**Chapter 17 Installation Requirements for Hanging and Support of System Piping**

17.1\* General

17.1.1

Unless the requirements of 17.1.2 are met, types of hangers shall be in accordance with the requirements of Chapter 17.

17.1.2

Hangers certified by a registered professional engineer to include all of the following shall be an acceptable alternative to the requirements of Chapter 17:

Hangers shall be designed to support five times the weight of the water-filled pipe plus 250 lb (115 kg) at each point of piping support.

These points of support shall be adequate to support the system.

The spacing between hangers shall not exceed the value given for the type of pipe as indicated in Table 17.4.2.1(a) or Table 17.4.2.1(b).

Hanger components shall be ferrous.

Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in hangers, piping, and fittings, and safety factors allowed.

17.1.3 Support of Non-System Components

17.1.3.1\*

Sprinkler piping or hangers shall not be used to support non-system components.

17.1.3.2

Sprinkler piping shall be permitted to utilize shared support structures in accordance with 17.1.4.

17.1.4

Shared support structures shall be certified by a registered professional engineer in accordance with 17.1.2 and 17.1.4.

17.1.4.1\*

The design of a shared support structure shall be based on either 17.1.4.1.1 or 17.1.4.1.2.

17.1.4.1.1

Sprinkler pipe and other distribution systems shall be permitted to be supported from a shared support structure designed to support five times the weight of water-filled sprinkler pipe and other supported distribution systems plus 250 lb (115 kg), based on the allowable ultimate stress.

17.1.4.1.2

Sprinkler pipe and other distribution systems shall be permitted to be supported from a shared support structure designed to support five times the weight of the water-filled sprinkler pipe plus 250 lb (115 kg), and one and one-half times the weight of all other supported distribution systems.

17.1.4.1.3

The building structure shall not be considered a shared support structure.

17.1.4.1.4\*

The requirements of 17.1.4.1 shall not apply to 17.4.1.3.3.

17.1.4.1.5

Systems that are incompatible with the fire sprinkler systems based on vibration, thermal expansion and contraction, or other factors shall not share support structures.

17.1.5

Where water-based fire protection systems are required to be protected against damage from earthquakes, hangers shall also meet the requirements of Section 18.7.

17.1.6 Listing

17.1.6.1\*

Unless permitted by 17.1.6.2 or 17.1.6.3, the components of hanger assemblies that directly attach to the pipe, building structure, or racking structure shall be listed.

17.1.6.2\*

Mild steel hanger rods and hangers formed from mild steel rods shall be permitted to be not listed.

17.1.6.3\*

Fasteners as specified in 17.2.2, 17.2.3, and 17.2.4 shall be permitted to be not listed.

17.1.6.4

Other fasteners shall be permitted as part of a hanger assembly that has been tested, listed, and installed in accordance with the listing requirements.

17.1.7 Component Material

17.1.7.1

Unless permitted by 17.1.7.2 or 17.1.7.3, hangers and their components shall be ferrous metal.

17.1.7.2

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 acceptable.

17.1.7.3

Holes through solid structural members shall be permitted to serve as hangers for the support of system piping, provided such holes are permitted by applicable building codes and the spacing and support provisions for hangers of this standard are satisfied.

17.2 Hanger Components

17.2.1 Hanger Rods

17.2.1.1

Unless the requirements of 17.2.1.2 are met, hanger rod size shall be the same as that approved for use with the hanger assembly, and the size of rods shall not be less than that given in Table 17.2.1.1.

Table 17.2.1.1 Hanger Rod Sizes

Pipe Size Diameter of Rod

in. mm in. mm

Up to and including 4 100 3/8 10

5 125 1/2 13

6 150

8 200

10 250 5/8 16

12 300 3/4 20

17.2.1.2

Rods of smaller diameters than indicated in Table 17.2.1.1 shall be permitted where the hanger assembly has been tested and listed by a testing laboratory and installed within the limits of pipe sizes expressed in individual listings.

17.2.1.3

Where the pitch of the branch line is 6 in 12 or greater, a reduction in the lateral loading on branch line hanger rods shall be done by one of the following:

\* Second hanger installed in addition to the required main hangers

Lateral sway brace assemblies on the mains

Branch line hangers utilizing an articulating structural attachment

Equivalent means providing support to the branch line hanger rods

17.2.1.4 U-Hooks

The size of the rod material of U-hooks shall not be less than that given in Table 17.2.1.4.

Table 17.2.1.4 U-Hook Rod Sizes

Pipe Size Hook Material Diameter

in. mm in. mm

Up to and including 2 50 5/16 8

21/2 to 6 65 to 150 3/8 10

8 200 1/2 13

17.2.1.5 Eye Rods

17.2.1.5.1

The size of the rod material for eye rods shall not be less than specified in Table 17.2.1.5.1.

Table 17.2.1.5.1 Eye Rod Sizes

Pipe Size Diameter of Rod

With Bent Eye With Welded Eye

in. mm in. mm in. mm

Up to and including 4 100 3/8 10 3/8 10

5 125 1/2 13 1/2 13

6 150 1/2 13 1/2 13

8 200 3/4 20 1/2 13

17.2.1.5.2

Eye rods shall be secured with lock washers to prevent lateral motion.

17.2.1.5.3

Where eye rods are fastened to wood structural members, the eye rod shall be backed with a large flat washer bearing directly against the structural member, in addition to the lock washer.

17.2.1.6 Threaded Sections of Rods

Threaded sections of rods shall not be formed or bent.

17.2.2\* Fasteners in Concrete

17.2.2.1

Unless prohibited by 17.2.2.2 or 17.2.2.3, the use of listed inserts set in concrete and listed post-installed anchors to support hangers shall be permitted for mains and branch lines.

17.2.2.2

Post-installed anchors shall not be used in cinder concrete, except for branch lines where the post-installed anchors are alternated with through-bolts or hangers attached to beams.

17.2.2.3

Post-installed anchors shall not be used in ceilings of gypsum or other similar soft material.

17.2.2.4

Unless the requirements of 17.2.2.5 are met, post-installed anchors shall be installed in a horizontal position in the sides of concrete beams.

17.2.2.5

Post-installed anchors shall be permitted to be installed in the vertical position under any of the following conditions:

When used in concrete having gravel or crushed stone aggregate to support pipes 4 in. (100 mm) or less in diameter

When post-installed anchors are alternated with hangers connected directly to the structural members, such as trusses and girders, or to the sides of concrete beams [to support pipe 5 in. (125 mm) or larger]

When post-installed anchors are spaced not over 10 ft (3 m) apart [to support pipe 4 in. (100 mm) or larger]

17.2.2.6

Holes for post-installed anchors in the side of beams shall be above the centerline of the beam or above the bottom reinforcement steel rods.

17.2.2.7

Holes for post-installed anchors used in the vertical position shall be drilled to provide uniform contact with the shield over its entire circumference.

17.2.2.8

The depth of the post-installed anchor hole shall not be less than specified for the type of shield used.

17.2.2.9 Powder-Driven Studs

17.2.2.9.1

Powder-driven studs, welding studs, and the tools used for installing these devices shall be listed.

17.2.2.9.2

Pipe size, installation position, and construction material into which they are installed shall be in accordance with individual listings.

17.2.2.9.3\*

Representative samples of concrete into which studs are to be driven shall be tested to determine that the studs will hold a minimum load of 750 lb (340 kg) for 2 in. (50 mm) or smaller pipe; 1000 lb (454 kg) for 21/2 in., 3 in., or 31/2 in. (65 mm, 80 mm, or 90 mm) pipe; and 1200 lb (544 kg) for 4 in. or 5 in. (100 mm or 125 mm) pipe.

17.2.2.9.4

Increaser couplings shall be attached directly to the powder-driven studs.

17.2.2.10 Minimum Bolt or Rod Size for Concrete

17.2.2.10.1

The size of a bolt or rod used with a hanger and installed through concrete shall not be less than specified in Table 17.2.2.10.1.

Table 17.2.2.10.1 Minimum Bolt or Rod Size for Concrete

Pipe Size Size of Bolt or Rod

in. mm in. mm

Up to and including 4 100 3/8 10

5 125 1/2 13

6 150

8 200

10 250 5/8 16

12 300 3/4 20

17.2.2.10.2

Holes for bolts or rods shall not exceed 1/16 in. (1.6 mm) greater than the diameter of the bolt or rod.

17.2.2.10.3

Bolts and rods shall be provided with flat washers and nuts.

17.2.3 Fasteners in Steel

17.2.3.1\*

Powder-driven studs, welding studs, and the tools used for installing these devices shall be listed.

17.2.3.2

Pipe size, installation position, and construction material into which they are installed shall be in accordance with individual listings.

17.2.3.3

Increaser couplings shall be attached directly to the powder-driven studs or welding studs.

17.2.3.4

Welding studs or other hanger parts shall not be attached by welding to steel less than U.S. Standard, 12 gauge (2.8 mm).

17.2.3.5 Minimum Bolt or Rod Size for Steel

17.2.3.5.1

The size of a bolt or rod used with a hanger and installed through steel shall not be less than specified in Table 17.2.3.5.1.

Table 17.2.3.5.1 Minimum Bolt or Rod Size for Steel

Pipe Size Size of Bolt or Rod

in. mm in. mm

Up to and including 4 100 3/8 10

5 125 1/2 13

6 150

8 200

10 250 5/8 15

12 300 3/4 20

17.2.3.5.2

Holes for bolts or rods shall not exceed 1/16 in. (1.6 mm) greater than the diameter of the bolt or rod.

17.2.3.5.3

Bolts and rods shall be provided with flat washers and nuts.

17.2.4 Fasteners in Wood

17.2.4.1 Drive Screws

17.2.4.1.1

Drive screws shall be used only in a horizontal position as in the side of a beam and only for 2 in. (50 mm) or smaller pipe.

17.2.4.1.2

Drive screws shall only be used in conjunction with hangers that require two points of attachments.

17.2.4.2 Ceiling Flanges and U-Hooks With Screws

17.2.4.2.1

Unless the requirements of 17.2.4.2.2 or 17.2.4.2.3 are met, for ceiling flanges and U-hooks, screw dimensions shall not be less than those given in Table 17.2.4.2.1.

Table 17.2.4.2.1 Screw Dimensions for Ceiling Flanges and U-Hooks

Pipe Size Two Screw Ceiling Flanges

in. mm

Up to and including 2 50 Wood screw No. 18 × 11/2 in.

or

Lag screw 5/16 in. × 11/2 in.

(8 mm × 40 mm)

Three Screw Ceiling Flanges

Up to and including 2 50 Wood screw No. 18 × 11/2 in.

21/2 65 Lag screw 3/8 in. × 2 in.

(10 mm × 50 mm)

3 80

31/2 90

4 100 Lag screw 1/2 in. × 2 in.

(13 mm × 50 mm)

5 125

6 150

8 200 Lag screw 5/8 in. × 2 in.

(16 mm × 50 mm)

Four Screw Ceiling Flanges

Up to and including 2 50 Wood screw No. 18 × 11/2 in.

21/2 65 Lag screw 3/8 in. × 11/2 in.

(10 mm × 40 mm)

3 80

31/2 90

4 100 Lag screw 1/2 in. × 2 in.

(13 mm × 50 mm)

5 125

6 150

8 200 Lag screw 5/8 in. × 2 in.

(16 mm × 50 mm)

U-Hooks

Up to and including 2 50 Drive screw No. 16 × 2 in.

21/2 65 Lag screw 3/8 in. × 21/2 in.

(10 mm × 65 mm)

3 80

31/2 90

4 100 Lag screw 14 in. × 3 in.

(13 mm × 75 mm)

5 125

6 150

8 200 Lag screw 5/8 in. × 3 in.

(16 mm × 75 mm)

17.2.4.2.2

When the thickness of planking and thickness of flange do not permit the use of screws 2 in. (50 mm) long, screws 13/4 in. (45 mm) long shall be permitted with hangers spaced not over 10 ft (3 m) apart.

17.2.4.2.3

When the thickness of beams or joists does not permit the use of screws 21/2 in. (65 mm) long, screws 2 in. (50 mm) long shall be permitted with hangers spaced not over 10 ft (3 m) apart.

17.2.4.3 Bolts, Rods, or Lag Screws

17.2.4.3.1

Unless the requirements of 17.2.4.3.2 are met, the size of bolt, rod, or lag screw used with a hanger and installed on the side of the beam shall not be less than specified in Table 17.2.4.3.1.

Table 17.2.4.3.1 Minimum Bolt, Rod, or Lag Screw Sizes for Side of Beam Installation

Pipe Size Size of Bolt, Rod or Lag Screw Length of Lag Screw Used with Wood Beams

in. mm in. mm in. mm

Up to and including 2 50 3/8 10 21/2 65

21/2 to 6 (inclusive) 65 to 150 1/2 13 3 75

8 200 5/8 16 3 75

17.2.4.3.2

Where the thickness of beams or joists does not permit the use of screws 21/2 in. (65 mm) long, screws 2 in. (50 mm) long shall be permitted with hangers spaced not over 10 ft (3 m) apart.

17.2.4.3.3

All holes for lag screws shall be pre-drilled 1/8 in. (3 mm) less in diameter than the maximum root diameter of the lag screw thread.

17.2.4.3.4

Holes for bolts or rods shall not exceed 1/16 in. (1.6 mm) greater than the diameter of the bolt or rod.

17.2.4.3.5

Bolts and rods shall be provided with flat washers and nuts.

17.2.4.4 Wood Screws

Wood screws shall be installed with a screwdriver.

17.2.4.5 Nails

Nails shall not be acceptable for fastening hangers.

17.2.4.6 Screws in Side of Timber or Joists

17.2.4.6.1

Screws in the side of a timber or joist shall be not less than 21/2 in. (65 mm) from the lower edge where supporting pipe is up to and including nominal 21/2 in. (65 mm) and not less than 3 in. (75 mm) where supporting pipe is greater than nominal 21/2 in. (65 mm).

17.2.4.6.2

The requirements of 17.2.4.6.1 shall not apply to 2 in. (50 mm) or thicker nailing strips resting on top of steel beams.

17.2.4.7 Coach Screw Rods

17.2.4.7.1 Minimum Coach Screw Rod Size

The size of coach screw rods shall not be less than the requirements of Table 17.2.4.7.1.

Table 17.2.4.7.1 Minimum Coach Screw Rod Size

Pipe Size Diameter of Rod Minimum Penetration

in. mm in. mm in. mm

Up to and including 4 100 3/8 10 3 75

Larger than 4 100 NP NP NP NP

NP: Not permitted.

17.2.4.7.2

The minimum plank thickness and the minimum width of the lower face of beams or joists in which coach screw rods are used shall be not less than that specified in Table 17.2.4.7.2 and shown in Figure 17.2.4.7.2.

FIGURE 17.2.4.7.2 Dimensions for Structural Members with Coach Screw Rods.

Table 17.2.4.7.2 Minimum Plank Thicknesses and Beam or Joist Widths

Pipe Size Nominal Plank Thickness Nominal Width of Beam or Joist Face

in. mm in. mm in. mm

Up to and including 2 50 3 75 2 50

21/2 65 4 100 2 50

3 80 4 100 3 75

31/2 90

4 100

17.2.4.7.3

Coach screw rods shall not be used for support of pipes larger than 4 in. (100 mm) in diameter.

17.2.4.7.4

All holes for coach screw rods shall be predrilled 1/8 in. (3 mm) less in diameter than the maximum root diameter of the wood screw thread.

17.3\* Trapeze Hangers

17.3.1

For trapeze hangers, the minimum size of steel angle or pipe span between structural members shall be such that the section modulus required in Table 17.3.1(a) does not exceed the available section modulus of the trapeze member from Table 17.3.1(b) or Table 17.3.1(c).

Table 17.3.1(a) Section Modulus Required for Trapeze Members (in.3)

Nominal Diameter of Pipe Being Supported — Schedule 10 Steel

Span (ft) 1 1.25 1.5 2 2.5 3 3.5 4 5 6 8 10

1.5 0.08 0.08 0.09 0.09 0.10 0.11 0.12 0.13 0.15 0.18 0.26 0.34

2.0 0.11 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.20 0.24 0.34 0.45

2.5 0.14 0.14 0.15 0.16 0.18 0.21 0.23 0.25 0.30 0.36 0.50 0.69

3.0 0.16 0.17 0.18 0.19 0.20 0.22 0.24 0.26 0.31 0.36 0.51 0.67

3.5 0.19 0.20 0.21 0.22 0.24 0.26 0.28 0.30 0.36 0.42 0.60 0.78

4.0 0.22 0.22 0.24 0.25 0.27 0.30 0.32 0.34 0.41 0.48 0.68 0.89

4.5 0.24 0.25 0.27 0.28 0.30 0.33 0.36 0.38 0.46 0.54 0.77 1.01

5.0 0.27 0.28 0.30 0.31 0.34 0.37 0.40 0.43 0.51 0.60 0.85 1.12

5.5 0.30 0.31 0.33 0.34 0.37 0.41 0.44 0.47 0.56 0.66 0.94 1.23

6.0 0.33 0.34 0.35 0.38 0.41 0.44 0.48 0.51 0.61 0.71 1.02 1.34

6.5 0.35 0.36 0.38 0.41 0.44 0.48 0.52 0.56 0.66 0.77 1.11 1.45

7.0 0.38 0.39 0.41 0.44 0.47 0.52 0.56 0.60 0.71 0.83 1.19 1.56

7.5 0.41 0.42 0.44 0.47 0.51 0.55 0.60 0.64 0.76 0.89 1.28 1.68

8.0 0.43 0.45 0.47 0.50 0.54 0.59 0.63 0.68 0.82 0.95 1.36 1.79

8.5 0.46 0.48 0.50 0.53 0.58 0.63 0.67 0.73 0.87 1.01 1.45 1.90

9.0 0.49 0.50 0.53 0.56 0.61 0.66 0.71 0.77 0.92 1.07 1.53 2.01

9.5 0.52 0.53 0.56 0.60 0.64 0.70 0.75 0.81 0.97 1.13 1.62 2.12

10.0 0.54 0.56 0.59 0.63 0.68 0.74 0.79 0.85 1.02 1.19 1.70 2.23

10.5 0.57 0.59 0.62 0.66 0.71 0.78 0.83 0.90 1.07 1.25 1.79 2.35

11.0 0.60 0.62 0.65 0.69 0.74 0.81 0.87 0.94 1.12 1.31 1.87 2.46

11.5 0.63 0.64 0.68 0.72 0.78 0.85 0.91 0.98 1.17 1.37 1.96 2.57

12.0 0.65 0.67 0.71 0.75 0.81 0.89 0.95 1.02 1.22 1.43 2.04 2.68

12.5 0.68 0.70 0.74 0.78 0.85 0.92 0.99 1.07 1.27 1.49 2.13 2.79

13.0 0.71 0.73 0.77 0.81 0.88 0.96 1.03 1.11 1.33 1.55 2.21 2.90

13.5 0.73 0.76 0.80 0.85 0.91 1.00 1.07 1.15 1.38 1.61 2.30 3.02

14.0 0.76 0.78 0.83 0.88 0.95 1.03 1.11 1.20 1.43 1.67 2.38 3.13

14.5 0.79 0.81 0.86 0.91 0.98 1.07 1.15 1.24 1.48 1.73 2.47 3.24

15.0 0.82 0.84 0.89 0.94 1.02 1.11 1.19 1.28 1.53 1.79 2.56 3.35

15.5 0.84 0.87 0.92 0.97 1.05 1.14 1.23 1.32 1.58 1.85 2.64 3.46

16.0 0.87 0.90 0.95 1.00 1.08 1.18 1.27 1.37 1.63 1.91 2.73 3.58

Nominal Diameter of Pipe Being Supported — Schedule 40 Steel

Span (ft) 1 1.25 1.5 2 2.5 3 3.5 4 5 6 8 10

1.5 0.08 0.09 0.09 0.1 0.11 0.12 0.14 0.15 0.18 0.22 0.30 0.41

2.0 0.11 0.11 0.12 0.13 0.15 0.16 0.18 0.20 0.24 0.29 0.40 0.55

2.5 0.14 0.14 0.15 0.16 0.17 0.18 0.20 0.21 0.25 0.30 0.43 0.56

3.0 0.16 0.17 0.18 0.20 0.22 0.25 0.27 0.30 0.36 0.43 0.60 0.82

3.5 0.19 0.20 0.21 0.23 0.26 0.29 0.32 0.35 0.42 0.51 0.70 0.96

4.0 0.22 0.23 0.24 0.26 0.29 0.33 0.36 0.40 0.48 0.58 0.80 1.10

4.5 0.25 0.26 0.27 0.29 0.33 0.37 0.41 0.45 0.54 0.65 0.90 1.23

5.0 0.27 0.29 0.30 0.33 0.37 0.41 0.45 0.49 0.60 0.72 1.00 1.37

5.5 0.30 0.31 0.33 0.36 0.40 0.45 0.50 0.54 0.66 0.79 1.10 1.51

6.0 0.33 0.34 0.36 0.39 0.44 0.49 0.54 0.59 0.72 0.87 1.20 1.64

6.5 0.36 0.37 0.40 0.42 0.48 0.54 0.59 0.64 0.78 0.94 1.31 1.78

7.0 0.38 0.40 0.43 0.46 0.52 0.58 0.63 0.69 0.84 1.01 1.41 1.92

7.5 0.41 0.43 0.46 0.49 0.55 0.62 0.68 0.74 0.90 1.08 1.51 2.06

8.0 0.44 0.46 0.49 0.52 0.59 0.66 0.72 0.79 0.96 1.16 1.61 2.19

8.5 0.47 0.48 0.52 0.56 0.63 0.70 0.77 0.84 1.02 1.23 1.71 2.33

9.0 0.49 0.51 0.55 0.59 0.66 0.74 0.81 0.89 1.08 1.30 1.81 2.47

9.5 0.52 0.54 0.58 0.62 0.70 0.78 0.86 0.94 1.14 1.37 1.91 2.60

10.0 0.55 0.57 0.61 0.65 0.74 0.82 0.90 0.99 1.20 1.45 2.01 2.74

10.5 0.58 0.60 0.64 0.69 0.77 0.86 0.95 1.04 1.26 1.52 2.11 2.88

11.0 0.60 0.63 0.67 0.72 0.81 0.91 0.99 1.09 1.32 1.59 2.21 3.01

11.5 0.63 0.66 0.70 0.75 0.85 0.95 1.04 1.14 1.38 1.66 2.31 3.15

12.0 0.66 0.68 0.73 0.78 0.88 0.99 1.08 1.19 1.44 1.73 2.41 3.29

12.5 0.69 0.71 0.76 0.82 0.92 1.03 1.13 1.24 1.5 1.81 2.51 3.43

13.0 0.71 0.74 0.79 0.85 0.96 1.07 1.17 1.29 1.56 1.88 2.61 3.56

13.5 0.74 0.77 0.82 0.88 0.99 1.11 1.22 1.34 1.62 1.95 2.71 3.70

14.0 0.77 0.80 0.85 0.91 1.03 1.15 1.26 1.39 1.68 2.02 2.81 3.84

14.5 0.80 0.83 0.88 0.95 1.07 1.19 1.31 1.43 1.74 2.1 2.91 3.97

15.0 0.82 0.86 0.91 0.98 1.10 1.24 1.35 1.48 1.8 2.17 3.01 4.11

15.5 0.85 0.88 0.94 1.01 1.14 1.28 1.4 1.53 1.86 2.24 3.11 4.25

16.0 0.88 0.91 0.97 1.05 1.18 1.32 1.44 1.58 1.92 2.31 3.21 4.39

For SI units, 1 in. = 25.4 mm; 1 ft = 0.3048 m.

Note: The table is based on a maximum bending stress of 15 ksi (103.4 MPa) and a midspan concentrated load from 15 ft (4.6 m) of water-filled pipe, plus 250 lb (114 kg).

Table 17.3.1(b) Available Section Modulus of Common Trapeze Hangers (in.3)

Pipe Modulus (in.3) Angles (in.) Modulus (in.3)

in. mm

Schedule 10

1 25 0.12 11/2 × 11/2 × 3/16 0.10

11/4 32 0.19 2 × 2 × 1/8 0.13

11/2 40 0.26 2 × 11/2 × 3/16 0.18

2 50 0.42 2 × 2 × 3/16 0.19

21/2 65 0.69 2 × 2 × 1/4 0.25

3 80 1.04 21/2 × 11/2 × 3/16 0.28

31/2 90 1.38 21/2 × 2 × 3/16 0.29

4 100 1.76 2 × 2 × 5/16 0.30

5 125 3.03 21/2 × 21/2 × 3/16 0.30

6 150 4.35 2 × 2 × 3/8 0.35

21/2 × 21/2 × 1/4 0.39

3 × 2 × 3/16 0.41

Schedule 40

1 25 0.13 3 × 21/2 × 3/16 0.43

11/4 32 0.23 3 × 3 × 3/16 0.44

11/2 40 0.33 21/2 × 21/2 5/16 0.48

2 50 0.56 3 × 2 × 1/4 0.54

21/2 65 1.06 21/2 × 2 × 3/8 0.55

3 80 1.72 21/2 × 21/2 × 3/8 0.57

31/2 90 2.39 3 × 3 × 1/4 0.58

4 100 3.21 3 × 3 × 5/16 0.71

5 125 5.45 21/2 × 21/2 × 1/2 0.72

6 150 8.50 31/2 × 21/2 × 1/4 0.75

3 × 21/2 × 3/8 0.81

3 × 3 × 3/8 0.83

31/2 × 21/2 × 5/16 0.93

3 × 3 × 7/16 0.95

4 × 4 × 1/4 1.05

3 × 3 × 1/2 1.07

4 × 3 × 5/16 1.23

4 × 4 × 5/16 1.29

4 × 3 × 3/8 1.46

4 × 4 × 3/8 1.52

5 × 31/2 × 5/16 1.94

4 × 4 × 1/2 1.97

4 × 4 × 5/8 2.40

4 × 4 × 3/4 2.81

6 × 4 × 3/8 3.32

6 × 4 × 1/2 4.33

6 × 4 × 3/4 6.25

6 × 6 × 1 8.57

Table 17.3.1(c) Available Section Modulus of Common Trapeze Hangers (cm3)

Pipe Modulus (cm3) Angles (mm) Modulus (cm3)

in. mm

Schedule 10

1 25 1.97 40 × 40 × 5 1.64

11/4 32 3.11 50 × 50 × 3 2.13

11/2 40 4.26 50 × 40 × 5 2.95

2 50 6.88 50 × 50 × 5 3.11

21/2 65 11.3 50 × 50 × 6 4.10

3 80 17.0 65 × 40 × 5 4.59

31/2 90 22.6 65 × 50 × 5 4.75

4 100 28.8 50 × 50 × 8 4.92

5 125 49.7 65 × 65 × 5 4.92

6 150 71.3 50 × 50 × 10 5.74

65 × 65 × 6 6.39

80 × 50 × 5 6.72

Schedule 40

1 25 2.1 80 × 65 × 10 7.05

11/4 32 3.8 3 × 3 × 3/16 7.21

11/2 40 5.4 65 × 65 × 8 7.87

2 50 9.2 3 × 2 × 1/4 8.85

21/2 65 17.4 65 × 50 × 10 9.01

3 80 28.2 65 × 65 × 10 9.34

31/2 90 39.2 80 × 80 × 6 9.50

4 100 52.6 80 × 80 × 8 11.6

5 125 89.3 65 × 65 × 15 11.8

6 150 139.3 90 × 65 × 6 12.3

80 × 65 × 10 13.3

80 × 80 × 10 13.6

90 × 65 × 8 15.2

80 × 80 × 11 15.6

100 × 100 × 6 17.2

80 × 80 × 15 17.5

100 × 80 × 8 20.2

100 × 100 × 8 21.1

100 × 80 × 10 23.9

100 × 100 × 10 24.9

125 × 90 × 8 31.8

100 × 100 × 16 32.3

100 × 100 × 8 39.3

100 × 100 × 20 46.0

150 × 100 × 10 54.4

150 × 100 × 15 71.0

150 × 100 × 20 102

150 × 150 × 25 140

17.3.2

Any other sizes or shapes giving equal or greater section modulus shall be acceptable.

17.3.3

All angles shall be installed with the longer leg vertical.

17.3.4

The trapeze member shall be secured to prevent slippage.

17.3.5\*

All components of each hanger assembly that attach to a trapeze member shall conform to 17.1.6 and be sized to support the suspended sprinkler pipe.

17.3.6

The ring, strap, or clevis installed on a pipe trapeze shall be manufactured to fit the pipe size of the trapeze member.

17.3.7

Holes for bolts or rods shall not exceed 1/16 in. (1.6 mm) greater than the diameter of the bolt or rod.

17.3.8

Bolts and rods shall be provided with flat washers and nuts.

17.3.9

Where angles are used for trapeze hangers and slotted holes are used, the slotted holes shall meet all of the following:

The length of each slotted hole shall not exceed 3 in. (75 mm).

The width of the slotted hole shall not exceed 1/16 in. (1.6 mm) greater than the bolt or rod diameter.

The minimum distance between slotted holes shall be 3 in. (75 mm) edge to edge.

The minimum distance from the end of the angle to the edge of the slotted hole shall be 3 in. (75 mm).

The number of slots shall be limited to three per section of angle.

The washer(s) required by 17.3.8 shall have a minimum thickness of one-half the thickness of the angle.

Washers and nuts required by 17.3.8 shall be provided on both the top and bottom of the angle.

17.4\* Installation of Pipe Hangers

17.4.1 General

17.4.1.1 Ceiling Sheathing

17.4.1.1.1\*

Unless the requirements of 17.4.1.1.2 are met, sprinkler piping shall be supported independently of the ceiling sheathing.

17.4.1.1.2

Toggle hangers shall be permitted only for the support of pipe 11/2 in. (40 mm) or smaller in size under ceilings of hollow tile or metal lath and plaster.

17.4.1.2 Storage Racks

Where sprinkler piping is installed in storage racks, piping shall be supported from the storage rack structure or building in accordance with all applicable provisions of Section 17.4 and Chapter 18.

17.4.1.3\* Building Structure

17.4.1.3.1

Sprinkler piping shall be substantially supported from the building structure, which must support the added load of the water-filled pipe plus 250 lb (115 kg) applied at the point of hanging, except where permitted by 17.4.1.1.2, 17.4.1.3.3, and 17.4.1.4.1.

17.4.1.3.2

Trapeze hangers shall be used where necessary to transfer loads to appropriate structural members.

17.4.1.3.3\* Flexible Sprinkler Hose Fittings

17.4.1.3.3.1

Listed flexible sprinkler hose fittings and their anchoring components intended for use in installations connecting the sprinkler system piping to sprinklers shall be installed in accordance with the requirements of the listing, including any installation instructions.

17.4.1.3.3.2

When installed and supported by suspended ceilings, the ceiling shall meet ASTM C635/C635M, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings, and shall be installed in accordance with ASTM C636/C636M, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

17.4.1.3.3.3\*

Where flexible sprinkler hose fittings exceed 6 ft (1.8 m) in length and are supported by a suspended ceiling in accordance with 17.4.1.3.3.2, a hanger(s) attached to the structure shall be required to ensure that the maximum unsupported length does not exceed 6 ft (1.8 m).

17.4.1.3.3.4\*

Where flexible sprinkler hose fittings are used to connect sprinklers to branch lines in suspended ceilings, a label limiting relocation of the sprinkler shall be provided on the anchoring component.

17.4.1.4 Metal Deck

17.4.1.4.1\*

Branch line hangers attached to metal deck shall be permitted only for the support of pipe 1 in. (25 mm) or smaller in size, by drilling or punching the vertical portion of the metal deck and using through bolts.

17.4.1.4.2

The distance from the bottom of the bolt hole to the bottom of the vertical member shall be not less than 3/8 in. (10 mm).

17.4.1.5

Where sprinkler 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 and the load specified in 17.4.1.3.1.

17.4.2\* Maximum Distance Between Hangers

17.4.2.1

The maximum distance between hangers shall not exceed that specified in Table 17.4.2.1(a) or Table 17.4.2.1(b), except where the provisions of 17.4.4 apply.

Table 17.4.2.1(a) Maximum Distance Between Hangers (ft-in.)

Nominal Pipe Size (in.)

3/4 1 11/4 11/2 2 21/2 3 31/2 4 5 6 8

Steel pipe except threaded lightwall

NA 12-0 12-0 15-0 15-0 15-0 15-0 15-0 15-0 15-0 15-0 15-0

Threaded lightwall steel pipe

NA 12-0 12-0 12-0 12-0 12-0 12-0 NA NA NA NA NA

Copper tube

8-0 8-0 10-0 10-0 12-0 12-0 12-0 15-0 15-0 15-0 15-0 15-0

CPVC

5-6 6-0 6-6 7-0 8-0 9-0 10-0 NA NA NA NA NA

Ductile-iron pipe

NA NA NA NA NA NA 15-0 NA 15-0 NA 15-0 15-0

NA: Not applicable.

Table 17.4.2.1(b) Maximum Distance Between Hangers (m)

Nominal Pipe Size (mm.)

20 25 32 40 50 65 80 90 100 125 150 200

Steel pipe except threaded lightwall

NA 3.7 3.7 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6

Threaded lightwall steel pipe

NA 3.7 3.7 3.7 3.7 3.7 3.7 NA NA NA NA NA

Copper tube

2.4 2.4 3.0 3.0 3.7 3.7 3.7 4.6 4.6 4.6 4.6 4.6

CPVC

1.7 1.8 2.0 2.1 2.4 2.7 3.0 NA NA NA NA NA

Ductile-iron pipe

NA NA NA NA NA NA 4.6 NA 4.6 NA 4.6 4.6

NA: Not applicable.

17.4.2.2

The maximum distance between hangers for listed nonmetallic pipe shall be modified as specified in the individual product listings.

17.4.3 Location of Hangers on Branch Lines

17.4.3.1

Subsection 17.4.3 shall apply to the support of steel pipe or copper tube as specified in 7.3.1 and subject to the provisions of 17.4.2.

17.4.3.2\* Minimum Number of Hangers

17.4.3.2.1

Unless the requirements of 17.4.3.2.2 through 17.4.3.2.5 are met, there shall be not less than one hanger for each section of pipe.

17.4.3.2.2\*

Unless the requirements of 17.4.3.2.3 are met, where sprinklers are spaced less than 6 ft (1.8 m) apart, hangers spaced up to a maximum of 12 ft (3.7 m) shall be permitted.

17.4.3.2.3

For welded or mechanical outlets on a continuous section of pipe, hanger spacing shall be according to Table 17.4.2.1(a) or Table 17.4.2.1(b).

17.4.3.2.4\*

Starter lengths less than 6 ft (1.8 m) shall not require a hanger, unless on the end line of a sidefeed system or where an intermediate cross main hanger has been omitted.

17.4.3.2.5\*

A single section of pipe shall not require a hanger when the cumulative distance between hangers on the branch line does not exceed the spacing required by Table 17.4.2.1(a) and Table 17.4.2.1(b).

17.4.3.3 Clearance to Hangers

The distance between a hanger and the centerline of an upright sprinkler shall not be less than 3 in. (75 mm).

17.4.3.4\* Unsupported Lengths

17.4.3.4.1

For steel pipe, the unsupported horizontal length between the end sprinkler and the last hanger on the line shall not be greater than 36 in. (900 mm) for 1 in. (25 mm) pipe, 48 in. (1.2 m) for 11/4 in. (32 mm) pipe, and 60 in. (1500 m) for 11/2 in. (40 mm) or larger pipe.

17.4.3.4.2

For copper tube, the unsupported horizontal length between the end sprinkler and the last hanger on the line shall not be greater than 18 in. (450 mm) for 1 in. (25 mm) pipe, 24 in. (600 mm) for 11/4 in. (32 mm) pipe, and 30 in. (750 mm) for 11/2 in. (40 mm) or larger pipe.

17.4.3.4.3

Where the limits of 17.4.3.4.1 and 17.4.3.4.2 are exceeded, the pipe shall be extended beyond the end sprinkler and shall be supported by an additional hanger.

17.4.3.4.4\* Unsupported Length With Maximum Pressure Exceeding 100 psi (6.9 Bar) and Branch Line Above Ceiling Supplying Sprinklers in Pendent Position Below Ceiling

17.4.3.4.4.1

Where the maximum static or flowing pressure, whichever is greater at the sprinkler, applied other than through the fire department connection, exceeds 100 psi (6.9 bar) and a branch line above a ceiling supplies sprinklers in a pendent position below the ceiling, the hanger assembly supporting the pipe supplying an end sprinkler in a pendent position shall be of a type that restrains upward movement of the pipe.

17.4.3.4.4.2

The unsupported length between the end sprinkler in a pendent position or drop nipple and the last hanger on the branch line shall not be greater than 12 in. (300 mm) for steel pipe or 6 in. (150 mm) for copper pipe.

17.4.3.4.4.3

When the limit of 17.4.3.4.4.2 is exceeded, the pipe shall be extended beyond the end sprinkler and supported by an additional hanger.

17.4.3.4.4.4

Unless flexible hose fittings in accordance with 17.4.1.3.3.1 and ceilings in accordance with 17.4.1.3.3.2 are used, the hanger closest to the sprinkler shall be of a type that restrains the pipe from upward movement.

17.4.3.5\* Unsupported Armover Length

17.4.3.5.1

The cumulative horizontal length of an unsupported armover to a sprinkler, sprinkler drop, or sprig shall not exceed 24 in. (600 mm) for steel pipe or 12 in. (300 mm) for copper tube.

17.4.3.5.2\* Unsupported Armover Length With Maximum Pressure Exceeding 100 psi (6.9 Bar) and Branch Line Above Ceiling Supplying Sprinklers in Pendent Position Below Ceiling

17.4.3.5.2.1

Where the maximum static or flowing pressure, whichever is greater at the sprinkler, applied other than through the fire department connection, exceeds 100 psi (6.9 bar) and a branch line above a ceiling supplies sprinklers in a pendent position below the ceiling, the cumulative horizontal length of an unsupported armover to a sprinkler or sprinkler drop shall not exceed 12 in. (300 mm) for steel pipe and 6 in. (150 mm) for copper tube.

17.4.3.5.2.2

Unless flexible sprinkler hose fittings in accordance with 17.4.1.3.3.1 are used, the hanger closest to the sprinkler shall be of a type that restrains upward movement of the pipe.

17.4.3.5.2.3

Where the armover exceeds the maximum unsupported length of 17.4.3.5.2.1, a hanger shall be installed so that the distance from the end sprinkler or drop nipple to the hanger is not greater than 12 in. (300 mm) for steel or 6 in. (150 mm) for copper, or the pipe shall be extended beyond the end sprinkler and shall be supported by an additional hanger.

17.4.3.6\*

Wall-mounted sidewall sprinklers shall be restrained to prevent movement.

17.4.3.7 Sprigs

Sprigs 4 ft (1.2 m) or longer shall be restrained against lateral movement.

17.4.4 Location of Hangers on Mains

17.4.4.1

Unless any of the requirements of 17.4.4.2 through 17.4.4.7 are met, hangers for mains shall be in accordance with 17.4.2, between each branch line, or on each section of pipe, whichever is the lesser dimension.

17.4.4.2

For welded or mechanical outlets on a continuous section of pipe, hanger spacing shall be according to Table 17.4.2.1(a) or Table 17.4.2.1(b).

17.4.4.3

For cross mains in steel pipe systems in bays having two branch lines, the intermediate hanger shall be permitted to be omitted, provided that a hanger attached to a purlin is installed on each branch line located as near to the cross main as the location of the purlin permits.

17.4.4.3.1

The remaining branch line hangers shall be installed in accordance with 17.4.3.

17.4.4.4

For cross mains in steel pipe systems only in bays having three branch lines, either side or center feed, one (only) intermediate hanger shall be permitted to be omitted, provided that a hanger attached to a purlin is installed on each branch line located as near to the cross main as the location of the purlin permits.

17.4.4.4.1

The remaining branch line hangers shall be installed in accordance with 17.4.3.

17.4.4.5

For cross mains in steel pipe systems only in bays having four or more branch lines, either side or center feed, two intermediate hangers shall be permitted to be omitted, provided the maximum distance between hangers does not exceed the distances specified in 17.4.2 and a hanger attached to a purlin on each branch line is located as near to the cross main as the purlin permits.

17.4.4.6

The unsupported length of the end of a main shall be no greater than one half the maximum allowable hanger spacing per Table 17.4.2.1(a) and Table 17.4.2.1(b).

17.4.4.7

At the end of the main, intermediate trapeze hangers shall be installed unless the main is extended to the next framing member with a hanger installed at this point, in which event an intermediate hanger shall be permitted to be omitted in accordance with 17.4.4.3, 17.4.4.4, and 17.4.4.5.

17.4.4.8\*

A single section of pipe shall not require a hanger when the cumulative distance between hangers on the main does not exceed the spacing required by Table 17.4.2.1(a) and Table 17.4.2.1(b).

17.4.4.9

The unsupported length of the end of a main shall be no greater than one half the maximum allowable hanger spacing per Table 17.4.2.1(a) and Table 17.4.2.1(b).

17.4.5 Support of Risers

17.4.5.1

Risers shall be supported by riser clamps or by hangers located on the horizontal connections within 24 in. (600 mm) of the centerline of the riser.

17.4.5.2

Riser clamps supporting risers by means of set screws shall not be used.

17.4.5.3\*

Riser clamps anchored to walls using hanger rods in the horizontal position shall not be permitted to vertically support risers.

17.4.5.4 Multistory Buildings

17.4.5.4.1

In multistory buildings, riser supports shall be provided at the lowest level, at each alternate level above, above and below offsets, and at the top of the riser.

17.4.5.4.2\*

Supports above the lowest level shall also restrain the pipe to prevent movement by an upward thrust where flexible fittings are used.

17.4.5.4.3

Where risers are supported from the ground, the ground support shall constitute the first level of riser support.

17.4.5.4.4

Where risers are offset or do not rise from the ground, the first ceiling level above the offset shall constitute the first level of riser support.

17.4.5.5

Distance between supports for risers shall not exceed 25 ft (7.6 m).

17.5\* Pipe Stands

17.5.1 General

17.5.1.1

Where pipe stands are used to support system piping, the requirements of Section 17.5 shall apply unless the requirements of 17.5.1.2 are met.

17.5.1.2

Pipe stands certified by a registered professional engineer to include all of the following shall be an acceptable alternative to the requirements of Section 17.5:

Pipe stands shall be designed to support five times the weight of water-filled pipe plus 250 lb (115 kg) at each point of piping support.

These points of support shall be adequate to support the system.

The spacing between pipe stands shall not exceed the value given for the type of pipe as indicated in Table 17.4.2.1(a) or Table 17.4.2.1(b).

Pipe stand components shall be ferrous.

Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed in the pipe stand, the system piping and fittings, and safety factors allowed.

17.5.1.3

Where water-based fire protection systems are required to be protected against damage from earthquakes, pipe stands shall also meet the requirements of Section 18.8.

17.5.2 Component Material

17.5.2.1

Pipe stands and their components shall be ferrous unless permitted by 17.5.2.2.

17.5.2.2

Nonferrous components that have been proven by fire tests to be adequate for the hazard application and that are in compliance with the other requirements of this section shall be acceptable.

17.5.3 Sizing

17.5.3.1\*

The maximum heights for pipe stands shall be in accordance with Table 17.5.3.1 unless the requirements of 17.5.3.2 are met.

Table 17.5.3.1 Maximum Pipe Stand Heightsa

System Pipe Diameterc Pipe Stand Diameterb

11/2 in. 2 in. 21/2 in. 3 in. 4 in. 6 in.

11/2 in. 6.6 ft 9.4 ft 11.3 ft 13.8 ft 18.0 ft 26.8 ft

2 in. 4.4 ft 9.4 ft 11.3 ft 13.8 ft 18.0 ft 26.8 ft

21/2 in. — 8.1 ft 11.3 ft 13.8 ft 18.0 ft 26.8 ft

3 in. — 5.2 ft 11.3 ft 13.8 ft 18.0 ft 26.8 ft

4 in. up to and including 8 in. — — — — 14.7 ft 26.8 ft

aFor SI units, 1 in. = 25.4 mm; 1 ft = 0.305 m.

bPipe stands are Schedule 40 pipe.

cSystem piping is assumed to be Schedule 40 [8 in. (200 mm) is Schedule 30].

17.5.3.2\*

Pipe diameters up to and including 10 in. (250 mm) Schedule 40 are permitted to be supported by 2 in. (50 mm) diameter pipe stands when all of the following conditions are met:

The maximum height shall be 4 ft (1.2 m), as measured from the base of the pipe stand to the centerline of the pipe being supported.

\* The pipe stand shall be axially loaded.

17.5.3.3

The distance between pipe stands shall not exceed the values in Table 17.4.2.1(a) or Table 17.4.2.1(b).

17.5.4 Pipe Stand Base

17.5.4.1

The pipe stand base shall be secured by an approved method.

17.5.4.2\*

Pipe stand base plates shall be threaded malleable iron flanges or welded steel flanges in accordance with Table 7.4.1.

17.5.4.2.1

Pipes stands installed in accordance with 17.5.3.2 shall be permitted to use a welded steel plate.

17.5.4.3\*

Pipe stands shall be fastened to a concrete floor or footing using listed concrete anchors or other approved means.

17.5.4.4

A minimum of four anchors shall be used to attach the base plate to the floor.

17.5.4.4.1

Pipe stands installed in accordance with 17.5.3.2 shall be permitted to use a minimum of two anchors to attach the base plate to the floor.

17.5.4.5

The minimum diameter for the anchors shall be 1/2 in. (15 mm) for pipe stand diameters up to and including 3 in. (80 mm) and 5/8 in. (16 mm) for pipe stands 4 in. (100 mm) diameter and larger.

17.5.4.5.1

Where the pipe stand complies with 17.5.3.2, 3/8 in. (10 mm) anchors shall be permitted.

17.5.5 Attaching to System Piping

17.5.5.1

Piping shall be attached to the pipe stand with U-bolts or equivalent attachment.

17.5.5.2\*

Where a horizontal bracket is used to attach the system piping to the pipe stand, it shall not be more than 1 ft (0.3 m) as measured horizontally from the centerline of the pipe stand to the centerline of the supported pipe.

17.5.5.3

Horizontal support brackets shall be sized such that the section modulus required in Table 17.5.5.3 does not exceed the available section modulus from Table 17.3.1 (b).

Table 17.5.5.3 Required Section Modulus for Pipe Stand Horizontal Support Arms (in.3)

Nominal Diameter of Pipe Being Supported (in.) 1 11/4 11/2 2 21/2 3 31/2 4 5 6 8

Section Modulus — Schedule 10 Steel 0.22 0.23 0.24 0.25 0.30 0.36 0.42 0.49 0.66 0.85 1.40

Section Modulus — Schedule 40 Steel 0.22 0.24 0.24 0.27 0.36 0.45 0.54 0.63 0.86 1.13 1.64

For SI units, 1 in. = 25.4 mm.

17.5.6.1\*

System piping shall be supported and restrained to restrict movement due to sprinkler/nozzle reaction and water surges.

17.5.6.2\*

Where thrust forces are anticipated to be high, a pipe ring or clamp shall secure the system piping to the pipe stand.

17.5.7 Exterior Applications

17.5.7.1

Where required, pipe stands used in exterior applications shall be made of galvanized steel or other suitable corrosion-resistant materials.

17.5.7.2

A welded, threaded, grooved, or other approved cap shall be securely attached to the top of the pipe stand.