Standpipes and Hose Systems

CHAPTER 3

This chapter, which opens with an overview of standpipe and hose systems, is intended to assist the registered design professional (RDP), commissioning agent, authority having jurisdiction (AHJ), and the installing contractor in the proper commissioning of these systems. Included here is information needed for the submission of plans and calculations during the permitting process and for inspections and tests required to verify system performance. Also provided is information the RDP, commissioning agent, and/or the AHJ can use to develop the system-specific commissioning requirements, methods, and procedures for a project specification.

OVERVIEW

Standpipe and Hose Systems Defined

A standpipe system is intended to eliminate the need for excessively long runs of hose for manual fire fighting. With a standpipe system installed in a building, the fire fighter can connect hose to a permanently installed valve on the standpipe system and, with not more than 100 to 200 ft (35.5 m to 61 m) of hose, can fight a fire anywhere on a given floor. Standpipe systems are divided into classes to identify their specific function. Those classifications are as follows:

- *Class I.* Intended for fire department use only. This type of system is equipped with a 2½ in. (65 mm) angle valve for hose attachment. The system is not provided with hose; the fire department will use their own hose (see Exhibit 3.1).
- *Class II.* Previously intended for building occupant use only. NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* now restricts this type of system for use by trained industrial fire brigades.

  The Class II system is usually equipped with 1½ in. (65 mm) hose in varying lengths of 50 to 150 ft (50 m to 45.7 m) and is designed to discharge water at a rate of 50 gpm (189 L/m) per hose rack at a pressure of 65 psi (4.5 bar).
- *Class III*. A combination of Class I and Class II. This type of system is usually equipped with a 2½ in. (65 mm) angle valve for fire department use and a 1½ in. (40 mm) hose rack assembly for industrial fire brigade use, although a 2½ in. (65 mm) hose valve with a 2½ in. × 1½ in. (40 mm) reducer and a 1½ in. (40 mm) cap and chain can, by definition in NFPA 14, be used to satisfy the Class III standpipe system requirement. It is important to note that many building codes will require the installation of a Class III standpipe system. Such a requirement can be met without the installation of a hose rack assembly (see Exhibit 3.2).

EXHIBIT 3.1 Class I Standpipe System

Owner Requirements

Although there are no specific owner requirements contained in NFPA 14, to be consistent with the concept of fire protection systems commissioning, the building owner should provide the RDP with the general information discussed in the basis of design (BOD). Similarly, since many modern standpipe system installations are "combined" systems, the same owner information required by NFPA 13, *Standard for the Installation of Sprinkler Systems,* applies to standpipe systems (see Exhibits 3.3 and 3.4).

Contractor Requirements

The contractor will be legally bound to comply with the provisions of the contract, which should include, as a minimum, compliance with plans and specifications and with NFPA 14.

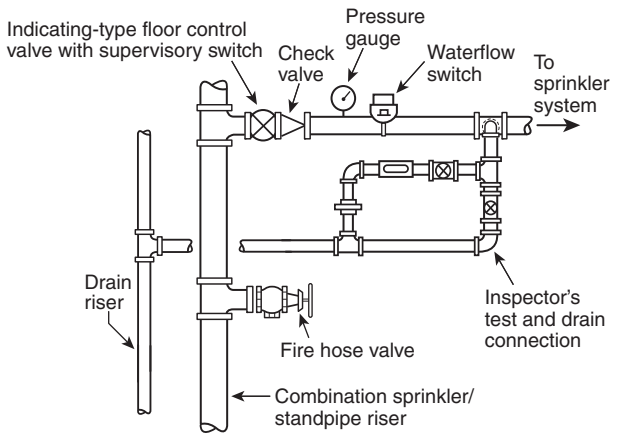
PLANS AND CALCULATIONS

Plans

NFPA 14 does not consider the use of preliminary plans. Preliminary plans, discussed in Part I of this handbook, are usually submitted by the RDP when he or she applies for a building permit. The plan requirements contained in NFPA 14 are intended to be working plans and should be prepared in sufficient detail as described in NFPA 13, with the particulars necessary for standpipe systems included as described below.

EXHIBIT 3.2 Class III Standpipe System

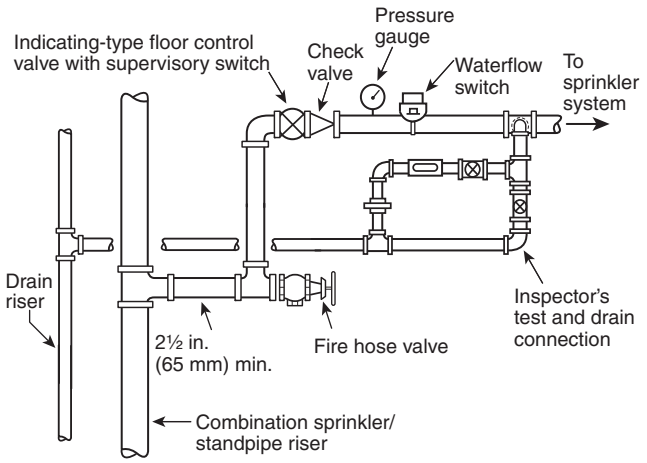
EXHIBIT 3.3 Acceptable Piping Arrangement for Combined Sprinkler/Standpipe System



Source: NFPA 14, 2010, Figure A.7.10.1.3.1(a).

Program for Individual Systems

EXHIBIT 3.4 Combined Sprinkler/Standpipe System



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Plans accurately showing the details and arrangement of the standpipe system shall be furnished to the authority having jurisdiction prior to the installation of the system. [NFPA 14-10: 8.1.1]

Plans shall be clear, legible, and drawn to scale. [NFPA 14-10: 8.1.2]

The drawings shall show the location, arrangement, water supply, equipment, and all other details necessary to establish compliance with this standard. [NFPA 14-10: 8.1.3]

The plans shall include specifications covering the character of materials used and shall describe all system components. [NFPA 14-10: 8.1.4]

The plans shall include an elevation diagram, and the vertical elevation of each floor shall be indicated. [NFPA 14-10: 8.1.5]

Hydraulic Calculations

Standpipe system calculations should be prepared in a format similar to that of sprinkler systems. Standpipe calculations are intended to verify that the proper flow and pressure are available at the hose valve outlet. Calculations for all standpipes are mandated by NFPA 14.

The following information should be included on all hydraulic calculation submittals:

- Standpipe system piping should be sized by hydraulic calculations.
- A complete set of calculations should be submitted with the plans.
- Hydraulic calculations should be prepared on form sheets that include a summary sheet, detailed worksheets, and a graph sheet.
- The summary sheet should contain the following information, where applicable:

1. Date
2. Location
3. Name of owner and occupant
4. Building number or other identification
5. Description of hazard
6. Name and address of contractor or designer
7. Name of approving agency

8. System design requirements, including the number of standpipes flowing and the minimum rate of water application gpm/ft^2 (mm/min)
9. Total water requirements as calculated, including allowance for inside hose, outside hydrants, and sprinklers for buildings with partial sprinkler protection

- Detailed worksheets or computer printout sheets should contain the following information:

1. Sheet number
2. Hose connection description and discharge constant (K)
3. Hydraulic reference points
4. Flow in gpm (L/min)
5. Pipe size
6. Pipe lengths, center-to-center of fittings
7. Equivalent pipe lengths for fittings and devices
8. Friction loss in psi/ft (bar/m) of pipe
9. Total friction loss between reference points
10. Devices such as alarm valves, dry-pipe valves, deluge valves, strainers, pressure-regulating devices, backflow preventers
11. Elevation head in psi (bar) between reference points
12. Required pressure in psi (bar) at each reference point
13. Velocity pressure and normal pressure if included in calculations
14. Notes to indicate starting points or reference to other sheets or to clarify data shown

- A graphic representation of the complete hydraulic calculation should be plotted on semi-exponential graph paper ($Q_{1.85}$) and should include the following:

1. Water supply curve
2. Standpipe system demand
3. Hose demand (where applicable)
4. Partial sprinkler demand (where applicable)

APPROVAL AND ACCEPTANCE

General

Any concealed pipe should be pressure tested prior to concealment. Leaks discovered after concealment can be very costly to repair. NFPA 14 addresses this concern in Chapter 11 of the standard by recommending the pressure test before pipe is concealed.

A Where standpipe connections are built into the walls or partitions, the hydrostatic tests should be made before they are covered or permanently sealed. [NFPA 14-10: A.11.1]

All new systems shall be tested prior to the occupancy of the building. [NFPA 14-10: 11.1.1]

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Ordinarily, the AHJ will not issue an occupancy permit until all fire systems have been tested and accepted.

Existing standpipe systems that are to be utilized as standpipes for a combination system in the retrofit of a new sprinkler system shall be tested in accordance with NFPA 14-2010 Section 11.4. [NFPA 14-10: 11.1.2]

The installing contractor shall complete and sign the appropriate contractor's material and test certificate(s) as shown in Figure 11.1.3(a) [Exhibit 3.5] and Figure 11.1.3(b)[Exhibit 3.6]. [NFPA 14-10: 11.1.1]

14

EXHIBIT 3.5 Sample Contractor's Material and Test Certificate for Aboveground Piping.

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR ABOVEGROUND PIPING

Standpipe System NFPA 14

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and the system left in service before the contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood that the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with the approving authority's requirements or local ordinances.

Property name		Date
Property address		
Plans	Accepted by approving authorities (names)	
	Address	
	Installation conforms to accepted plans?	❑ Yes ❑ No
	Equipment used is approved or listed?	❑ Yes ❑ No
	If no, explain deviations. _____	
Type of System	Automatic dry	❑ Yes
	Automatic wet	❑ Yes
	Semiautomatic dry	❑ Yes
	Manual dry	❑ Yes
	Manual wet	❑ Yes
	Combination standpipe/sprinkler	❑ Yes
	If other, explain. _____	
Water Supply Data Used for Design and As Shown on Plans	Fire pump data	
	Manufacturer _____ Model _____	
	Type: ❑ Electric ❑ Diesel ❑ Other (explain) _____	
	Rated, gpm _____ Rated, psi _____ Shutoff, psi _____	
Water Supply Source Capacity, Gallons	❑ Public waterworks system ❑ Storage tank ❑ Gravity tank ❑ Open reservoir	
	❑ Other (explain) _____	
If Public Waterworks System:	Static, psi _____ Residual, psi _____ Flow, gpm _____	
Have Copies of the Following Been Left on the Premises?	❑ System components instructions ❑ Care and maintenance of system ❑ NFPA 25	
	❑ Copy of accepted plans ❑ Hydraulic data/calculations	
Supplies Building(s)	Main waterflow shutoff location _____	
	Number of standpipe risers _____	
	Do all standpipe risers have base of riser shutoff valves?	❑ Yes ❑ No
Valve Supervision	❑ Locked open ❑ Sealed and tagged ❑ Tamperproof switch ❑ Other	
	If other, explain. _____	
Pipe and Fittings	Type of pipe _____	
	Type of fittings _____	
Hose Threads	Hose threads have been verfied for compliance with local fire department	❑ Yes ❑ No
Backflow Preventor	❑ Double check assembly Size _____ Make and model _____	
	❑ Reduced-pressure device	

EXHIBIT 3.5 Continued

CONTROL VALVE DEVICE

Type	Size	Make	Model

Time to trip through remote hose valve _____ Min _____ Sec Water pressure _____ Air pressure _____
Time water reached remote hose valve outlet _____ Min _____ Sec Trip point air pressure _____ psi
Alarm operated properly? ❑ Yes ❑ No If no, explain. _____

Time water reached remote hose valve outlet _____ Min _____ Sec
Hydraulic activation ❑ Yes
Electric activation ❑ Yes
Pneumatic activation ❑ Yes
Make and model of activation device _____
Each activation device tested? ❑ Yes ❑ No If no, explain. _____

Each activation device operated properly? ❑ Yes ❑ No If no, explain. _____

PRESSURE-REGULATING DEVICE

Location & Floor	Model	Nonflowing (psi)		Flowing (psi)		gpm
		Inlet	Outlet	Inlet	Outlet	

All hose valves on system operated properly? ❑ Yes ❑ No If no, explain. _____

EXHIBIT 3.5 Continued

Test Description	*Hydrostatic:* Hydrostatic tests shall be made at not less than 200 psi (13.6 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.2 bar) for 2 hours. Differential dry pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped. *Pneumatic:* Establish 40 psi (2.7 bar) air pressure and measure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop, which shall not exceed 1½ psi (0.1 bar) in 24 hours.
Tests	All piping hydrostatically tested at _____ psi (____ bar) for _____ hrs Dry piping pneumatically tested? ❑ Yes ❑ No Equipment operates properly? ❑ Yes ❑ No If no, state reason. Do you certify as the standpipe contractor that additives and corrosive chemicals, sodium silicate, or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? ❑ Yes ❑ No Drain test: Reading of gauge located near water supply test connection _____ psi (____ bar); Residual pressure with valve in test connection open wide _____ psi (____ bar) Underground mains and lead-in connections to system risers flushed before connection made to standpipe piping. Verified by copy of the U form no. 85b? ❑ Yes ❑ No ❑ Other (explain) _____ Flushed by installer of underground standpipe piping? ❑ Yes ❑ No _____
Flow Test	Flow water from the hydraulically most remote standpipe outlet(s). Record: Static pressure: _____ psi (____ bar) Residual pressure: _____ psi (____ bar) Nozzle diameter: _____ in. (____ cm) Pitot pressure: _____ psi (____ bar) Total flow: _____ gpm (____ L/min) *Note:* The minimum flow should be 500 gpm (1893 L/min) at 100 psi (6.9 bar) residual pressure for Class I or Class III systems and 100 gpm (379 L/min) at 65 psi (4.5 bar) for Class II systems.
Blank Testing	Number used _____ Locations _____ Number removed _____
Welding	Welded piping ❑ Yes ❑ No **If yes . . .** Do you certify as the standpipe contractor that welding procedures comply with the requirements of at least AWS D10.9, Level AR-3? ❑ Yes ❑ No Do you certify that the welding was performed by welders qualified in compliance with the requirements of at least AWS D10.9, Level AR-3? ❑ Yes ❑ No Do you certify that welding was carried out in compliance with a documented quality control procedure to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residue are removed, and that the internal diameters of piping are not penetrated? ❑ Yes ❑ No
Cutouts (Discs)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? ❑ Yes ❑ No
Hydraulic Data Nameplate	Nameplate provided? ❑ Yes ❑ No ❑ If no, explain. _____
Remarks	Date left in service with all control valves open: _____
Name of Sprinkler/ Standpipe Contractor	Name of contractor _____ Address _____ State license number (if applicable) _____
System Operating Test Witnessed by	Property owner _____ Title _____ Date _____ Sprinkler/standpipe contractor _____ Title _____ Date _____ Approving authorities _____ Title _____ Date _____
Additional Explanation and Notes	

 NFPA 14 (p. 3 of 3)

EXHIBIT 3.6 Sample Conntractor's Material and Test Certificate for Underground Piping.

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING

PROCEDURE

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and the system left in service before the contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood that the owner's representative's signature in no way prejudices any claim against the contractor for faulty material, poor workmanship, or failure to comply with the approving authority's requirements or local ordinances.

Property name		Date
Property address		
Plans	Accepted by approving authorities (names)	
	Address	
	Installation conforms to accepted plans? ❑ Yes ❑ No Equipment used is approved? ❑ Yes ❑ No If no, state deviations. _____	
Instructions	Has person in charge of fire equipment been instructed as to the location of control valves and care and maintenance of this new equipment? ❑ Yes ❑ No If no, explain. _____	
	Have copies of appropriate instructions and care and maintenance charts been left on premises? ❑ Yes ❑ No If no, explain. _____	
Location	Supplies buildings	
Underground Pipes and Joints	Pipe types and class	Type joint
	Pipe conforms to _____ standard ❑ Yes ❑ No Fittings conform to _____ standard ❑ Yes ❑ No If no, explain. _____	
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ standard ❑ Yes ❑ No If no, explain. _____	
Test Description	*Flushing:* Flow the required rate until water is clear, as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 gpm (1476 L/min) for 4 in. (100 mm) pipe, 880 gpm (3331 L/min) for 6 in. (150 mm) pipe, 1560 gpm (5905 L/min) for 8 in. (200 mm) pipe, 2440 gpm (9235 L/min) for 10 in. (250 mm) pipe, and 3520 gpm (13,323 L/min) for 12 in. (300 mm) pipe. When supply cannot produce stipulated flow rates, obtain maximum available. *Hydrostatic:* Hydrostatic tests shall be made at not less than 200 psi (13.8 bar) for 2 hours or 50 psi (3.4 bar) above static pressure in excess of 150 psi (10.3 bar) for 2 hours. *Leakage:* New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qt/hr (1.89 L/hr) per 100 joints, irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints, the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above can be increased by 1 fl oz per in. valve diameter per hr (30 mL/25 mm/hr) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so that the hydrants are under pressure, an additional 5 oz/min (150 mL/min) leakage is permitted for each hydrant.	
Flushing Tests	New underground piping system flushed according to _____ standard by (company) ❑ Yes ❑ No If no, explain. _____	
	How flushing flow was obtained ❑ Public water ❑ Tank or reservoir ❑ Fire pump	Through what type of opening ❑ Hydrant butt ❑ Open pipe
	Lead-ins flushed according to _____ standard by (company) ❑ Yes ❑ No If no, explain. _____	
	How flushing flow was obtained ❑ Public water ❑ Tank or reservoir ❑ Fire pump	Through what type of opening ❑ Y conn. to flange & spigot ❑ Open pipe

 NFPA 14 (p. 1 of 2)

EXHIBIT 3.6 Continued

Hydrostatic Test	All new underground piping hydrostatically tested at _____ psi for _____ hours		Joints covered ❑ Yes ❑ No
Leakage Test	Total amount of leakage measured _____ gal _____ hours		
	Allowable leakage _____ gal _____ hours		
Hydrants	Number installed	Type and make	All operate satisfactorily ❑ Yes ❑ No
Control Valves	Water control valves left wide open? ❑ Yes ❑ No If no, explain. _____		
	Hose threads of fire department connections and hydrants interchangeable with those of fire department answering alarm ❑ Yes ❑ No		
Remarks	Date left in service _____		
Signatures	Name of installing contractor		
	Tests Witnessed By		
	For property owner (signed)	Title	Date
	For installing contractor (signed)	Title	Date
Additional Explanation and Notes			

 NFPA 14 (p. 2 of 2)

Inspections and Action Items

In addition to acceptance testing, approval and acceptance involve a number of inspections or action items that must be documented on the contractor's material and test certificate for standpipe systems or other project closeout documentation. These items are as follows:

- Documentation of fire pump data
- Documentation of other water supply source
- Location of control valves
- Number of standpipe risers and riser isolation valves
- Method of valve supervision
- Verification of pipe and fitting type
- Backflow preventer type and size
- Verification of test blank removal (if applicable)
- Welding certification (if applicable)
- Posting of hydraulic data nameplate
- Project closeout submittals, such as system component maintenance instructions, general system care and maintenance instructions, and a copy of NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*
- Valve identification (installation of valve signs)
- Verification of flushing of underground supply piping

These items can be verified and documented on the contractor's material and test certificate for standpipe systems, but training of operations personnel and submission of as-built plans and operation and maintenance manuals (O&M) should be completed in much more detail.

Acceptance Testing Activities

Acceptance testing involves a number of activities that must be performed, witnessed, and documented. These activities are as follows:

- Functional test of the system alarm device
- Trip test and water transit time for dry systems
- Trip test for semiautomatic systems
- Pressure regulating device test (if present)
- Hydrostatic test
- Main drain test

The completion of these tests can be documented on the contractor's material and test certificate for standpipe systems.

Flushing of Piping

The underground main must be flushed to remove obstructive material such as dirt or rocks before aboveground piping is attached. A copy of the contractor's material and test certificate for underground piping should be obtained prior to commencing work on aboveground piping. This test form verifies pressure, flushing, and flow tests and verifies that the underground piping system is complete.

> Underground piping supplying the system shall be flushed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*. [NFPA 14-10: 11.2.1]
>
> Piping between the fire department connection and the check valve in the inlet pipe shall be flushed with a sufficient volume of water in order to remove any construction debris and trash accumulated in the piping prior to the completion of the system and prior to the installation of the fire department connection. [NFPA 14-10: 11.2.2]

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Hose Thread Testing

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All hose connection and fire department connection threads shall be tested to verify their compatibility with threads used by the local fire department. [NFPA 14-10: 11.3.1]

The test shall consist of threading coupling samples, caps, or plugs onto the installed devices. [NFPA 14-10: 11.3.2]

Hydrostatic Tests

Testing Pressure

A hydrostatic test is a pressure test to reveal the presence of leaks in the piping system. For fire protection systems, the piping is pressurized to 200 psi (13.8 bar) for a period of 2 hours. During this time period, the system piping is inspected for leaks. Leaks in the piping system are revealed either by observation of water droplets or by a reduction in test pressure. Any leaks or reduction in test pressure necessitates a repair of the pipe joint involved and a retest to verify that the leak has been repaired. In cases where high pressure exists, the standard requires that the test pressure be 50 psi (3.5 bar) in excess of the normal system pressure if the resultant test pressure will be greater than 200 psi (13.8 bar).

In the case of underground piping, a certain amount of leakage is permitted due to the type of valves and fittings permitted. During the hydrostatic test of underground piping, a slight pressure loss should be anticipated. The system should be pressurized such that this slight pressure loss does not permit the test pressure to drop below the specified 200 psi (13.8 bar). Following the 2-hour test period, the pressure loss should be simulated by opening a small drain valve installed for the test and draining the water into a calibrated container. The water volume should be measured and compared to the values permitted by NFPA 13, Standard for the Installation of Sprinkler Systems. If the amount of water drained from the system is less than that permitted, the test can be considered to be acceptable.

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All new systems, including yard piping and fire department connections, shall be tested hydrostatically at not less than 200 psi (13.8 bar) of pressure for 2 hours, or at 50 psi (3.5 bar) in excess of the maximum pressure where the maximum pressure is in excess of 150 psi (10.3 bar). [NFPA 14-10: 11.4.1]

The hydrostatic test pressure shall be measured at the low elevation point of the individual system or zone being tested. [NFPA 14-10: 11.4.2]

An air pressure leakage test at 40 psi (2.8 bar) shall be conducted for 24 hours. [NFPA 14-10: 11.4.5.1]

Any leakage that results in a loss of pressure in excess of 1½ psi (0.1 bar) during a continuous 24-hour period shall be corrected. [NFPA 14-10: 11.4.5.2]

Air Testing

It is important to note here that this interim air test is permitted only where there is concern for freezing. When possible, a hydrostatic test using water must be completed. An air test can be difficult to pass, since the acceptance criterion is a pressure variation of not more than 1.5 psi in a 24-hour period. With an air test, temperature fluctuations can cause a pressure variation of more than 1.5 psi in many cases. As a result, careful consideration should be given to conducting an air test, which may require substantial time to complete.

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Where cold weather prevents testing with water, an interim air test shall be permitted to be conducted prior to the standard hydrostatic test. [NFPA 14-10: 11.4.5]

Piping Testing

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The standpipe system piping shall show no leakage other than as permitted by NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances.* [NFPA 14-10: 11.4.3]

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Underground pipe shall be tested in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*. [NFPA 1410: 11.4.4]

Piping between the fire department connection and the check valve in the inlet pipe shall be tested hydrostatically in the same manner as the balance of the system. [NFPA 14-10: 11.4.6]

Where an existing standpipe system, including yard piping and fire department connection, is modified, the new piping shall be independently tested in accordance with 11.4.1. [NFPA 14-10: 11.4.7.1]

During testing, care shall be taken to ensure that no portion of the piping is subject to freezing during cold weather. [NFPA 14-10: 11.4.8]

During the hydrostatic test, the pressure gauge at the top of each standpipe shall be observed and the pressure recorded. [NFPA 14-10: 11.4.9]

Additives or Chemicals

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Additives, corrosive chemicals such as sodium silicate or derivatives of sodium silicate, brine, or other chemicals shall not be used while hydrostatically testing systems or for stopping leaks. [NFPA 14-10: 11.4.10]

System Operational Test

Flow Test

The flow test is intended to verify the system design. The test is completed by flowing 500 gpm at 100 psi (1892 L/min at 6.9 bar) at the most hydraulically demanding riser plus an additional 250 gpm (946 L/min) for each additional riser simultaneously. The total flow needed is 1250 gpm (4731 L/min) for buildings that are not completely sprinklered or 1000 gpm (3785 L/min) for buildings that are protected throughout with an automatic sprinkler system.

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The standpipe system shall be tested to verify system demand. [NFPA 14-10: 11.5.1]

This test shall be conducted by flowing water simultaneously from the outlet(s) indicated in the approved hydraulic calculations of each standpipe as required by Sections 7.8 and 7.10 of NFPA 14 2010. [NFPA 14-10: 11.5.1.1]

A manual system is connected to a water supply that is intended to keep the system full of only water. The needed flow and pressure for a manual system is provided by the fire department through the fire department connection. Therefore, a fire department pumper or portable pump is needed to achieve the required pressure for this test.

Testing Devices

Pressure-regulating devices must be tested to verify that the pressure setting is correct and that each device is installed in the correct location. Pressures are measured for flowing and nonflowing conditions and are recorded on contractor's material and test certificate. Pressure-regulating devices are available in a variety of configurations. Care must be taken to verify that they are installed correctly, because failure to do so can and has resulted in death or injury to operators. These devices are defined as follows:

Pressure-Regulating Device: A device designed for the purpose of reducing, regulating, controlling, or restricting water pressure. Examples include pressure-reducing valves, pressure control valves, and pressure-restricting devices.

Pressure-Reducing Valve: A valve designed for the purpose of reducing the downstream water pressure under both flowing (residual) and nonflowing (static) conditions.

Pressure-Restricting Device: A valve or device designed for the purpose of reducing the downstream water pressure under flowing (residual) conditions only.

Pressure-regulating devices may be field adjustable or factory set. In either case, the valve must be clearly marked for the appropriate set pressure and installed in the correct location. A valve set for lower pressures on higher floors will not function correctly if mistakenly installed on lower floors. It is recommended that set numbers or other identifying features be included on installation drawings and verified during commissioning.

14 Each alarm and supervisory device provided shall be tested in accordance with NFPA 72, *National Fire Alarm Code*. [NFPA 14-10: 11.7]

Main Drain Testing

The main drain test is intended to provide a record of static and residual pressures when flowing the 2 in. (50 mm) main drain connection. No measurement of flow is required for this test. The static and residual pressures are recorded on the contractor's material and test certificate to provide a baseline pressure set for future evaluation. The main drain test must be performed annually on existing systems. The inspector is required to compare future test results with that shown on the contractor's material and test certificate to reveal any potential issues with the water supply, such as a closed or partially closed water supply control valve or any condition that would affect the water supply to the standpipe system.

14 The main drain valve shall be opened and shall remain open until the system pressure stabilizes. [NFPA 14-10: 11.5.5.1]

The static and residual pressure shall be recorded on the contractor's test certificate. [NFPA 14-10: 11.5.5.2]

Dry System Testing

Similar to the test required for dry-pipe sprinkler systems, a dry standpipe system must be automatically activated and the water transit time must be recorded on the contractor's material and test certificate. An automatic dry standpipe system uses a dry-pipe valve, which must be tested to verify that the valve is functioning correctly. A semiautomatic standpipe system uses a deluge valve and normally an electrically operated manual pull station for activation. The deluge valve and manual pull devices must be tested to verify proper function.

14 Automatic dry and semiautomatic systems shall be tested by initiating a flow of water from the hydraulically most remote hose connection. [NFPA 14-10: 11.5.6.1]

The system shall deliver a minimum of 250 gpm (946 L/min) at the hose connection within 3 minutes of opening the hose valve if the system capacity exceeds 750 gal (2480 L). [NFPA 14-10: 11.5.6.2]

Each remote control activation device for operating a semiautomatic system shall be tested in accordance with the manufacturer's specifications and instructions. [NFPA 14-10: 11.5.6.3]

13 In addition the standard hydrostatic test, an air pressure leakage test at 40 psi (2.8 bar) shall be conducted for 24 hours. Any leakage that results in a loss of pressure in excess of 1½ psi (0.1 bar) for the 24 hours shall be corrected. [NFPA 13-10: 24.2.2]

14 These tests shall be conducted in addition to all the tests required for automatic and manual systems. [NFPA 14-10: 11.5.6.5]

Where pumps are part of the water supply for a standpipe system, testing shall be conducted while the pumps are operating. [NFPA 14-10: 11.5.7]

System Hydraulic Information Sign

14 The installing contractor shall provide a sign identifying the basis of the system design as either hydraulic calculations or pipe schedule. [NFPA 14-10: 6.8.1]

14

The sign shall be located at the water supply control valve for automatic or semiautomatic standpipe systems and at an approved location for manual systems. [NFPA 14-10: 6.8.2]

The sign shall indicate the following:

(1) Location of the two hydraulically most remote hose connections
(2) Design flow rate for the connections identified in 6.8.3(1)
(3) Design residual inlet and outlet pressures for the connections identified in 6.8.3(1)
(4) Design static pressure and the design system demand (i.e., flow and residual pressure) at the system control valve, or at the pump discharge flange where a pump is installed, and at each fire department connection [NFPA 14-10: 6.8.3]

Exhibit 3.7 provides a sample system hydraulic information sign.

EXHIBIT 3.7 System Hydraulic Information Sign.

Location of the two hydraulically most remote hose connections: _____

Design flow rate for the connections identified above: _____

Design residual inlet and outlet pressures for the connections identified above: _____

Design static pressure and design system demand (i.e., flow and residual pressure) at the system control valve, or at the pump discharge flange where a pump is installed, and at each fire department connection: _____

Source: NFPA 14, 2010, Figure A.6.7.

SUMMARY

Like all water-based fire protection systems, standpipe systems must undergo a pressure test, an alarm test, and a main drain test during commissioning. Standpipe systems must also be flow tested to verify the system design flow and pressures. In addition to these tests, the verification of pressure-regulating devices — that is, their location and static and residual pressures — is critical to the safety of the system user and system components. All of these tests must be conducted and documented accurately to ensure proper operation of the system.

In many cases, standpipe system commissioning can be conducted simultaneously with that of a sprinkler system because many combined systems are installed. The documentation and general test procedures are consistent with those of other water-based fire protection systems.