An automatic standpipe system engineering essay

Engineering

This part covers the minimum requirements for the installation of standpipe systems for buildings and structures. The purpose is to provide a reasonable degree of protection for life and property from fire through installation requirements for standpipe systems based on sound engineering principles, test data, and field experience. The provisions of this document shall be considered necessary to provide a reasonable level of protection from loss of life and property from fire. The number and arrangement of standpipe equipment necessary for proper protection is governed by local conditions such as the occupancy, character, and construction of the building and its accessibility. The authority having jurisdiction shall be consulted regarding the required type of system, class of system, and special requirements.

1. Definitions

1. 1Automatic Standpipe System: A standpipe system that is attached to a water supply capable of supplying the system demand at all times and that requires no action other than opening a hose valve to provide water at hose connections. 1. 2Branch Line: A piping system, generally in a horizontal plane, connecting one or more hose connections with a standpipe. 1. 3Combined System: A standpipe system having piping that supplies both hose connections and automatic sprinklers. 1. 4Control Valve: A valve used to control the water supply system of a standpipe system. 1. 5Dry Standpipe: A standpipe system designed to have piping containing water only when the system is being utilized. 1. 6Feed Main: That portion of a standpipe system that supplies water to one or more standpipes. 1. 7Fire Department Connection: A connection through which the fire department can pump water into the standpipe system. 1. 8Hose Connection: A combination of

equipment provided for connection of a hose to a standpipe system that includes a hose valve with a threaded outlet. 1. 9Hose Station: A combination of a hose rack, hose nozzle, hose, and hose connection. 1. 10Hose Valve: The valve to an individual hose connection. 1. 11Manual Standpipe System: A standpipe system that relies exclusively on a fire department connection to supply the system demand1. 12Pressure, Nozzle: The pressure required at the inlet of a nozzle to produce the desired water discharge characteristics. 1. 13Pressure, Residual: The pressure acting on a point in the system with a flow being delivered by the system. 1. 14Pressure, Static: The pressure acting on a point in the system with no flow from the system. 1. 15Pressure Control Valve: A pilot-operated pressure reducing valve designed for the purpose of reducing the downstream water pressure to a specific value under both flowing (residual) and non-flowing (static) conditions. 1. 16Pressure Reducing Valve: A valve designed for the purpose of reducing the downstream water pressure under both flowing (residual) and non-flowing (static) conditions. 1. 17Pressure 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. 1. 18Pressure Restricting Device: A valve or device designed for the purpose of reducing the downstream water pressure under flowing (residual) conditions only. 1. 19Semiautomatic Standpipe System: A standpipe system that is attached to a water supply capable of supplying the system demand at all times and that requires activation of a control device to provide water at hose connections. 1. 20Shell: Indicates a mandatory requirement. 1. 21Standpipe: The riser portion of the system piping that delivers the water supply for hose

connections, and sprinklers on combined systems, vertically from floor to floor. 1. 22Standpipe System: An arrangement of piping, valves, hose connections, and allied equipment installed in a building or structure, with the hose connections located in such a manner that water can be discharged in streams or spray patterns through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building or structure and its contents in addition to protecting the occupants. This is accomplished by means of connections to water supply systems or by means of pumps, tanks, and other equipment necessary to provide an adequate supply of water to the hose connections. 1. 23Standpipe System Zone: A vertical subdivision of a standpipe system by height. 1. 24System Demand: The flow rate and residual pressure required from a water supply, measured at the point of connection of the water supply to a standpipe system, to deliver the following:(a) The total water flow rate required for a standpipe system(b) The minimum residual pressures at the hydraulically most remote hose connection.(c) The minimum water flow rate for sprinkler connections, on combined systems. 1. 25Wet Standpipe: A standpipe system having piping containing water at all times.

2. System Components and Hardware

Standpipe system components and hardware shall be in accordance with this chapter. All devices and materials used in standpipe systems shall be of an approved type. System components shall be rated for working pressures not less than the maximum pressure to be developed at their corresponding locations within the system under any condition, including the pressure that

occurs when a permanently installed fire pump is operating at shutoff pressure.

2. 1Pipe and Tube

Pipe or tube used in standpipe systems shall meet or exceed one of the standards in Table E-2. 1 or shall be in accordance with E-2. 2.

Table E-2. 1 Pipe or Tube Materials and Dimensions

Material and Dimensions (Specifications)

Standard

Ferrous PipingDuctile-Iron Pipe, Centrifugally Cast, for Water or Other LiquidsAWWA C151Electric-Resistance Welded Steel PipeA Standard Specification for Electric-Resistance-Welded Steel Pipe STM A 135Welded and Seamless SteelStandard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) WeldedASTM A 795And Seamless Steel Pipe for Fire Protection UseWelded and Seamless Steel PipeStandard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, WeldedASTM A 53And SeamlessWelded and Seamless Wrought Steel PipeANSI B36. 10MCopper Tube (Drawn, Seamless)Standard Specification for Seamless Copper TubeASTM B 75Standard Specification for Seamless Copper Water TubeASTMB 88Standard Specification for General Requirements for Wrought Seamless Copper andASTM B 251Copper-Alloy TubeBrazing Filler Metal (Classifications BCuP-3 or BCuP-4Specification for Filler Metals for Brazing and Braze Welding AWS A5. 8

2. 2Pipe Bending

Bending of Schedule 40 steel pipe and Types K and L copper tube shall be permitted where bends are made with no kinks, ripples, distortions, reductions in diameter, or any noticeable deviations from a round shape. The minimum radius of a bend shall be six pipe diameters for pipe sizes 2 in. (51 mm) and smaller, and five pipe diameters for pipe sizes 2. 5 in. (64 mm) and larger.

2. 3Fittings

Fittings used in standpipe systems shall meet or exceed the standards in Table E. 2. 3. 1. Other types of fittings investigated for suitability in standpipe installations and listed for this service, including, but not limited to, steel differing from that provided in Table E. 2. 3. 1, shall be permitted where installed in accordance with their listing limitations, including installation instructions.

Table E-2. 3. 1 Fittings, Materials, and Dimensions

Material and Dimensions

Standard

Malleable IronMalleable Iron Threaded FittingsANSI B16. 3Ductile IronDuctile-Iron Fittings and Gray-Iron Fittings, 3 in. Through 48 in. AWWA C110(75 mm Through 1200 mm) for Water and Other Liquids SteelFactory-Made Wrought Steel Butt-welding FittingsANSI B16. 9Butt-welding EndANSI B16. 25Standard Specification for Piping Fittings of Wrought CarbonASTM A 234Steel and Alloy Steel for Moderate and Elevated TemperaturesPipe Flanges and Flanged FittingsANSI B16. 5Forged Fittings, Socket-Welding and ThreadedANSI B16.

11CopperWrought Copper and Copper Alloy Solder Joint Pressure FittingsANSI B16. 22Cast Copper Alloy Solder Joint Pressure FittingsANSI B16. 18Cast IronGray Iron Threaded FittingsANSI B16. 4Cast Iron Pipe Flanges and Flanged FittingsANSI B16. 1Screwed unions shall not be used on pipe larger than 2 in. (51 mm). Couplings and unions of other than the screwed type shall be of the types listed specifically for use in standpipe systems. A one-piece reducing fitting shall be used wherever a change is made in the size of the pipe.

2. 4Joining of Pipe and Fittings

2. 4. 1 Threaded Pipe and Fittings:

All threaded pipe and fittings shall have threads cut in accordance with ANSI B1. 20. 1. Steel pipe with wall thickness less than Schedule 30 [sizes 8 in. (203 mm) and larger] or Schedule 40 [sizes less than 8 in. (203 mm)] shall not be joined by threaded fittings. Joint compound or tape shall be applied only to male threads.

2. 4. 2 Welded Pipe and Fittings:

Welding methods that comply with all of the requirements of AWS D10. 9, Specification for Qualification of Welding Procedures and Welders for Piping and Tubing, Level AR-3, shall be considered to be an acceptable means of joining fire protection piping. No welding shall be performed if rain, snow, sleet, or high wind impinges on the weld area of the pipe product. The following requirements shall be met: Holes in piping for outlets shall be cut to the full inside diameter of fittings prior to welding the fittings in place. Discs shall be retrieved. Smoothbore openings shall be cut into piping, and

allinternal slag and welding residue shall be removed. Fittings shall not penetrate the internal diameter of thepiping. Steel plates shall not be welded to the ends of piping orfittings. Fittings shall not be modified. Nuts, clips, eye rods, angle brackets, or other fastenersshall not be welded to pipe or fittings. Where reducing the pipe size in a run of piping, a reducing fitting designed for that purpose should be used. Torch cutting and welding shall not be permitted as a means of modifying or repairing standpipe systems. A welding procedure shall be established and qualified by the contractor or fabricator before any welding is done. Qualification of the welding procedure to be used and the performance of all welders and welding operators shall be required and shall meet or exceed the requirements of AWS D10. 9, Specification for Qualification of Welding Procedures and Welders for Piping and Tubing, Level AR-3. Welders or welding machine operators shall, upon completion of each weld, stamp an imprint of their identification into the side of the pipe adjacent to the weld.

2. 5Hangers

Hangers certified by a registered professional engineer as to include all of the following requirements shall be permitted:(a)Hangers shall be designed to support five times the weight of the water-filled pipe plus 250 lb (114 kg) at each point of piping support.(b)The points of support shall be adequate to support the standpipe system.(c)Hanger components shall be ferrous. □□□ Detailed calculations shall be submitted, where required by the reviewing authority, that show the stresses developed both in hangers and piping and the safety factors allowed. The components of hanger assemblies that directly attach to the pipe or to the building structure shall be listed. Mild

steel hangers formed from rods shall not be required to be listed. Hangers and their components shall be ferrous. Nonferrous components that have been proven by fire tests to be adequate for the hazard application, that are listed for this purpose, and that are in compliance with the other requirements of this section shall be permitted. Standpipe piping shall be substantially supported from the building structure, which shall support the added load of the water-filled pipe plus a minimum of 250 lb (114 kg) applied at the point of hanging. Where standpipe piping is installed below ductwork, piping shall be supported from the building structure or from the ductwork supports, provided such supports are capable of handling both the load of the ductwork.

Diameter of Rod

Pipe Size(in.)(mm)Up to and including 4 in. 3/89. 55 in, 6 in and 8 in1/212. 710 in and 12 in5/815. 9

Table E-2. 5. 1 Hanger Rod Sizes

Hook Material Diameter

Pipe Size(in.)(mm)Up to 2 in5/167. 921/2 in to 6 in3/89. 58 in1/212. 7

Table E-2. 5. 2 U-Hook Rod Sizes

Diameter of Rod

Bent Eye

Welded Eye

Pipe Size(in.)(mm)(in.)(mm)Up to 4 in3/89. 53/89. 55 in to 6 in1/212. 71/212. 78 in3/419. 11/212. 7

Table E-2. 5. 3 Eye Rod Sizes

Eye rods shall be secured with lock washers to prevent lateral motion. Threaded sections of rods shall not be formed or bent. For ceiling flanges and U-hooks, screw dimensions shall not be less than those specified in Table E. 2. 5. 4.

Pipe Size

Two Screw Flanges

Up to 2 inWood screw No 18 x 1. 5 in

Pipe Size

Three Screw Flanges

Up to 2 inWood screw No 18 x 1. 5 in2. 5 in, 3 in, 3. 5 inLag screw 3/8 in x 2 in4 in, 5 in, 6 inLag screw 1/2 in x 2 in8 inLag screw 5/8 in x 2 in

Pipe Size

Four Screw Flanges

Up to 2 inWood screw No 18 x 1. 5 in2. 5 in, 3 in, 3. 5 inLag screw 3/8 in x 1. 5 in4 in, 5 in, 6 inLag screw 1/2 in x 2 in8 inLag screw 5/8 in. x 2 in.

Pipe Size

U-Hooks

Up to 2 inDrive screw No. 16 x 2 in2. 5 in, 3 in, 3. 5 inLag screw 3/8 in x 2. 5 in4 in, 5 in, 6 inLag screw 1/2 in x 3 in8 inLag screw 5/8 in x 3 in

Table E. 2. 5. 4 Screw Dimensions for Ceiling Flanges and U-Hooks

2. 6Types of Standpipe Systems

2. 6. 1 Automatic-Dry: An automatic-dry standpipe system shall be a dry standpipe system, normally filled with pressurized air, that is arranged through the use of a device, such as a dry pipe valve, to admit water into the system piping automatically upon the opening of a hose valve. The water supply for an automatic-dry standpipe system shall be capable of supplying the system demand. 2. 6. 2 Automatic-Wet: An automatic-wet standpipe system shall be a wet standpipe system that has a water supply that is capable of supplying the system demand automatically. 2. 6. 3 Semiautomatic-Dry: A semiautomatic-dry standpipe system shall be a dry standpipe system that is arranged through the use of a device, such as a deluge valve, to admit water into the system piping upon activation of a remote control device located at a hose connection. A remote control activation device shall be provided at each hose connection. The water supply for a semiautomatic-dry standpipe system shall be capable of supplying the system demand. 2. 6. 4 Manual-Dry: A manual-dry standpipe system shall be a dry standpipe system that does not have a permanent water supply attached to the system. Manual-dry standpipe systems need water from a fire department pumper to be pumped into the system through the fire department connection in order to supply the system demand. 2. 6. 5 Manual-Wet: A manual-wet standpipe system shall be a wet standpipe system connected to a small water supply for the purpose of maintaining water within the system but does not have a water supply capable of delivering the system demand attached to the system. Manual-wet

standpipe systems need water from a fire department pumper to be pumped into the system in order to supply the system demand.

2. 7Classes of Standpipe Systems

2. 7. 1 Class I Systems: A Class I standpipe system shall provide 2. 5-in. (63. 5-mm) hose connections to supply water for use by fire departments and those trained in handling heavy fire streams. 2. 7. 2 Class II Systems: A Class II standpipe system shall provide 1. 5-in. (38. 1-mm) hose stations to supply water for use primarily by the building occupants or by the fire department during initial response. Exception: A minimum 1-in. (25. 4-mm) hose shall be permitted to be used for hose stations in light hazard occupancies where investigated and listed for this service and where approved by the authority having jurisdiction. 2. 7. 3 Class III Systems: A Class III standpipe system shall provide 1. 5-in. (38. 1-mm) hose stations to supply water for use by building occupants and 2. 5-in. (63. 5-mm) hose connections to supply a larger volume of water for use by fire departments and those trained in handling heavy fire streams. Exception No. 1: A minimum 1-in. (25. 4-mm) hose shall be permitted to be used for hose stations in light hazard occupancies where investigated and listed for this service and where approved by the authority having jurisdiction. Exception No. 2: Where the building is protected throughout by an approved automatic sprinkler system, hose stations for use by the building occupants shall not be required, subject to the approval of the authority having jurisdiction, provided that each hose connection is 2. 5in. (63. 5 mm) and is equipped with a 2. 5-in or1. 5-in. (63. 5-mm or 38. 2-mm) reducer and a cap attached with a chain.

2. 8. Protection of Piping

Standpipe system piping shall not pass through hazardous areas and shall be located so that it is protected from mechanical and fire damage. Standpipes and lateral piping supplied by standpipes shall be located in enclosed exit stairways or shall be protected by a degree of fire resistance equal to that required for enclosed exit stairways in the building in which they are located. Exception 1: In buildings equipped with an approved automatic sprinkler system, lateral piping to 2. 5-in. (63. 5-mm) hose connections shall not be required to be protected. Exception 2: Piping connecting standpipes to 1. 5-in. (38. 1-mm) hose connections. Where a standpipe or lateral pipe that is normally filled with water passes through an area subject to freezing temperatures, it shall be protected by a reliable means to maintain the temperature of the water in the piping between 40°F and 120°F (4. 4°C and 48. 9°C). Antifreeze solutions shall not be used to protect standpipe system piping from freezing. Where corrosive conditions exist or piping is exposed to the weather, corrosion-resistant types of pipe, tube, fittings, and hangers or protective corrosion-resistive coatings shall be used. If steel pipe is to be buried underground, it shall be protected against corrosion before being buried.

2. 9Gate Valves and Check Valves

Connections to each water supply shall be provided with an approved indicating-type valve and check valve located close to the supply, such as at tanks, pumps, and connections from waterworks systems. Valves shall be provided to allow isolation of a standpipe without interrupting the supply to other standpipes from the same source of supply. Listed indicating-type

valves shall be provided at the standpipe for controlling branch lines for remote hose stations. Where wafer-type valve discs are used, they shall be installed so that they do not interfere with the operation of other system components. 2. 9. 1 Valves on Combined Systems: Each connection from a standpipe that is part of a combined system to a sprinkler system shall have an individual control valve of the same size as the connection. 2. 9. 2 Valves on Connections to Water Supplies: Connections to public water systems shall be controlled by post indicator valves of an approved type located at least 40 ft (12. 2 m) from the building protected. All valves shall be plainly marked to indicate the service that they control. Exception No. 1: Where the valve cannot be located at least 40 ft (12. 2 m) from the building, it shall be installed in an approved location and where it is readily accessible in case of fire and not subject to damage. Exception No. 2: Where post indicator valves cannot be used, underground valves shall be permitted. The valve locations, directions for their opening, and services that they control shall be plainly marked on the buildings served. Where the standpipes are supplied from a yard main or header in another building, the connection shall be provided with a listed indicating-type valve located outside at a safe distance from the building or at the header. 2. 9. 3 Valve Supervision: System water supply valves, isolation control valves, and other valves in feed mains shall be supervised in an approved manner in the open position by one of the following methods: ba)A central station, proprietary, or remote station signaling service. b)A local signaling service that initiates an audible signal at a constantly attended location. c)Locking of valves in the open position; d)Sealing of valves and an approved weekly-recorded inspection where valves are located within fenced enclosures under the control of the owner.

Exception: Underground gate valves with roadway boxes shall not be required to be supervised. 2. 9. 4 Signs and Room Identification for Valves: All main and sectional system control valves, including water supply control valves, shall have a sign indicating the portion of the system that is controlled by the valve. All control, drain, and test connection valves shall be provided with signs indicating their purpose. Where sprinkler system piping supplied by a combined system is supplied by more than one standpipe (" loop" or " dual feed" design), a sign shall be located at each dual or multiple feed connection to the combination system standpipe to indicate that in order to isolate the sprinkler system served by the control valve, an additional control valve or valves at other standpipes shall be shut off. The sign also shall identify the location of the additional control valves. Where a main or sectional system control valve is located in a closed room or concealed space, the location of the valve shall be indicated by a sign in an approved location on the outside of the door or near the opening to the concealed space.

2. 10. Deluge Valves

2. 10. 1 Description: A Deluge System is a fixed fire-protection system which totally floods an area with pressurized water through a system of piping and open nozzles or sprinklers. The system piping is empty until the Deluge Valve is activated by a hydraulic, pneumatic, electric or manual release system. 2. 10. 2 Applications: Regular Deluge Systems may be required to protect extra-hazard occupancies by creating a fire buffer zone or by cooling surfaces to prevent deformation or structural collapse. Examples: storage or process areas containing substances having a low flash point; areas in which

fire may spread rapidly; tanks containing combustible solutions, transformers, equipment pits or product handling systems. Systems should be designed by qualified fire-protection engineers in conjunction with the approving bodies having jurisdiction. Foam-water deluge systems are those using foam-water sprinklers or spray nozzles and an air-foam concentrate which is introduced into the water at controlled rate on the system side of the deluge valve. bÐ2. 10. 3 Operation: The Deluge Valve prevents water from entering the system piping until required. The deluge valve is kept closed by a pressurized upper valve chamber. The pressure is maintained through a restriction on the service side. This upper chamber is also connected to the release line. When the pressure is relieved from the upper chamber through the release line, the clapper is lifted by the water pressure under the clapper. Water floods the system and rings alarm.

3. Locations and Identification

Fire department connections shall be on the street side of buildings, fully visible and recognizable from the street or nearest point of fire department apparatus accessibility, and shall be located and arranged so that hose lines can be attached to the inlets without interference from nearby objects, including buildings, fences, posts, or other fire department connections. Each fire department connection shall be designated by a sign having raised letters, at least 1 in. (25. 4 mm) in height, cast on a plate or fitting that reads " STANDPIPE." If automatic sprinklers are also supplied by the fire department connection, the sign or combination of signs shall indicate both designated services (e. g., " STANDPIPE AND AUTOSPKR," or " AUTOSPKR AND STANDPIPE"). A sign also shall indicate the pressure required at the

inlets to deliver the system demand. Where a fire department connection services only a portion of a building, a sign shall be attached indicating the portions of the building served. A fire department connection for each standpipe system shall be located not more than 100 ft (30. 5 m) from the nearest fire hydrant connected to an approved water supply. Fire department connections shall be located not less than 18 in. (45. 7 cm) nor more than 48 in. (121. 9 cm) above the level of the adjoining ground, sidewalk, or grade surface.

4. Support of Piping

4. 1Support of Standpipes

Standpipes shall be supported by attachments connected directly to the standpipe. Standpipe supports shall be provided at the lowest level, at each alternate level above the lowest level, and at the top of the standpipe. Supports above the lowest level shall restrain the pipe to prevent movement by an upward thrust where flexible fittings are used. Clamps supporting pipe by means of set screws shall not be used.

4. 2Support of Horizontal Piping

Horizontal piping from the standpipe to hose connections that are more than 18 in. (457 mm) in length shall be provided with hangers. Horizontal piping hangers shall be spaced at a maximum separation distance of 15 ft (4. 6 m). The piping shall be restrained to prevent movement by horizontal thrust where flexible fittings are used.

5. Design

The design of the standpipe system is governed by building height, area per floor, occupancy classification, egress system design, required flow rate and residual pressure, and the distance of the hose connection from the source(s) of the water supply. The maximum pressure at any point in the system at any time shall not exceed 350 psi (24. 1bar).

5. 1. Locations of Hose Connections

Hose connections and hose stations shall be unobstructed and shall be located not less than 3 ft (0. 9 m) or more than 5 ft (1. 5 m) above the floor. 5. 1. 1 Class I Systems: Class I systems shall be provided with 2. 5-in. (63. 5-mm) hose connections in the following locations: At each intermediate landing between floor levels in every required exit stairway. Exception: Hose connections shall be permitted to be located at the main floor landings in exit stairways where approved by the authority having jurisdiction. On each side of the wall adjacent to the exit openings of horizontal exits. In each exit passageway at the entrance from the building areas into the passageway. In covered mall buildings, at the entrance to each exit passageway or exit corridor, and at exterior public entrances to the mall. At the highest landing of stairways with stairway access to a roof, and on the roof where stairways do not access the roof an additional 2. 5-in. (63. 5-mm) hose connection shall be provided at the hydraulically most remote riser to facilitate testing of the system. Where the most remote portion of a non-sprinklered floor or story is located in excess of 150 ft (45. 7 m) of travel distance from a required exit or the most remote portion of a sprinklered floor or story is located in excess of 200 ft (61 m) of travel distance from a required exit, additional hose

connections shall be provided, in approved locations, where required by the local fire department. 5. 1. 2 Class II Systems: Class II systems shall be provided with 1. 5 in. (38. 1 mm) hose stations so that all portions of each floor level of the building are within 130 ft (39. 7 m) of a hose connection provided with 1. 5 in. (38. 1 mm) hose or within 120 ft (36. 6 m) of a hose connection provided with less than 1. 5 in. (38. 1 mm) hose. Distances shall be measured along a path of travel originating at the hose connection. 5. 1. 3 Class III Systems: Class III systems shall be provided with hose connections as required for both Class II systems and I.

5. 2Interconnection of Standpipes

Where two or more standpipes are installed in the same building or section of building, they shall be interconnected at the bottom. Where standpipes are supplied by tanks located at the top of the building or zone, they also shall be interconnected at the top; in such cases, check valves shall be installed at the base of each standpipe to prevent circulation.

5. 3. Minimum Sizes for Standpipes

Class I and Class III standpipes shall be at least 4 in. (102 mm) in size. Standpipes that are part of a combined system shall be at least 6 in. (152 mm) in size. Exception: In fully sprinklered buildings having a combined standpipe system that is hydraulically calculated, the minimum standpipe size is 4 in. (102 mm).

5. 4. Minimum Pressure for System Design and Sizing of Pipe

Standpipe systems shall be designed so that the system demand can be supplied by both the attached water supply, where required, and fire department connections. The authority having jurisdiction shall be consulted regarding the water supply available from a fire department pumper. Standpipe systems shall be one of the following:(a)Hydraulically designed to provide the required water flow rate at a minimum residual pressure of 100 psi (6. 9 bars) at the outlet of the hydraulically most remote 2. 5 in. (63. 5 mm) hose connection and 65 psi (4. 5 bars) at the outlet of the hydraulically most remote 1. 5 in. (38. 1 mm) hose station; orException: Where the authority having jurisdiction permits pressures lower than 100 psi (6. 9 bars) for 2. 5 in. (63. 5 mm) hose connections, based on suppression tactics, the pressure shall be permitted to be reduced to not less than 65 psi (4. 5 bars). (b)Sized in accordance with the pipe schedule in Table 5-4 to provide the required water flow rate at a minimum residual pressure of 100 psi (6. 9 bars) at the topmost 2. 5 in. (63. 5 mm) hose connection and 65 psi (4. 5 bars) at the topmost 1. 5 in. (38. 1 mm) hose station. Pipe schedule designs shall be limited to wet standpipes for buildings that are not defined as high-rise.

Total Accumulated

Total Distance of Piping From Flow Farthest Outlet

<50 ft50–100 ft> 100 ft(gpm)(L/min)(<15. 2 m)(15. 2–30. 5 m)(> 30. 5 m)10037922. 53101–500382–1893446501–7501896–2839556751–12502843–47316661251 and over4735888

Table E. 5. 4 Pipe Schedule - Standpipes and Supply Piping Minimum Nominal Pipe Sizes in Inches

5. 5Maximum Pressure for Hose Connections

Where the residual pressure at a 1. 5 in (38. 1 mm) outlet on a hose connection available for occupant use exceeds 100 psi (6. 9 bars). Where the static pressure at a hose connection exceeds 175 psi (12. 1 bars), an approved pressure-regulating device shall be provided to limit static and residual pressures at the outlet of the hose connection to 100 psi (6. 9 bars) for 1. 5 in. (38. 1 mm) hose connections available for occupant use and 175 psi (12. 1 bars) for other hose connections. The pressure on the inlet side of the pressure-regulating device shall not exceed the device’s rated working pressure.

5. 6Minimum Flow Rates

5. 6. 1 Class I and Class III Systems

5. 6. 1. 1 Minimum Flow Rate: For Class I and Class III systems, the minimum flow rate for the hydraulically most remote standpipe shall be 500 gpm (1893 L/min). The minimum flow rate for additional standpipes shall be 250 gpm (946 L/min) per standpipe, with the total not to exceed 1250 gpm (4731 L/min). Exception: When the floor area exceeds 80, 000 ft2 (7432 m2), the second most remote standpipe shall be designed to accommodate 500 gpm (1893 L/min). 5. 6. 1. 2 Hydraulic Calculation Procedure: Hydraulic calculations and pipe sizes for each standpipe shall be based on providing 250 gpm (946 L/min) at the two hydraulically most remote hose connections on the standpipe and at the topmost outlet of each of the other standpipes at the minimum residual pressure required by Section 5-4. Common supply

piping shall be calculated and sized to provide the required flow rate for all standpipes connected to such supply piping, with the total not to exceed 1250 gpm (4731 L/min). 5. 6. 1. 3 Combined Systems: For a combined system in a building equipped with partial automatic sprinkler protection, the flow rate required by 5. 6. 1 shall be increased by an amount equal to the hydraulically calculated sprinkler demand or 150 gpm (568 L/min) for light hazard occupancies, or by 500 gpm (1893 L/min) for ordinary hazard occupancies, whichever is less. Where an existing standpipe system having standpipes with a minimum diameter of 4 in. (102 mm) is to be utilized to supply a new retrofit sprinkler system, the water supply required by 5-6. 1 shall not be required to be provided by automatic or semiautomatic means if approved by the authority having jurisdiction, provided that the water supply is adequate to supply the hydraulic demand of the sprinkler system.

5. 6. 2 Class II Systems

5. 6. 2. 1 Minimum Flow Rate: For Class II systems, the minimum flow rate for the hydraulically most remote standpipe shall be 100 gpm (379 L/min). Additional flow shall not be required where more than one standpipe is provided. 5. 6. 2. 2 Hydraulic Calculation Procedure: Hydraulic calculations and pipe sizes for each standpipe shall be based on providing 100 gpm (379 L/min) at the hydraulically most remote hose connection on the standpipe at the minimum residual pressure. Common supply piping serving multiple standpipes shall be calculated and sized to provide 100 gpm (379 L/min).

6. Water Supplies

6. 1Required Water Supply

Automatic and semiautomatic standpipe systems shall be attached to an approved water supply capable of supplying the system demand. Manual standpipe systems shall have an approved water supply accessible to a fire department pumper. A single automatic or semiautomatic water supply shall be permitted where it is capable of supplying the system demand for the required duration. Water supplies from the following sources shall be permitted:(a)A public waterworks system where pressure and flow rate are adequate.(b)Automatic fire pumps connected to an approved water source in accordance with NFPA 20, Standard for the Installation of Centrifugal Fire Pumps.(c)Manually controlled fire pumps in combination with pressure tanks. (d)Pressure tanks installed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection(e)Manually controlled fire pumps operated by remote control devices at each hose station.(f)Gravity tanks installed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.

6. 2Standpipe System Zones

Each zone requiring pumps shall be provided with a separate pump. This shall not preclude the use of pumps arranged in series. Where pumps supplying two or more zones are located at the same level, each zone shall have separate and direct supply piping of a size not smaller than the standpipe that it serves. Zones with two or more standpipes shall have at least two direct supply pipes of a size not smaller than the largest standpipe that they serve. Where the supply for each zone is pumped from the next

lower zone, and the standpipe or standpipes in the lower zone are used to supply the higher zone. At least two lines shall be provided between zones; one of these lines shall be arranged so that the supply can be automatically delivered from the lower to the higher zone.