500 gpm (946 L/min) × 2 × 1892 L/min].

Usually, the most remote hose connections, as referred to in 6.3.1.1, are located on the roof or upper floors. Testing hose connections in such locations requires coordination to conduct the test safely, prevent water damage, and ensure proper water disposal. In some cases, special drain risers may be needed to remove the water generated by the test. If the test cannot be conducted at the most remote outlet, other arrangements can be made when acceptable to the AHJ.

6.3.1.2 Where a flow test of the hydraulically most remote outlet(s) is not practical, the authority having jurisdiction shall be consulted for the appropriate location for the test.

6.3.1.3 All systems shall be flow tested and pressure tested at the requirements for the design criteria in effect at the time of the installation.

Paragraph 6.3.1.3 requires the system to be flow tested and pressure tested according to the design criteria used for the standpipe system design. Depending on the edition of NFPA 14 the system was designed to, the hydraulic demand and permissible system pressures may vary greatly. Testing the system to the wrong demand and pressure may provide inaccurate results or may cause damage to the system. In the 1950s, standpipe systems were designed to flow water at a pressure of 50 psi (3.5 bar). The 65 psi (4.5 bar) pressure requirement was introduced into NFPA 14 in the early 1970s and was later revised to the current pressure of 100 psi (6.9 bar). In order to test to the proper pressure, the testing agent should remember these pressure differences to determine the date of installation of the standpipe system and, if possible, which edition of NFPA 14 was utilized in the design. Obviously, a standpipe system that was designed to operate at 65 psi (4.5 bar) most likely will not flow water at 100 psi (6.9 bar).

6.3.1.3.1 The actual test method(s) and performance criteria shall be discussed in advance with the authority having jurisdiction.

6.3.1.4 Standpipes, sprinkler connections to standpipes, or hose stations equipped with pressure reducing valves or pressure regulating valves shall have these valves inspected, tested, and maintained in accordance with the requirements of Chapter 13.

6.3.1.5 A main drain test shall be performed on all standpipe systems with automatic water supplies in accordance with the requirements of Chapter 13.

6.3.1.5.1 The test shall be performed at the low point drain for each standpipe or the main drain test connection where the supply main enters the building (when provided).

6.3.1.5.2 Pressure gauges shall be provided for the test and shall be maintained in accordance with 5.3.2.

6.3.2 Hydrostatic Tests.

6.3.2.1 Hydrostatic tests of not less than 200 psi (13.8 bar) pressure for 2 hours, or at 50 psi (3.4 bar) in excess of the maximum pressure, where maximum pressure is in excess of 150 psi (10.3 bar), shall be conducted every 5 years on manual standpipe systems and semi-automatic dry standpipe systems, including piping in the fire department connection.

CASE STUDY

Internal Fire Suppression Systems Hampered by Inadequate Fire Attack Hose Stream Pressure

Fire in a 38-story high-rise building in Philadelphia resulted in the death of three fire fighters, fire extension to nine floors, and severe structural damage to the building. In addition, 24 fire

fighters and one civilian were injured in this mostly unoccupied office building. The fire department received the initial alarm from a person located outside the building just before 8:30 p.m. Upon arrival at the scene, the fire fighters observed heavy smoke at the mid-height of the building. During the 18-hour effort to control the blaze, interior fire suppression activities were hampered by the loss of electrical power (including emergency power) and inadequate fire attack hose stream pressure. As a result, the fire spread from the floor of origin, the 22nd floor, to the 29th floor by various spread mechanisms. Vertical fire spread was eventually stopped by the 30th floor automatic sprinkler system supplied by fire department pumpers through the siamese connection. One of the major factors contributing to the loss of life and the severity of the fire was found to be inadequate pressures for fire attack hose lines due to the improper setting of the standpipe pressure-regulating valves. The 2011 edition of the standard eliminates the requirement for a hydrostatic test on automatic dry systems. Automatic dry systems are supervised under constant air pressure and the dry valve is subject to annual trip testing. However, semi-automatic dry systems use a deluge valve and are not supervised; thus, the need for the hydrostatic test remains. Paragraph 6.3.2.1 requires a hydrostatic test every 5 years for manual standpipe systems and semi-automatic dry standpipe systems to detect failures before they become catastrophic in nature. Problems with piping integrity in wet systems can be detected by leaks. Similarly, leaks in automatic dry systems are detected by the loss of air pressure and are subject to the 3-year test for air leakage as required by the standard (see 13.4.4.2.9). However, it is not possible to detect leakage within manual dry and semi-automatic standpipe systems, which are more susceptible to corrosion due to the combination of air and moisture in the system. Undetected leaks can lead to failures when the dry standpipe is pressurized.

6.3.2.1.1 Manual wet standpipes that are part of a combined sprinkler/standpipe system shall not be required to be tested in accordance with 6.3.2.1.

It is not the intent to require a hydrostatic test on manual wet standpipes that are part of a combined system, since leaks in this type of system are usually detected immediately.

6.3.2.2* Hydrostatic tests shall be conducted in accordance with 6.3.2.1 on any system that has been modified or repaired.

A.6.3.2.2 The intent of 6.3.2.2 is to ascertain whether the system retains its integrity under fire conditions. Minimum leakage existing only under test pressure is not cause for repair.

6.3.2.3 The hydrostatic test pressure shall be measured at the low elevation point of the individual system or zone being tested.

6.3.2.3.1 The inside standpipe piping shall show no leakage.

TABLE 6.1.1.2 Summary of Standpipe and Hose Systems Inspection, Testing, and Maintenance

<i>Item</i>	<i>Frequency</i>	<i>Reference</i>
Inspection		
Control valves		Table 13.1
Pressure regulating devices		Table 13.1
Piping	Annually	6.2.1
Hose connections		Table 13.1
Cabinet	Annually	NFPA 1962
Gauges	Weekly	6.2.2
Hose	Annually	NFPA 1962
Hose storage device	Annually	NFPA 1962
Hose nozzle	Annually and after each use	NFPA 1962
Hydraulic design information sign	Annually	6.2.3
Test		
Waterflow alarm devices		Table 13.1
Valve supervisory alarm devices		Table 13.1
Supervisory signal devices (except valve supervisory switches)		Table 13.1
Hose storage device	Annually	NFPA 1962
Hose	5 years/3 years	NFPA 1962
Pressure control valve		Table 13.1
Pressure reducing valve		Table 13.1
Hydrostatic test	5 years	6.3.2
Flow test	5 years	6.3.1
Main drain test		Table 13.1
Maintenance		
Hose connections	Annually	Table 6.1.2
Valves (all types)	Annually/as needed	Table 13.1

13.2.5* Main Drain Test. A main drain test shall be conducted annually at each water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves. (*See also 13.3.3.4.*)

A.13.2.5 Main drains are installed on system risers for one principal reason: to drain water from the overhead piping after the system is shut off. This allows the contractor or plant maintenance department to perform work on the system or to replace nozzles after a fire or other incident involving system operation.

The test for standpipe systems should be done at the low-point drain for each standpipe or the main drain test connection where the supply main enters the building.

These drains also are used to determine whether there is a major reduction in waterflow to the system, such as could be caused by a major obstruction, a dropped gate, a valve that is almost fully closed, or a check valve clapper stuck to the valve seat.

A large drop in the full flow pressure of the main drain (as compared to previous tests) normally is indicative of a dangerously reduced water supply caused by a valve in an almost fully closed position or other type of severe obstruction. After closing the drain, a slow return to normal static pressure is confirmation of the suspicion of a major obstruction in the waterway and should be considered sufficient reason to determine the cause of the variation.

A satisfactory drain test (i.e., one that reflects the results of previous tests) does not necessarily

indicate an unobstructed passage, nor does it prove that all valves in the upstream flow of water are fully opened. The performance of drain tests is not a substitute for a valve check on 100 percent of the fire protection valving.

The main drain test is conducted in the following manner:

- (1) Record the pressure indicated by the supply water gauge.
- (2) Close the alarm control valve on alarm valves.
- (3) Fully open the main drain valve.
- (4) After the flow has stabilized, record the residual (flowing) pressure indicated by the water supply gauge.
- (5) Close the main drain valve slowly.
- (6) Record the time taken for the supply water pressure to return to the original static (nonflowing) pressure.
- (7) Open the alarm control valve.

The two major reasons to conduct a main drain test are to verify the following:

- (1) Water supply pressure is similar to the original acceptance test or to other previous tests.
- (2) System control valve is fully open after having been closed and reopened during annual testing

Exhibit [13.9](#) shows the discharge from a 2 in. (50 mm) main drain test.

The results of the main drain test should be compared to those of previous tests, including the original acceptance test, to identify any deterioration of the water supply.

Main drain test results should not be solely relied upon to determine whether valves are open. A main drain test may not reveal a partially closed valve in a large-diameter supply pipe with relatively high pressure.



Exhibit 13.9

Discharge from a Main Drain Test. See Color Plate 29.

13.2.5.1 In systems where the sole water supply is through a backflow preventer and/or pressure reducing valves, the main drain test of at least one system downstream of the device shall be conducted on a quarterly basis.

The intent of 13.2.5.1 is to exercise the backflow preventers by producing periodic flow through them. Fire protection systems are relatively static, only flowing when a fire occurs. The backflow prevention device was originally designed to be used for domestic water applications. Since domestic water systems continually cycle water through devices, the backflow prevention device is constantly being exercised. In a fire protection system where there is no day-to-day exercising of the equipment, there must be a means for determining that the components are still functioning. This is accomplished by performing a quarterly test.

TABLE 13.1.1.2 Summary of Valves, Valve Components, and Trim Inspection, Testing, and Maintenance

<i>Item</i>	<i>Frequency</i>	<i>Reference</i>
Inspection		
<i>Control Valves</i>		
Sealed	Weekly	13.3.2.1
Locked	Monthly	13.3.2.1.1
Tamper switches	Monthly	13.3.2.1.1
<i>Alarm Valves</i>		
Exterior	Monthly	13.4.1.1
Interior	5 years	13.4.1.2
Strainers, filters, orifices	5 years	13.4.1.2
<i>Check Valves</i>		
Interior	5 years	13.4.2.1
<i>Preaction/Deluge Valves</i>		
Enclosure (during cold weather)	Daily/weekly	13.4.3.1
Exterior	Monthly	13.4.3.1.6
Interior	Annually/5 years	13.4.3.1.7
Strainers, filters, orifices	5 years	13.4.3.1.8
<i>Dry Pipe Valves/Quick-Opening Devices</i>		
Gauges	Weekly/monthly	13.4.4.1.2.4, 13.4.4.1.2.5
Enclosure (during cold weather)	Daily/weekly	13.4.4.1.1

Exterior	Monthly	13.4.4.1.4
Interior	Annually	13.4.4.1.5
Strainers, filters, orifices	5 years	13.4.4.1.6
<i>Pressure Reducing and Relief Valves</i>		
Sprinkler systems	Quarterly	13.5.1.1
Hose connections	Annually	13.5.2.1
Hose racks	Annually	13.5.3.1
Fire Pumps		
Casing relief valves	Weekly	13.5.7.1, 13.5.7.1.1
Pressure relief valves	Weekly	13.5.7.2, 13.5.7.2.1
<i>Backflow Prevention Assemblies</i>		
Reduced pressure	Weekly/monthly	13.6.1
Reduced pressure detectors	Weekly/monthly	13.6.1
<i>Fire Department Connections</i>	Quarterly	13.7.1
Testing		
<i>Main Drains</i>	Annually/quarterly	13.2.5, 13.2.5.1, 13.3.3.4
<i>Waterflow Alarms</i>	Quarterly/semiannually	13.2.6
<i>Control Valves</i>		
Position	Annually	13.3.3.1
Operation	Annually	13.3.3.1
Supervisory	Semiannually	13.3.3.5
<i>Preaction/Deluge Valves</i>		
Priming water	Quarterly	13.4.3.2.1
Low air pressure alarms	Quarterly/annually	13.4.3.2.13, 13.4.3.2.14
Full flow	Annually	13.4.3.2.2
<i>Dry Pipe Valves/Quick-Opening Devices</i>		
Priming water	Quarterly	13.4.4.2.1
Low air pressure alarm	Quarterly	13.4.4.2.6
Quick-opening devices	Quarterly	13.4.4.2.4
Trip test	Annually	13.4.4.2.2
Full flow trip test	3 years	13.4.4.2.2.2
<i>Pressure Reducing and Relief Valves</i>		
Sprinkler systems	5 years	13.5.1.2
Circulation relief	Annually	13.5.7.1.2
Pressure relief valves	Annually	13.5.7.2.2
Hose connections	5 years	13.5.2.2
Hose racks	5 years	13.5.3.2
<i>Backflow Prevention Assemblies</i>	Annually	13.6.2
Maintenance		
<i>Control Valves</i>	Annually	13.3.4
<i>Preaction/Deluge Valves</i>	Annually	13.4.3.3.2
<i>Dry Pipe Valves/ Quick-Opening Devices</i>	Annually	13.4.4.3