**Chapter 18 Fire Department Access and Water Supply**

18.1 General

Fire department access and water supplies shall comply with this chapter.

18.1.1 Application

18.1.1.1

This chapter shall apply to public and privately owned fire apparatus access roads.

18.1.1.2

This chapter shall apply to public and privately owned fire hydrant systems.

18.1.2 Permits

Permits, where required, shall comply with Section 1.12.

18.1.3 Plans

18.1.3.1 Fire Apparatus Access

Plans for fire apparatus access roads shall be submitted to the AHJ for review and approval prior to construction.

18.1.3.2 Fire Hydrant Systems

Plans and specifications for fire hydrant systems shall be submitted to the AHJ for review and approval prior to construction.

18.2 Fire Department Access

18.2.1

Fire department access and fire apparatus access roads shall be provided and maintained in accordance with Section 18.2.

18.2.2\* Access to Structures or Areas

18.2.2.1 Access Box(es)

The AHJ shall have the authority to require an access box(es) to be installed in an accessible location where access to or within a structure or area is difficult because of security. The access box(es) shall be of an approved type listed in accordance with UL 1037.

18.2.2.2 Access to Gated Subdivisions or Developments

The AHJ shall have the authority to require fire department access be provided to gated subdivisions or developments through the use of an approved device or system.

18.2.2.3 Access Maintenance

The owner or occupant of a structure or area, with required fire department access as specified in 18.2.2.1 or 18.2.2.2, shall notify the AHJ when the access is modified in a manner that could prevent fire department access.

18.2.3 Fire Apparatus Access Roads

18.2.3.1 Required Access

18.2.3.1.1

Approved fire apparatus access roads shall be provided for every facility, building, or portion of a building hereafter constructed or relocated.

18.2.3.1.2

Fire apparatus access roads shall consist of roadways, fire lanes, parking lot lanes, or a combination thereof.

18.2.3.1.3\*

The provisions of 18.2.3.1 through 18.2.3.2.2.1 shall be permitted to be modified by the AHJ where any of the following conditions exists:

One- and two-family dwellings protected by an approved automatic sprinkler system in accordance with Section 13.1

Existing one- and two-family dwellings

Private garages having an area not exceeding 400 ft2 (37 m2)

Carports having an area not exceeding 400 ft2 (37 m2)

Agricultural buildings having an area not exceeding 400 ft2 (37 m2)

Sheds and other detached buildings, not classified as a residential occupancy, having an area not exceeding 400 ft2 (37 m2)

18.2.3.1.4

When fire apparatus access roads cannot be installed due to location on property, topography, waterways, nonnegotiable grades, or other similar conditions, the AHJ shall be authorized to require additional fire protection features.

18.2.3.2 Access to Building

18.2.3.2.1

A fire apparatus access road shall extend to within 50 ft (15 m) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building.

18.2.3.2.1.1

Where a one- or two-family dwelling, or townhouse, is protected with an approved automatic sprinkler system that is installed in accordance with Section 13.3, the distance in 18.2.3.2.1 shall be permitted to be increased to 150 ft (46 m).

18.2.3.2.2

Diagram

Fire apparatus access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 ft (46 m) from fire apparatus access roads as measured by an approved route around the exterior of the building or facility.

UpCodes Diagrams

P

Fire Apparatus Access Roads

18.2.3.2.2.1

Where buildings are protected throughout with an approved automatic sprinkler system that is installed in accordance with NFPA 13, NFPA 13R, or NFPA 13D, the distance in 18.2.3.2.2 shall be permitted to be increased to 450 ft (137 m).

18.2.3.3\* Multiple Access Roads

More than one fire apparatus access road shall be provided when it is determined by the AHJ that access by a single road could be impaired by vehicle congestion, condition of terrain, climate conditions, or other factors that could limit access.

18.2.3.4 Traffic Signal Pre-Emption

Where fire department apparatus are equipped with traffic signal pre-emption devices, newly installed traffic signals shall be equipped with traffic signal pre-emption.

18.2.3.5 Specifications

18.2.3.5.1 Dimensions

18.2.3.5.1.1\*

Fire apparatus access roads shall have an unobstructed width of not less than 20 ft (6.1 m).

18.2.3.5.1.1.1\*

Where approved by the AHJ, the width of fire apparatus access roads shall be permitted to be less than the minimum specified in 18.2.3.5.1.1.

18.2.3.5.1.1.2

The width of fire apparatus access roads shall be increased when the minimum width specified in 18.2.3.5.1.1 is not adequate to accommodate fire apparatus.

18.2.3.5.1.2

Fire apparatus access roads shall have an unobstructed vertical clearance of not less than 13 ft 6 in. (4.1 m).

18.2.3.5.1.2.1

Vertical clearance shall be permitted to be reduced where approved by the AHJ, provided such reduction does not impair access by fire apparatus, and approved signs are installed and maintained indicating the established vertical clearance when approved.

18.2.3.5.1.2.2

Vertical clearances shall be increased when vertical clearances are not adequate to accommodate fire apparatus.

18.2.3.5.2\* Surface

Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with an all-weather driving surface.

18.2.3.5.3 Turning Radius

18.2.3.5.3.1

The turning radius of a fire apparatus access road shall be as approved by the AHJ.

18.2.3.5.3.2

Turns in fire apparatus access roads shall maintain the minimum road width.

18.2.3.5.3.3

Fire apparatus access roads connecting to roadways shall be provided with curb cuts extending at least 2 ft (0.61 m) beyond each edge of the fire apparatus access road.

18.2.3.5.4 Dead Ends

Dead-end fire apparatus access roads in excess of 150 ft (46 m) in length shall be provided with approved provisions for the fire apparatus to turn around.

18.2.3.5.5 Bridges

18.2.3.5.5.1

When a bridge is required to be used as part of a fire apparatus access road, it shall be constructed and maintained in accordance with nationally recognized standards.

18.2.3.5.5.2

The bridge shall be designed for a live load sufficient to carry the imposed loads of fire apparatus.

18.2.3.5.5.3

Vehicle load limits shall be posted at both entrances to bridges where required by the AHJ.

18.2.3.5.6 Grade

18.2.3.5.6.1

The gradient for a fire apparatus access road shall not exceed the design limitations of the fire apparatus of the fire department and shall be subject to approval by the AHJ.

18.2.3.5.6.2\*

The angle of approach and departure for any means of fire apparatus access road shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m) or the design limitations of the fire apparatus of the fire department, and shall be subject to approval by the AHJ.

18.2.3.5.7 Traffic Calming Devices

The design and use of traffic calming devices shall be approved by the AHJ.

18.2.3.6 Marking of Fire Apparatus Access Road

18.2.3.6.1

WTiere required by the AHJ, approved signs, approved roadway surface markings, or other approved notices shall be provided and maintained to identify fire apparatus access roads or to prohibit the obstruction thereof or both.

18.2.3.6.2

A marked fire apparatus access road shall also be known as a fire lane.

18.2.4\* Obstruction and Control of Fire Apparatus Access Road

18.2.4.1 General

18.2.4.1.1

The required width of a fire apparatus access road shall not be obstructed in any manner, including by the parking of vehicles.

18.2.4.1.2

Minimum required widths and clearances established under 18.2.3.5 shall be maintained at all times.

18.2.4.1.3\*

Facilities and structures shall be maintained in a manner that does not impair or impede accessibility for fire department operations.

18.2.4.1.4

Entrances to fire apparatus access roads that have been closed with gates and barriers in accordance with 18.2.4.2.1 shall not be obstructed by parked vehicles.

18.2.4.2 Closure of Accessways

18.2.4.2.1

The AHJ shall be authorized to require the installation and maintenance of gates or other approved barricades across roads, trails, or other accessways not including public streets, alleys, or highways.

18.2.4.2.2

Where required, gates and barricades shall be secured in an approved manner.

18.2.4.2.3

Roads, trails, and other accessways that have been closed and obstructed in the manner prescribed by 18.2.4.2.1 shall not be trespassed upon or used unless authorized by the owner and the AHJ.

18.2.4.2.4

Public officers acting within their scope of duty shall be permitted to access restricted property identified in 18.2.4.2.1.

18.2.4.2.5

Locks, gates, doors, barricades, chains, enclosures, signs, tags, or seals that have been installed by the fire department or by its order or under its control shall not be removed, unlocked, destroyed, tampered with, or otherwise vandalized in any manner.

18.2.4.2.6

Gates shall comply with 18.2.4.2.6.1 and 18.2.4.2.6.2.

18.2.4.2.6.1

Electric gate operators and systems, where provided, shall be installed, maintained, listed, and labeled in accordance with UL 325, Door, Drapery, Gate, Louver, and Window Operators and Systems.

18.2.4.2.6.2

Gates intended for automatic operation shall be designed, constructed, installed, and maintained to comply with ASTM F2200, Standard Specification for Automated Vehicular Gate Construction.

18.2.4.2.7

When authorized by the AHJ, public officers acting within their scope of duty shall be permitted to obtain access through secured means identified in 18.2.4.2.1.

18.3 Water Supplies

18.3.1\*

An approved water supply capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities, buildings, or portions of buildings are hereafter constructed or moved into the jurisdiction. The approved water supply shall be in accordance with Section 18.4.

18.3.1.1\*

Where no adequate or reliable water distribution system exists, approved reservoirs, pressure tanks, elevated tanks, fire department tanker shuttles, or other approved systems capable of providing the required fire flow shall be permitted.

18.4 Fire Flow Requirements for Buildings

18.4.1\* Scope

18.4.1.1\*

The procedure determining fire flow requirements for buildings hereafter constructed or moved into the jurisdiction shall be in accordance with Section 18.4.

18.4.1.2

Section 18.4 shall not apply to structures other than buildings.

18.4.2 Definitions

See definitions 3.3.14.4, Fire Flow Area, and 3.3.128, Fire Flow.

18.4.3 Modifications

18.4.3.1 Decreases in Fire Flow Requirements

18.4.3.1.1\*

Fire flow requirements shall be permitted to be decreased by the AHJ for isolated buildings or a group of buildings in rural areas or suburban areas where the development of full fire flow requirements is impractical as determined by the AHJ.

18.4.3.1.2

The AHJ shall be authorized to establish conditions on fire flow reductions approved in accordance with 18.4.3.1.1 including, but not limited to, fire sprinkler protection, type of construction of the building, occupancy, development density, building size, and setbacks.

18.4.3.2 Increases in Fire Flow Requirements

The minimum required fire flow shall be permitted to be increased by the AHJ where conditions indicate an unusual susceptibility to group fires or conflagrations. An upward modification shall not be more than twice that required for the building under consideration.

18.4.4 Fire Flow Area

18.4.4.1 General

The fire flow area shall be the total floor area of all floor levels of a building except as modified in 18.4.4.2.

18.4.4.2 Type I (443), Type I (332), and Type II (222) Construction

The fire flow area of a building constructed of Type I (443), Type I (332), and Type II (222) construction shall be the area of the three largest successive floors.

18.4.5 Fire Flow Requirements for Buildings

18.4.5.1 One- and Two-Family Dwellings Not Exceeding 5000 ft2 (464.5 m2)

18.4.5.1.1

The minimum fire flow and flow duration requirements for one- and two-family dwellings having a fire flow area that does not exceed 5000 ft2 (464.5 m2) shall be 1000 gpm (3785 L/min) for 1 hour.

18.4.5.1.2\*

A reduction in required fire flow of 75 percent shall be permitted where the one- and two-family dwelling is provided with an approved automatic sprinkler system.

18.4.5.1.3\*

Where one- and t wo-family dwellings are proposed to be constructed in areas where water distribution systems providing fire flow were designed and installed prior to the effective date of this Code, the AHJ shall be authorized to accept the previously designed system fire flow where the one- and two-family dwellings are provided with approved automatic sprinkler systems.

18.4.5.1.4

A reduction in fire flow shall be permitted for building separation distance in accordance with 18.4.5.1.4 and Table 18.4.5.1.4.

Table 18.4.5.1.4 Permitted Fire Flow Reduction for Building Separation

Separation Distance Between Buildings on a Single Lot Separation Distance to Lot Line or Easementa Permitted Fire Flow Reduction

ft m ft m

>30 and ≤50 >9.1 and ≤15.2 >15 and ≤25 >4.6 and ≤7.6 25%

>50 >15.2 >25 >7.6 40%

a. See 18.4.5.1.4.3.

18.4.5.1.4.1

Where multiple buildings are located on a single lot, the building separation distance shall be the distance between the buildings.

18.4.5.1.4.2

Where a building abuts a lot line, the building separation distance shall be the distance between the building and the lot line.

18.4.5.1.4.3

Where a building is contiguous to a public right of way or no-build easement, the separation distance shall be the distance between the building to the opposite side of the right of way or no-build easement.

18.4.5.1.4.4

Where multiple buildings are located on a single lot and abut a lot line, the building separation distance for determining fire flow reduction shall be the smallest of the two distances.

18.4.5.1.5\*

The reductions in 18.4.5.1.2, 18.4.5.1.3, and 18.4.5.1.4 shall not reduce the required fire flow to less than 500 gpm (1900 L/min).

18.4.5.2 One- and Two-Family Dwellings Exceeding 5000 ft2 (464.5 m2)

18.4.5.2.1

Fire flow and flow duration for dwellings having a fire flow area in excess of 5000 ft2 (464.5 m2) shall not be less than that specified in Table 18.4.5.2.1.

Table 18.4.5.2.1 Minimum Required Fire Flow and Flow Duration for Buildings

Fire Flow Area ft2 (x 0.0929 for m2) Fire Flow gpm†

(x 3.785 for L/min) Flow Duration (hours)

I(443), I(332), II(222)\* II(111), III(211)\* IV(2HH),

V(111)\* II(000), III(200)\* V(000)\*

0—22,700 0—12,700 0—8200 0—5900 0—3600 1500 2

22,701—30,200 12,701—17,000 8201—10,900 5901—7900 3601—4800 1750

30,201—38,700 17,001—21,800 10,901—12,900 7901—9800 4801—6200 2000

38,701—48,300 21,801—24,200 12,901—17,400 9801—12,600 6201—7700 2250

48,301—59,000 24,201—33,200 17,401—21,300 12,601—15,400 7701—9400 2500

59,001—70,900 33,201—39,700 21,301—25,500 15,401—18,400 9401—11,300 2750

70,901—83,700 39,701—47,100 25,501—30,100 18,401—21,800 11,301—13,400 3000 3

83,701—97,700 47,101—54,900 30,101—35,200 21,801—25,900 13,401—15,600 3250

97,701—112,700 54,901—63,400 35,201—40,600 25,901—29,300 15,601—18,000 3500

112,701—128,700 63,401—72,400 40,601—46,400 29,301—33,500 18,001—20,600 3750

128,701—145,900 72,401—82,100 46,401—52,500 33,501—37,900 20,601—23,300 4000 4

145,901—164,200 82,101—92,400 52,501—59,100 37,901—42,700 23,301—26,300 4250

164,201—183,400 92,401—103,100 59,101—66,000 42,701—47,700 26,301—29,300 4500

183,401—203,700 103,101—114,600 66,001—73,300 47,701—53,000 29,301—32,600 4750

203,701—225,200 114,601—126,700 73,301—81,100 53,001—58,600 32,601—36,000 5000

225,201—247,700 126,701—139,400 81,101—89,200 58,601—65,400 36,001—39,600 5250

247,701—271,200 139,401—152,600 89,201—97,700 65,401—70,600 39,601—43,400 5500

271,201—295,900 152,601—166,500 97,701—106,500 70,601—77,000 43,401—47,400 5750

Greater than 295,900 Greater than

166,500 106,501—115,800 77,001—83,700 47,401—51,500 6000

115,801—125,500 83,701—90,600 51,501—55,700 6250

125,501—135,500 90,601—97,900 55,701—60,200 6500

135,501—145,800 97,901—106,800 60,201—64,800 6750

145,801—156,700 106,801—113,200 64,801—69,600 7000

156,701—167,900 113,201—121,300 69,601—74,600 7250

167,901—179,400 121,301—129,600 74,601—79,800 7500

179,401—191,400 129,601—138,300 79,801—85,100 7750

Greater than 191,400 Greater than 138,300 Greater than 85,100 8000

\*Types of construction are based on NFPA 220.

†Measured at 20 psi (139.9 kPa).

18.4.5.2.2

Required fire flow shall be reduced by 75 percent and the duration reduced to 1 hour where the one- and twofamily dwelling is provided with an approved automatic sprinkler system.

18.4.5.2.3

A reduction in the required fire flow shall be permitted where a one- and two-family dwelling is separated from all lot lines in accordance with Table 18.4.5.1.4.

18.4.5.2.4

Required fire flow for one- and two-family dwellings protected by an approved automatic sprinkler system shall not exceed 2000 gpm (7571 L/min) for 1 hour.

18.4.5.2.5\*

The reductions in 18.4.5.2.2, and 18.4.5.2.3 shall not reduce the required fire flow to less than 500 gpm (1900 L/min) for 1 hour.

18.4.5.3 Buildings Other Than One- And Two-Family Dwellings

18.4.5.3.1\*

The minimum fire flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table 18.4.5.2.1.

18.4.5.3.2

Required fire flow shall be reduced by 75 percent when the building is protected throughout by an approved automatic sprinkler system. The resulting fire flow shall not be less than 1000 gpm (3785 L/min).

18.4.5.3.3

Required fire flow shall be reduced by 75 percent when the building is protected throughout by an approved automatic sprinkler system, which utilizes quick response sprinklers throughout. The resulting fire flow shall not be less than 600 gpm (2270 L/min).

18.4.5.3.4\*

Required fire flow for buildings protected by an approved automatic sprinkler system shall not exceed 2000 gpm (7571 L/min) for 2 hours.

18.4.5.3.5

Required fire flow for open parking structures that are not protected throughout by an approved automatic sprinkler system shall be reduced by 75 percent where all of the following conditions are met:

The structure complies with the building code.

The structure is of Type I or Type II construction.

The structure is provided with a Class I standpipe system in accordance with NFPA 14. Class I standpipe systems of the manual dry type shall be permitted.

The resulting fire flow is not less than 1000 gpm (3785 L/ min).

18.4.5.4\* Required Fire Flow and Automatic Sprinkler System Demand

For a building with an approved fire sprinkler system, the fire flow demand and the fire sprinkler system demand shall not be required to be added together. The water supply shall be capable of delivering the larger of the individual demands.

18.5 Fire Hydrants

18.5.1 Fire Hydrant Locations and Distribution

Fire hydrants shall be provided in accordance with Section 18.5 for all new buildings, or buildings relocated into the jurisdiction unless otherwise permitted by 18.5.1.1 or 18.5.1.2.

18.5.1.1

Fire hydrants shall not be required where the water distribution system is not capable of providing a fire flow of greater than 500 gpm (1893 L/min) at a residual pressure of 20 psi (139.9 kPa).

18.5.1.2\*

Fire hydrants shall not be required where modification or extension of the water distribution system is deemed to be impractical by the AHJ.

18.5.1.3

The provisions of 18.5.1.1 and 18.5.1.2 shall not eliminate the fire flow requirements of Section 18.4.

18.5.1.4\*

The distances specified in Section 18.5 shall be measured along fire apparatus access roads in accordance with 18.2.3.

18.5.1.5

Where fire apparatus access roads are provided with median dividers incapable of being crossed by fire apparatus, or where fire apparatus access roads have traffic counts of more than 30,000 vehicles per day, hydrants shall be placed on both sides of the fire apparatus access road on an alternating basis, and the distances specified by Section 18.5 shall be measured independently of the hydrants on the opposite side of the fire apparatus access road.

18.5.1.6

Fire hydrants shall be located not more than 12 ft (3.7 m) from the fire apparatus access road.

18.5.2 Detached One- And Two-Family Dwellings

Fire hydrants shall be provided for detached one- and two-family dwellings in accordance with both of the following:

The maximum distance to a fire hydrant from the closest point on the building shall not exceed 600 ft (183 m).

The maximum distance between fire hydrants shall not exceed 800 ft (244 m).

18.5.3 Buildings Other Than Detached One- And Two-Family Dwellings

Fire hydrants shall be provided for buildings other than detached one- and two-family dwellings in accordance with both of the following:

The maximum distance to a fire hydrant from the closest point on the building shall not exceed 400 ft (122 m).

The maximum distance between fire hydrants shall not exceed 500 ft (152 m).

18.5.4 Minimum Number of Fire Hydrants for Fire Flow

18.5.4.1

The minimum number of fire hydrants needed to deliver the required fire flow for new buildings in accordance with Section 18.4 shall be determined in accordance with Section 18.5.4.

18.5.4.2

The aggregate fire flow capacity of all fire hydrants within 1000 ft (305 m) of the building, measured in accordance with 18.5.1.4 and 18.5.1.5, shall be not less than the required fire flow determined in accordance with Section 18.4.

18.5.4.3\*

The maximum fire flow capacity for which a fire hydrant shall be credited shall be as specified by Table 18.5.4.3. Capacities exceeding the values specified in Table 18.5.4.3 shall be permitted when local fire department operations have the ability to accommodate such values as determined by the fire department.

Table 18.5.4.3 Maximum Fire Hydrant Fire Flow Capacity

Distance to Buildinga Maximum Capacityb

(ft) (m) (gpm) (L/min)

≤ 250 ≤ 76 1500 5678

> 250 and ≤ 500 > 76 and ≤ 152 1000 3785

> 500 and ≤ 1000 > 152 and ≤ 305 750 2839

a Measured in accordance with 18.5.1.4 and 18.5.1.5.

b Minimum 20 psi (139.9 kPa) residual pressure.

18.5.4.4

Fire hydrants required by 18.5.2 and 18.5.3 shall be included in the minimum number of fire hydrants for fire flow required by 18.5.4.

18.5.5 Testing and Maintenance

18.5.5.1

Private water supply systems shall be tested and maintained in accordance with NFPA 25.

18.5.5.2

Public water supply systems providing fire flow shall be tested and maintained in accordance with ANSI/AWWA G200, Standard for Distribution Systems Operation and Management.

18.5.6 Accessibility

Fire hydrants and connections to other approved water supplies shall be accessible to the fire department.

18.5.7 Clear Space Around Hydrants

18.5.7.1

A 36 in. (914 mm) clear space shall be maintained around the circumference of fire hydrants except as otherwise required or approved.

18.5.7.2

A clear space of not less than 60 in. (1524 mm) shall be provided in front of each hydrant connection having a diameter greater than 21/2 in. (64 mm).

18.5.8 Protection

Where required by the AHJ, fire hydrants subject to vehicular damage shall be protected unless located within a public right of way.

18.5.9 Hydrants Out of Service

Where water supplies or are out of service for maintenance or repairs, a visible indicator acceptable to the shall be used to indicate that the hydrant is out of service.

18.5.10 Marking of Hydrants

18.5.10.1

Fire hydrants shall be marked with an approved reflector affixed to the roadway surface where required by the AHJ.

18.5.10.2

Fire hydrants shall be marked with an approved flag or other device affixed to or proximate to the fire hydrant where required by the AHJ.

18.5.10.3\*

Where required by the AHJ, fire hydrants shall be color coded or otherwise marked with an approved system indicating the available flow capacity.

