

# FIRE PROTECTION DEVELOPMENT STANDARDS

## INTRODUCTION

Fire departments and fire companies are required to respond to a variety of emergency events in various buildings and facilities. Buildings and facilities include one- and two-family dwellings, apartments and condominiums, shopping malls, business complexes, industrial complexes, storage buildings, schools, hospitals, nursing and care facilities and outdoor storage areas.

Emergencies include aid calls that require the service of an ambulance, hazardous materials releases, water rescues, confined space rescues, high angle rescues and fires involving many large fire vehicles and numerous personnel. To be effective, fire departments and fire companies must be able to reach all buildings and facilities within the reach of their apparatus and equipment, and once there have the water supplies necessary to control and extinguish a fire.

These fire protection development standards are authorized by Pennsylvania law; the Uniform Construction Code, Title 34. That law authorizes the fire code official to adopt rules and regulations to carry out the intent of the law. The *International Fire Code*<sup>®</sup> gives the Fire Chief or Code Official broad latitude to set rules and regulations affecting fire access roads, water supplies and the built environment.

These standards are written to provide owners, developers and designers a clear and consistent set of guidelines for developing property to meet fire and life safety needs. By having this information beforehand, the owner can anticipate and plan for the requirements, rather than being subject to the vagaries of individual code officials or fire chiefs and their interpretations of the building and fire codes and standards. These rules and regulations are intended to provide predictability, consistency and clarity for property owners.

These rules and regulations cannot anticipate every conceivable design or use. In unique or extraordinary circumstances, the fire department and code official should be consulted to discuss alternatives to these standards.

# CONTENTS

	<b>Section</b>
<b>Introduction</b>	
<b>Administrative</b>	<b>1.00</b>
Plans Submittal	1.00
Site Plans (General)	1.01
Site Plans (Fire Protection Infrastructure)	1.02
<b>Definitions</b>	<b>2.00</b>
<b>Fire Apparatus Access to Buildings or Facilities</b>	<b>3.00</b>
General Requirements	3.00
Driveways for Group R-3 and U Occupancies	3.01
Minimum Dimensions	3.02
Angles of Approach, Departure and Breakover Angles	3.03
Road Surfaces	3.04
Turning Radii	3.05
Dead Ends	3.06
Grades	3.07
Dips, Bumps, Surface Irregularities, Traffic Calming Devices	3.08
Bridges	3.09
Culverts and Utility Vaults	3.10
Security Gates, Chains and Cables	3.11
Multiple Fire Apparatus Access Roads	3.12
Divided Entrances	3.13
Special Conditions for Aerial Apparatus	3.14
High-Piled Storage Facilities	3.15
Marking and Signs	3.16
Traffic Signalization	3.17
<b>Water Supplies and Fire Flow</b>	<b>4.00</b>
General Requirements	4.00
Fire Flow Computational Methods	4.01
Fire Flow: Rural Areas	4.02
Fire Flow: Suburban and Urban Areas	4.03
Fire Flow Surcharges	4.04
Credit for Automatic Sprinkler Systems	4.05
Fire Flow Calculations for Non-Structural Facilities	4.06
Fire Flow Calculations for Remodeled Buildings or Structures	4.07
Tanks and Reservoirs	4.08
Water Mains	4.09
Wet Hydrants	4.10

Dry Hydrants and Drafting Sites	4.11
Access to Dry Hydrants and Drafting Sites	4.12
Wet Hydrant Numbers and Placement	4.13
<b>Emergency Entry to Buildings or Facilities</b>	<b>5.00</b>
Key Boxes: General Requirements	5.00
Specifications	5.01
Occupancy Requirements	5.02
Locations	5.03
Contents	5.04
Indemnification Agreement	5.05
<b>Fire Department Connections for Fire Protection Systems</b>	<b>6.00</b>
General Requirements	6.00
Specifications	6.01
Location	6.02
Identification	6.03
Access and Visibility	6.04
<b>Vehicle Impact Protection</b>	<b>7.00</b>
General Requirements	7.00
Specifications	7.01
<b>Premises Identification</b>	<b>8.00</b>
General Requirements	8.00
Street or Road Signs	8.01
Specifications	8.02
Driveways for Multiple Group R-3 Occupancies	8.03
<b>Reference Standards</b>	<b>9.00</b>

## ADMINISTRATIVE

Pursuant to authorizations within Section 104.1 of the *International Fire Code*<sup>®</sup>, 2006 Edition, adopted by reference in 34 Pa. Code, §403.21 for "opt in" jurisdictions, the following rules and regulations pertain to the design, construction and installation of built-in fire protection and life safety features for buildings or property improvements.

These rules and regulations include specifications based on fire apparatus and equipment most likely to be used within the jurisdiction, the *International Fire Code*<sup>®</sup>, 2006 Edition and National Fire Protection Association standards, and are intended to standardize requirements, reduce ambiguities and confusion due code interpretations, and provide consistency in the design and construction of property improvements.


These rules and regulations shall not be applied to facilities, buildings, structures or equipment that were existing or approved for construction or installation prior to their effective date, except in those cases where it is determined by the permitting jurisdiction and Fire Chief or Code Official that the existing situation poses a distinct hazard to life or adjacent property.

Although these rules and regulations specifically for fire apparatus access to two or fewer dwellings are not within the scope of the *International Fire Code*<sup>®</sup>, 2006 Edition and National Fire Protection Association standards, in the interest of public safety and improved fire protection, the jurisdiction encourages all individual construction projects meet these standards.

Variations in specific cases from these rules, regulations and standards may be granted only upon the mutual consent of the Code Official and Fire Chief of the jurisdiction where the development occurs. All variation requests shall be made in writing to the Code Official and Fire Chief.

7/25/2007  
Effective Date

 Chief CO 2  
Fire Chief or Code Official

 CHIEF  
FOUNTAIN DALE  
FIRE CO.

## FORMAT

These rules, regulations and standards are organized in the following format:

<b>Section Number</b>	<b>Topic/Title</b>	<b>IFC/NFPA Reference</b>
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The “section number” pertains to the section of these rules and regulations.

The “topic/title” describes the overall content of that section.

The “IFC/NFPA Cross Reference” is the Chapter and Section number of the reference document from which the rule, regulation or standard is developed.

### *Example*

<b>3.01</b>	<b>Private Roads</b>	<b>IFC: 503.1</b>
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3.01-1 Private roads shall be extended to within 150 feet of all portions of the exterior walls of the first floor of a building.

**1.00 Plans Submittal**

**IFC: 105.4**

1.00-1 Plans for property improvement shall be submitted to the Fire Chief or Code Official in accordance with the requirements of the International Building Code, International Fire Code, the Pennsylvania Uniform Construction Code §403.42a(h) and these standards.

**1.01 Site Plans (General)**

**IFC: 105.4 and UCC §403.42a(h)**

1.01-1 Site plans shall be drawn to a commonly used scale and shall include the following:

- 1) The size and location of new construction and existing structures on the site.
- 2) Accurate boundary lines.
- 3) Distances from lot lines.
- 4) The established street grades and the proposed finished grades.
- 5) If the construction involves demolition, the site plan shall indicate construction that is to be demolished and the size and location of existing structures and construction that will remain on the site or plot.
- 6) Location of parking spaces, accessible routes, public transportation stops and other required accessibility features.

**1.02 Site Plans (Fire Protection Infrastructure)**

**IFC: 105.4**

1.02-1 Where improvements are made affecting fire protection infrastructure, site plans shall include the following information drawn to a commonly used scale:

- 1) Location and configuration of the property improvement, showing its relationship to the property lines and nearest existing streets or roads, alleys, fire lanes or fire apparatus access routes.
- 2) Location of existing and new underground water mains, the diameter of those mains and fire hydrants.
- 3) Location and capacity of static water supplies, tanks, wells, cisterns, lakes, ponds, reservoirs or other features intended to be used to satisfy fire flow requirements.
- 4) Location, width, overhead obstructions and construction of all streets, roadways, alleys, bridges, fire lanes or fire apparatus access routes.
- 5) Location of any temporary and/or permanent fences, walls, gates, arches, berms or any other security or ornamental features that may affect fire department access to and on the site during construction and occupancy.
- 6) Location of any unusual or remarkable topographic features, landscaping, vegetation, or other features that may affect fire department access to and on the site during construction and occupancy.

1.02-2 Drawings, plans, renderings and similar documents for private streets and roads verifying compliance with these standards shall be prepared, stamped and signed by a licensed professional engineer registered in the Commonwealth of Pennsylvania.

Exception: Engineered drawings are not required for driveways serving fewer than 6 Group R-3 and U occupancies provided they meet the requirements of these standards.



## SECTION 2

### DEFINITIONS

The following definitions shall apply to these rules, regulations and standards. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural, the plural the singular.

Where terms are not defined in these rules, regulations and standards, definitions in the *International Fire Code*<sup>®</sup> or National Fire Protection Association standards shall apply. Where terms are not defined in those publications, they shall have ordinarily accepted meanings as the context implies.

Unless otherwise noted, all spatial dimension references shall be measured in a straight line or direct line-of-sight.

#### DEFINITIONS

##### A-B-C

“Agricultural building” shall mean a structure designed and constructed as defined in the *International Building Code*<sup>®</sup> to house farm implements, hay, grain, poultry, livestock or other horticultural products. It does not include places of human habitation or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public.

“All-weather”, as it pertains to improved fire apparatus access road surfaces, shall mean a manner of construction and materials that is capable of withstanding without damage the seasonal conditions of rain, snow, sleet, hail, sun, wind and ice.

“American National Fire Hose Connection Screw Threads” shall mean fire hose and connection threads cut in accordance with National Fire Protection Association Standard No. 1963. It shall also be known as National Standard Thread (NST).

“Angle of approach” shall mean an angle measured in degrees between the ground and a line running from the fire apparatus front tire to the lowest hanging rigid object directly ahead of it, usually the front bumper, but may include sirens, lights, pump suction pipe or other objects. See also “Angle of departure” and “Breakover angle.”

“Angle of departure” shall mean an angle measured in degrees between the ground and a line running from the fire apparatus rear tire to the lowest hanging rigid object directly behind it, usually the tail-board or a low-hanging exhaust system. See also “Angle of approach” and “Breakover angle.”

“Approved” shall mean acceptable to the Fire Chief or Code Official or his designate.

“Area, Building”, as defined in the *International Building Code*<sup>®</sup>, shall mean the area within the surrounding walls (or exterior walls and fire walls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

“Bonnet, Wet hydrant” shall mean the top portion of a wet hydrant surrounding the operating stem.

“Breakover angle” shall mean an angle measured in degrees that a fire apparatus can drive over a bump or ridge without striking the object or hanging up between the axles. It is measured from the bottom center of the vehicle to the nearest edge of the front or rear tires on the ground. See also “Angle of approach” and “Angle of departure.”

“Building” shall mean a manmade structure designed and erected for the purpose of habitation, use, storage, business, education, manufacturing and similar operations.

“Building height”, for the purpose of these standards, shall be measured from the lowest point of fire department access to the highest point of the roof.

“Control area” shall mean spaces within a building which are enclosed or bounded by exterior walls, fire walls, fire barriers and roofs, or a combination thereof, where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled. See the *International Fire Code*<sup>®</sup> or *International Building Code*<sup>®</sup>.

## **D-E-F**

“Dead end water main” shall mean a pipe or tube intended to provide the required fire flow, and that is served from a single direction from the water source. See “Looped water main.”

“Divided entrance” shall mean a fire apparatus access road having two or more individual driving lanes separated by planting strips, barriers, landscaping, drainage facilities, fences, advertising signs or other obstructions, *i.e.* entrances to commercial shopping centers, schools, hotels, motels, apartment complexes, hospitals, nursing homes or similar developments

“Driveway” shall mean a private street or road intersecting a public street or road, and serving only Group R-3 or U occupancies.

“Draft” shall mean a fire fighting operation where a pump-equipped fire apparatus with rigid-wall hose (also known as “hard suction” or “hard sleeve”) draws water from a static water source using suction.

“Drafting site” shall mean a level space immediately adjacent and contiguous to an approved fire apparatus access road and static water source, measuring not less than 12 feet x 40 feet, with the long dimension parallel to the water source and within 10 feet of the static water source where the depth of the water is not less than 18 inches at all times of the year.

“Dwelling” shall mean a building that contains one or two dwelling units used, intended, or designed to be used, rented, leased, let or hired out to be occupied for living purposes.

“Dwelling unit” shall mean a single unit providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

“Exposure hazard” shall mean a building or facility within 50 feet of another building and 100 ft<sup>2</sup> or larger in area.

“Facility” shall mean a building, structure or use in a fixed location including exterior storage areas for flammable and combustible substances and hazardous materials, piers, wharves, tank farms and similar uses. This term includes recreational vehicle, mobile home and manufactured housing parks, sales and storage lots.

“Fire apparatus” shall include, but not be limited to, self-propelled, motorized or towed vehicles commonly described as fire engines or pumpers, ambulances, ladder trucks, aerial apparatus, quints, towers, water tenders or tankers, rescues, command vehicles, and may include specialty equipment such as utility trailers, water craft or land clearing apparatus.

“Fire apparatus access road” shall mean a road that provides fire apparatus access from a fire station to a facility, building or portion thereof. This is a general term inclusive of all other terms such as fire lane, public street or road, private street or road, parking lot lane, access roadway, bridge, culvert, cartway or cart path.

“Fire department access” shall mean the location or level where personnel, equipment or apparatus may be deployed for emergency operations.

“Fire Chief or Code Official” shall mean the duly elected or appointed principal administrative or command officer of a fire department. It may also mean the duly appointed code enforcement official of a municipal jurisdiction.

“Fire department” shall mean any agency, organization, corporation, jurisdiction or similar entity authorized and organized under the laws of the Commonwealth of Pennsylvania for the purpose of providing fire prevention, suppression, control and extinguishment, rescue and emergency medical services, and related public services.

“Fire department master key” shall mean a limited issue key or special or controlled design to be carried by fire department officials in command which will open key boxes on specified properties.

“Fire flow, Available” shall mean the quantity and duration of water flow available for fire protection in addition to the normal average consumption in the area.

“Fire flow calculation area” shall mean the total floor area of all floor levels within the exterior walls and under the horizontal projections of the roof of a building or structure, except for Type IA and IB construction in accordance with the *International Building Code*<sup>®</sup> where the fire flow calculation area shall mean the three largest successive floor areas.

“Fire flow, Required,” shall mean the quantity of water in gallons per minute and duration needed to control an anticipated fire in a facility, building or group of buildings, and shall consider the risk caused by the contents of the building or buildings and its proximity to adjacent structures or property lines.

“Fire lane” shall mean a road or passageway developed to allow the passage of fire apparatus. A fire lane is not necessarily intended for vehicular traffic other than fire apparatus.

## **G-H-I**

“GPM” shall mean gallons per minute.

“Ground clearance” shall mean the distance in inches between the ground and the lowest hanging rigid object on the bottom of a fire apparatus. This includes the transmission, drive line, and exhaust systems.

“Group R-3 occupancy” shall mean a residential building as defined by the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup> that is primarily permanent in nature and does not contain more than two dwelling units.

“Group U occupancy” shall mean buildings or structures as defined by the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup> that are of an accessory character, and miscellaneous structures not classified in any specific occupancy group within the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup>. Examples include agricultural buildings, aircraft hangars accessory to one- or two-family dwellings, barns, carports, fences more than six feet high, grain silos accessory to a residential occupancy, greenhouses, livestock shelters, private garages, retaining walls, sheds, stables, tanks and towers.

“Hazardous material” shall mean a product that produces a fire, explosion or health risk, and shall be as defined in the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup>.

“Hydrant, Dry” shall mean an arrangement of pipe permanently connected to a water source other than a piped, pressurized water supply system that provides a ready means of water supply for fire-fighting purposes and that utilizes the drafting (suction) capability of fire department pumps.

“Hydrant, Wet” shall mean a device attached to a municipal type water supply for the primary purpose of supplying available fire flow.

“*International Building Code*<sup>®</sup> (IBC)” shall mean the *International Building Code*<sup>®</sup> promulgated and published by the International Code Council, 5203 Leesburg Pike, Suite 600; Falls Church, VA 22041-3401.

“*International Fire Code*<sup>®</sup> (IFC)” shall mean the *International Fire Code*<sup>®</sup> promulgated and published by the International Code Council, 5203 Leesburg Pike, Suite 600; Falls Church, VA 22041-3401.

## **J-K-L**

“Key box” shall mean a secure, tamperproof device with a lock operable only by a fire department master key, and containing building entry keys and other keys that may be required for access in an emergency.

“Looped water main” shall mean one or more pipes or tubes intended to provide the required fire flow, and which are served from more than one direction from the water source. See “Dead end water main.”

## **M-N-O**

“Maximum allowable amounts per control area” shall mean the maximum quantity of hazardous materials allowed to be stored or used within a control area inside a building or an outdoor control area.

“National Fire Protection Association (NFPA) standards” shall mean fire protection and life safety documents promulgated and published by the National Fire Protection Association, One Batterymarch Park, Quincy, MA 02169-7471.

“National Standard Thread (NST)” See “American National Fire Hose Connection Screw Threads.”

“Opt-in” shall mean a jurisdiction that has elected to enforce the Uniform Construction Code in accordance with 34 Pa. Code, §403.21.

“Opt-out” shall mean a jurisdiction that has not elected to enforce the Uniform Construction Code in accordance with 34 Pa. Code, §403.21, and enforcement authority has been retained by the Commonwealth of Pennsylvania Department of Labor and Industries.

## **P-Q-R**

“PennDOT” shall mean the Commonwealth of Pennsylvania Department of Transportation.

“Planned building group” shall mean multiple structures constructed on a single parcel of land, excluding farmland, under the ownership, control, or development and on-going ownership of an individual, a corporation, a partnership, or a firm.

“PSI” shall mean pounds per square inch.

“Quint” shall mean a mobile fire apparatus that includes a fire pump, water tank, hose, ladders, aerial ladder, and fire fighting equipment.

“Recorded” shall mean legally registered with the city, county, township, borough or other entity having jurisdiction over the registration of real property.

“Reservoir” shall mean a natural or manmade impoundment for fire protection water supplies that has adequate capacity to meet fire flow requirements.

“Rural” shall mean residential and agricultural development in an area that has a United States Census Bureau census tract population of less than 500 persons.

### **S-T-U-V**

“Semi-impervious surface,” as it pertains to fire apparatus access roads only, shall mean a road surface that consists of a substrate capable of supporting the fire apparatus, but that enables low-growth landscaping to grow through, *i.e.* turf block, turfcrete, grasscrete or proprietary products.

“Storz coupling or fitting” shall mean a hose connection device attached to a wet or dry hydrant, a fire department connection to a fire protection system, or fire appliances and hoses that employs matching lugs on each connection rather than threaded fittings. It is a generic industry name for a product bearing the United States Patent No. 489107.

“Street or road, Private” shall mean any accessway normally intended for vehicular use but not dedicated as a public street or road.

“Street or road, Public” shall mean a thoroughfare that has been dedicated for vehicular use by the public.

“Suburban” shall mean residential and commercial development in an area that has a United States Census Bureau census tract population of more 500 persons but less than 2,500 persons.

“Ton” shall mean a standard United States short ton, *i.e.* 2,000 pounds.

“Tools, Hand-operated” shall mean equipment carried on fire apparatus that does not require electric, gasoline, compressed air or other operating mechanisms.

“Turnout” shall mean a level space immediately adjacent and contiguous to an approved fire apparatus access road, measuring not less than 12 feet x 40 feet, with the long dimension parallel to the road.

“Uniform Construction Code (UCC)” shall mean the Uniform Construction Code adopted by the Commonwealth of Pennsylvania in Act 45 of 1999, and codified as 34 Pa. Code, §403.21.

“Urban” shall mean a settled area that has a United States Census Bureau census population of more than 2,500 persons within the borough, village, town or city.

## W-X-Y-Z

“Water-based fire protection system” shall mean a fixed fire protection or fire suppression system installed in a building or facility in accordance with the *International Building Code*<sup>®</sup>, *International Fire Code*<sup>®</sup>, or National Fire Protection Association standards; and shall include, but not be limited to, automatic sprinklers, standpipes, fire pumps, water spray, water mist or similar systems that employ water as the primary fire control agent.

“Water main” shall mean one or a network of pipe or tube, valves, fittings and other connections to a reliable water source, of adequate size, materials and construction to provide the required fire flow.

“Water source, Static” shall mean a manmade or natural watercourse such as a pond, lake, reservoir, swimming pool, or other approved source, where fire flow water supplies are taken from draft.

“Water system, Municipal type” shall mean a public or privately owned and maintained system having water pipes serving hydrants and designed to furnish, over and above domestic consumption, a minimum flow of 250 gallons per minute at 20 pounds-per-square-inch residual pressure for a two-hour duration.

“Wheelbase” shall mean the measurement of the distance in inches from the center of the front axle to the center of the rearmost axle of a fire apparatus.

SECTION 3

**FIRE APPARATUS ACCESS TO BUILDINGS  
OR FACILITIES**

**Table 3.00  
Fire Department Access Road Requirements Summary**

<b>Buildings or Facilities</b>	<b>Reference</b>
1 to 2 Group R-3 or Group U occupancies	No requirements
3 to 5 Group R-3 or Group U occupancies	See Section 3.01
More than 5 Group R-3 or Group U occupancies	See Section 3.00
All other occupancies, buildings or facilities	See Sections 3.00 through 3.14
Buildings or facilities more 30 feet high from the lowest level of fire apparatus access.	See Section 3.14

**3.00 General Requirements**

**IFC: 503.1**

3.00-1 Approved fire apparatus access roads shall be provided for every facility, building or portion of a building constructed or moved into the jurisdiction after the effective date of these standards.

The fire apparatus roads shall comply with the requirements of this section and shall extend to within 150 feet of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility.

Exceptions:

1. Where the building is equipped throughout with an approved automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and the sprinkler system is not otherwise required by *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup> for hazardous, factory or industrial or storage occupancies.
2. Where fire apparatus access roads cannot be installed because of location on property, topography, waterways, non-negotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.
3. Where there are not more than two Group R-3 or Group U occupancies served by a single driveway.



3.00-2 Drawings, plans, renderings and similar documents for private streets and roads verifying compliance with these standards shall be prepared, stamped and signed by a licensed professional engineer registered in the Commonwealth of Pennsylvania.

Exception: Engineered drawings are not required for driveways serving fewer than 6 Group R-3 and U occupancies provided they meet the requirements of these standards.

3.00-3 The fire apparatus access road specifications identified in these standards shall apply to all buildings and facilities hereafter constructed except as described in Section 3.01 pertaining to Group R-3 and U occupancies.

### **3.01 Driveways for Group R-3 and U Occupancies**

**IFC: 503.1.2**

This section shall apply where there are more than 2 and up to and including 5 Group R-3 or U occupancies served by a single driveway. (For more than 5 Group R-3 or U occupancies, and all other occupancies, refer to **Section 3.00** and **Sections 3.02 through 3.14**.)

3.01-1 Where any point of a Group R-3 or U occupancy is greater than 150 feet from a public street or road, a driveway shall be provided to within 150 feet of all portions of the exterior wall of the first floor of that building.

3.01-2 Where the driveway is more than 150 feet in length, it shall be not less than 12 feet in unobstructed width with 13 feet, 6 inches in unobstructed vertical clearance.

3.01-3 Where the driveway is more than 300 feet in length, it shall be provided with turnouts or turnarounds at locations approved by the Fire Chief or Code Official. Turnouts and turnarounds shall be spaced not more than 1000 feet apart.

3.01-4 When the driveway serves any structure more than 1000 feet from the public street or road, a minimum 4-foot tall white signpost shall be provided adjacent to the intersection of the driveway and public street or road. The signpost shall be provided with 1-inch wide red reflective tape bands parallel to the ground, with one band for each 1000 feet of driveway length or portion thereof. There shall be 1-inch of space between bands. Bands shall be located between 36 and 44 inches above the ground.

Additional signposts shall be provided at not more than 1000-foot intervals along the driveway. Each signpost shall have a number of red reflective tape bands for each remaining 1000 feet of driveway length or portion thereof

A "terminal" signpost shall be provided on the driveway within 1000 feet of the most remote portion of the most remote building or structure served by the driveway. The signpost shall be provided with a single 1-inch wide red reflective tape band parallel to the ground.

- 3.01-5 Driveways shall have a grade not exceeding 10 percent. Steeper grades may be permitted where mitigation measures can be agreed upon jointly by the Fire Chief or Code Official and the property owner. All variation requests shall be made in writing to the Code Official and Fire Chief.
- 3.01-6 The driveway shall be constructed of a material capable of supporting the imposed load of fire apparatus weighing not less than 72,000 pounds.

**3.02 Minimum Dimensions IFC: 503.2.1**

- 3.02-1 Fire apparatus access roads shall have an unobstructed driving width of not less than 20 feet, except for approved security gates as described in Section 3.11, and an unobstructed vertical clearance of not less than 13 feet, 6 inches.
- 3.02-2 For the purpose of this section, the measurement of the fire apparatus access road on private property shall begin at a line where the private street or fire lane intersects the public street or road right-of-way.
- 3.02-3 Fire apparatus access roads more than 150 feet in length shall be not less than 24 feet wide.
- 3.02-4 Parking along fire apparatus access roads shall be allowed only where an additional 9 feet of improved road width is provided along at least one side and only within that improved width.
- 3.02-5 Rolled curbs and gutters not exceeding 3 inches tall immediately adjacent and contiguous the road and concrete or bituminous asphalt sidewalks at least 4 feet wide may be included in the overall width specified in this section.

**3.03 Angles of Approach, Departure, and Breakover Angles IFC: 503.2.2**

- 3.03-1 No angle of approach shall exceed 8 degrees.
- 3.03-2 No angle of departure shall exceed 8 degrees.
- 3.03-3 No breakover angle shall exceed 8 degrees.

**3.04 Road Surfaces IFC: 503.2.3**

- 3.04-1 Fire apparatus access roads shall be designed and maintained to support the imposed load of fire apparatus weighing 72,000 pounds, and shall be concrete or bituminous asphalt surfaced to provide all-weather driving capabilities.

3.04-2 If a semi-impervious surface is used for a fire apparatus access road, it shall meet the following requirements:

- 1) The substrate shall be capable of supporting the imposed load of fire apparatus weighing 72,000 pounds.
- 2) The maximum grade of the fire apparatus access road shall not exceed 3 percent for its entire length.
- 3) The entry point to the fire apparatus access road shall be provided with an approved sign indicating its location.
- 4) The outline of the fire apparatus access road shall be permanently identified by reflective posts or similar markers not less than 4 feet tall and spaced not more than 50 feet apart.
- 5) All other requirements in this section for fire apparatus access roads pertaining to widths, turnarounds, marking, and turning radii shall apply.
- 6) A management plan to maintain the fire apparatus access roads during all weather conditions shall be submitted to the Fire Chief or Code Official for review and approval.

### **3.05 Turning Radii**

**IFC: 503.2.4**

3.05-1 Fire apparatus access roads shall have turning radii in accordance with this section. Turning radii are based on a maximum apparatus speed of 10 miles per hour. Turning radii shall be measured curb-to-curb. If there is no curb, turning radii shall be measured from edge-of-pavement to edge-of-pavement.

Exception: Where rolled curbs and gutters not exceeding 3 inches tall immediately adjacent and contiguous to the road and concrete or bituminous asphalt sidewalks at least 4 feet wide are provided, the turning radius measurement may include the sidewalk.

3.05-2 Turns in public streets and roads shall be not less than the standards of the jurisdiction in which the road occurs.

3.05-3 The minimum turning radii for private streets and roads not requiring access for aerial apparatus shall be 32 feet inside and 48 feet outside turning radius.

3.05-4 The minimum turning radii for private streets and roads where access for aerial apparatus is required shall be 36 feet inside and 52 feet outside turning radius. Trees, landscaping, lamp posts, signs and other vertical obstructions more than 7 feet tall shall not be placed within 10 feet of the outside turning radius. (See also **Section 3.14**)

**3.06 Dead Ends**

**IFC: 503.1.2**

- 3.06-1 Fire apparatus access roads more than 150 feet in length shall be provided with turnarounds in accordance with this section.
- 3.06-2 For the purpose of this section, the measurement of the fire apparatus access road on private property shall begin at the line where the private street or fire lane intersects the public street or road right of way.
- 3.06-3 Turnarounds shall be selected from one of the following designs:

**Table 3.06-3  
Turnaround Designs**

Cul-de-sac	96-foot diameter
Hammerhead or Tee	120-foot gross length
Oblique hammerhead ("Y")	60-foot length per leg
Elbow	60-foot length per leg
Bulb	96-foot diameter

- 3.06-4 Cul-de-sacs having a 96-foot diameter may have a center planter or grass island not exceeding 20 feet in diameter so long as there are no vertical obstructions exceeding 7 feet tall placed in the center island.

**3.07 Grades**

**IFC: 503.1.2**

- 3.07-1 Fire apparatus access road grades on public streets or roads shall not exceed the standards of the jurisdiction in which the road occurs. Private streets or roads shall be designed to have a consistent gradient not more than 10 percent throughout their entire length.

Exception: Private road segments may have a grade up to 14 percent, for not more than 150 feet in length.

- 3.07-2 Grades within the designated fire apparatus turnarounds shall not exceed 4 percent.
- 3.07-3 Fire apparatus access road grades shall be not less than 0.5 percent in order to prevent pooling of water in a traveled way. The slope from centerline to the outer edge of the pavement shall be not less than 0.5 percent and not more than 2 percent, or as in accordance with the jurisdictions' adopted road standards.
- 3.07-4 Any private street or road intersecting with another private street or road shall be sloped to meet the approach, departure, or breakover angles included in these standards.

**3.08 Dips, Bumps, Surface Irregularities, Traffic Calming Devices IFC: 503.1.2**

3.08-1 No dip, bump, surface irregularity or traffic calming device shall impede the movement of fire apparatus with a minimum ground clearance of 11 inches.

**3.09 Bridges IFC: 503.1.2**

3.09-1 Where a bridge or elevated surface is part of a fire apparatus access road, the bridge shall be constructed and maintained in accordance with the American Association of State Highway and Transportation Officials *Standard Specification for Highway Bridges*. Bridges and elevated surfaces shall be designed for a live load of not less than 72,000 pounds.

Exception: Where the bridge length is such that only one axle of fire apparatus may be imposed upon it at any time, the design load shall be not less than 52,000 pounds.

3.09-2 Vehicle load limits shall be posted at both entrances to bridges. The load limits shall be posted in tons. Signs shall have reflective letters not less than 1-inch in height on a contrasting background.

**3.10 Culverts and Utility Vaults IFC: 503.1.2**

3.10-1 Where a fire apparatus access road crosses a culvert, irrigation ditch, swale, depression or underground utility vault, the culvert pipe or utility vault and lid shall be capable of supporting a live load of not less than 72,000 pounds.

Exception: Where the culvert pipe or utility vault and lid is located where only one axle of fire may be imposed upon it at any time, the design load shall be not less than 52,000 pounds.

**3.11 Security Gates, Chains and Cables IFC: 503.6**

3.11-1 Gates or similar barriers installed on driveways intersecting private streets or roads shall be located on private property a minimum of 35 feet from the line where the private street or fire lane intersects the public street or road right of way.

3.11-2 The gate arm or barrier shall swing vertically or in the direction of access to the property. Vertically opening gates or barriers shall provide a minimum overhead clearance of 13 feet, 6 inches. Horizontally swinging gates or barriers shall provide a clear opening not less than 2 feet wider than the gated road or driveway

- 3.11-3 Emergency responders shall have ready access to locking mechanisms on any gate that restricts access. The gate post nearest the right hand driving lane shall have an approved key box mounted within 24 inches of the top of the post containing the key or security code to the gate or locking device.
- 3.11-4 Electric, pneumatic or other power-operated gates or barriers shall be provided with a manual override feature to allow emergency access.
- 3.11-5 Where chains or cables are suspended between posts to provide security, the chain, padlock shackle or cable shall not be greater than 1/4-inch in diameter, and shall be capable of being cut or broken by hand-operated tools.
- 3.11-6 Chains, cables or similar barriers shall be provided with reflective signs, tape or similar method to assure the chain, cable or barrier is visible under all lighting conditions or reflective to fire apparatus headlights.

**3.12 Multiple Fire Apparatus Access Roads**

**IFC: 503.1.2**

- 3.12-1 More than one fire apparatus access road shall be required when it is determined by the Fire Chief or Code Official that a single road may be impaired by traffic congestion, condition of terrain, climatic conditions, topography, grade or other factors than could limit access.
- 3.12-2 Fire apparatus access roads may be shared by adjacent properties provided that permanent access easements are recorded permanently on each site plan recorded with the jurisdiction.
- 3.12-3 For buildings, structures or facilities more than 150 feet from a public street or road and more than 30 feet in height, or 50,000 cumulative square feet gross building area on a single land parcel or in a planned building group, at least two separate approved means of access from the public street or road shall be provided.

Exception: Where there are not more than 60 Group R-3 or U occupancies.

- 3.12-4 Where more than 60 Group R-3 or U occupancies occur in a subdivision, planned building group or similar land use parcel, at least two separate approved means of access from the public street or road shall be provided unless all portions of the exterior walls of the first story of all dwellings can be reached within 150 feet of the public street or road.

Exception: Where the subdivision, planned building group or similar land use parcel has less than 150 feet of frontage immediately adjacent to a public street or road, a single fire apparatus access road may be permitted where mitigation measures can be agreed upon jointly by the Fire Chief or Code Official and the property owner. All variation requests shall be made in writing to the Code Official and Fire Chief.

- 3.12-5 Where two separate access points are required, they shall be placed a distance apart equal to not less than one half of the length of maximum overall diagonal dimension of the property or area to be served, measured in a straight line between the nearest edges of the access roads.

Exception Where this is not practical due to topography, access to public streets or roads, frontage limits, or geometric shape of the property or area to be served, the Fire Chief or Code Official may approve alternate designs. All variation requests shall be made in writing to the Code Official and Fire Chief.

### **3.13 Divided Entrances**

**IFC: 503.1.2**

- 3.13-1 Where divided entrances are provided for residential subdivisions, planned building groups, commercial or similar developments and the length of the separation parallel to the driving lanes is less than or equal to 150 feet, roads on both sides of the dividing features shall be not less than 15 feet in width, and shall meet all other requirements of these standards for paving, grade, parking and clearances.

- 3.13-2 Where divided entrances are provided for residential subdivisions, planned building groups, commercial or similar developments and the length of the separation parallel to the driving lanes exceeds 150 feet, roads on both sides of the dividing features shall be not less than 20 feet in width, and shall meet all other requirements of these standards for paving, grade, parking and clearances.

### **3.14 Special Conditions for Aerial Apparatus**

**IFC: 503.2.2**

The requirements of this section shall apply only to buildings or portions of buildings or facilities more than 30 feet in height above the lowest level of fire department access.

- 3.14-1 Buildings or portions of buildings or facilities more than 30 feet in height above the lowest level of fire department s access shall be provided with fire apparatus access roads capable of accommodating fire department aerial apparatus.
- 3.14-2 Fire apparatus access roads in the immediate vicinity of a building or portion of a building more than 30 feet in height shall have a minimum unobstructed width of 29 feet. Parking along fire apparatus access roads shall be allowed only where an additional 9 feet of improved road width is provided along at least one side and only within that improved width.
- 3.14-3 At least one of the required access roads meeting this condition shall be located within a minimum of 15 feet and a maximum of 30 feet from the building, and shall be located parallel to one entire side of the building having openings to the building interior.
- 3.14-4 The minimum turning radii for private streets and roads where access for aerial apparatus is required shall be 36 feet inside and 52 feet outside turning radius. Trees, landscaping, lamp posts, signs and other vertical obstructions more than 7 feet tall shall not be placed within 10 feet of the outside turning radius.
- 3.14-5 Fire apparatus access roads for aerial apparatus shall meet all other requirements of these standards for paving, grade, parking and clearances.

### **3.15 High-Piled Storage Facilities**

**IFC: 503.1.2**

- 3.15-1 Fire department vehicle access to buildings used for high-piled combustible storage shall comply with the applicable provisions of the *International Building Code*<sup>®</sup>, *International Fire Code*<sup>®</sup> and these standards.
- 3.15-2 Only side-hinged swinging doors shall qualify as fire fighter access doors.

### **3.16 Marking and Signs**

**IFC: 503.3.3**

- 3.16-1 Approved "No Parking – Fire Lane" signs shall be provided for fire apparatus access routes. Signs shall measure 12 by 18 inches, have red letters on a reflective white background and comply with the standard Scotchlite<sup>®</sup> Sign Face Number R7-32 or equivalent. Signs shall be mounted on 2 by 2 inch square 12 gauge metal posts so the bottom of the sign is 7 feet above the finished grade. The sign post shall be set in a concrete footing at least 12 inches in diameter and 18 inches deep.
- 3.16-2 Signs shall be installed at the entrance to the fire apparatus access route, and at not more than 100 foot intervals along the route. Signs shall be visible from all directions along the route.



**3.17 Traffic Signalization**

**IFC: 503.3.3**

3.17-1 Any traffic signalization installed in conjunction with property development shall be provided with emergency services visual capture devices (3M Opticom<sup>®</sup>) in accordance with PennDOT , Adams County or local jurisdictional standards.

## SECTION 4

# WATER SUPPLIES AND FIRE FLOW

### 4.00 General Requirements

IFC: 508

4.00-1 An approved water supply capable of supplying the required fire flow for fire protection shall be provided to premises upon which facilities, buildings or portions of buildings are constructed or moved into the jurisdiction after the effective date of these standards.

Exception: Up to 10 individual Group R-3 occupancies located on individual parcels more than one acre or in a planned building group, and not within 100 feet of another Group R-3 occupancy, shall not require an approved on-site fire protection water supply, provided there is an approved water supply within 2 miles measured in the shortest distance along approved public or private fire apparatus access roads.

Where a portion of a facility or building constructed or moved into the jurisdiction is more than 400 feet from a hydrant on a fire apparatus access road, as measured by approved route around the exterior of the facility or building, on-site fire hydrants and water mains shall be provided.

Exceptions:

1. For Group R-3 and U occupancies, the distance requirement shall be 600 feet.
2. For buildings equipped with an approved automatic sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, the distance requirement shall be 600 feet.

4.00-2 An approved water supply shall consist of reservoirs, pressure tanks, elevated tanks, water mains, natural or manmade watercourses with approved drafting sites, or other fixed system capable of providing the required fire flow Except as described in the Exception to 4.00-1, water supplies delivered by fire department tenders, tankers or other apparatus shall not be credited toward fire flow requirements.

4.00-3 When the nearest portion of a property under consideration is within 600 feet of municipal type water system, and the municipal type water system is capable of providing the required fire flow, the municipal type water system shall be extended to service the property on which the building or facility is located if approved by the owner or operator of the municipal type water system.

**4.01 Fire Flow Computational Methods**

**IFC: 508.3**

4.01-1 The method for determining fire flow requirements for buildings or portions or buildings and facilities located in **rural** areas shall be based on the method employed in NFPA 1142, "Standard on Water Supplies for Suburban and Rural Fire Fighting", as modified by these standards.

4.01-2 The method for determining fire flow requirements for buildings or portions or buildings and facilities located in **suburban** and **urban** areas shall be based on the tabular method employed in the *International Fire Code*<sup>®</sup> as modified by these standards.

**4.02 Fire Flow : Rural Areas**

**IFC: 508.3**

*For water supply and fire flow requirements in suburban and urban areas, refer to Section 4.03 and subsequent sections.*

Buildings or Facilities with No Exposure Hazards

4.02-1 For buildings or facilities with no exposure hazards, the minimum water supply, in gallons, shall be determined by the total cubic footage of the structure, including any attached structures, divided by the occupancy hazard classification number from below.

$$\text{Minimum Water Supply} = \frac{\text{Total Structure Volume}}{\text{Occupancy Hazard Classification}} \times \text{Construction Classification Number}$$

(total gallons)

**Table 4.02-1  
Occupancy Hazard Classifications**

Occupancy Hazard Classification	Description
3	Severe fire hazard occupancies. When an exposing structure is of occupancy hazard classification 3, it shall be considered an exposure hazard if within 50 feet, regardless of size.
4	High hazard occupancies. When an exposing structure is of occupancy hazard classification 4, it shall be considered an exposure hazard if within 50 feet, regardless of size.
5	Moderate hazard occupancies, in which the quantity or combustibility of contents is expected to develop moderate rates of spread and heat release. The storage of combustibles shall not exceed 12 feet in height.
6	Low hazard occupancies, in which the quantity or combustibility of contents is expected to develop relatively low rates of spread and heat release.
7	Light hazard occupancies, in which the quantity or combustibility of contents is expected to develop relatively light rates of spread and heat release.

4.02-2 The following examples are only for comparative and illustrative purposes to evaluate Occupancy Hazard Classifications as described in Table 4.02-1. The Fire Chief or Code Official shall have the authority to determine into which Occupancy Hazard Classification a building, structure or facility is placed.

**Table 4.02-2  
Occupancy Hazard Classification Examples**

<b>Class 3</b>	<b>Class 4</b>	<b>Class 5</b>	<b>Class 6</b>	<b>Class 7</b>	
Cereal or flour mills	Barns and stables (commercial)	Amusement occupancies	Automobile parking garages	Apartments	
Combustible hydraulics	Building materials supply storage	Clothing manufacturing plants	Bakeries	Colleges and universities	
Cotton picker and opening operations	Department stores	Cold storage warehouses	Barber or beauty shops	Clubs	
Die casting	Exhibition halls, auditoriums, and theaters	Confectionery product warehouses	Beverage manufacturing plants/breweries	Dormitories	
Explosives and pyrotechnics manufacturing and storage	Feed stores (without processing)	Farm storage buildings, such as corn cribs, dairy barns, equipment sheds, and hatcheries	Brick, tile, and clay product manufacturing plants	Dwellings	
Feed and gristmills	Freight terminals	Laundries	Canneries	Fire stations	
Flammable liquid spraying	Mercantile and retail sales and storage	Leather goods manufacturing plants	Cement plants	Fraternity or sorority houses	
Flow coating/dipping	Paper and pulp mills	Libraries (with large stockroom areas)	Churches and similar religious structures	Hospitals	
Hazardous materials storage or use	Paper processing plants	Lithography shops	Dairy products manufacturing and processing plants	Hotels and motels	
Manufactured homes/modular building assembly	Piers and wharves	Machine shops	Doctors' offices	Libraries (except large stockroom areas)	
Metal extruding	Repair garages	Metalworking shops	Electronics plants	Museums	
Plastic processing	Rubber products manufacturing and storage	Nurseries (plant)	Foundries	Nursing and convalescent homes	
Plywood and particle board manufacturing	Warehouses, such as those used for furniture, general storage, paint, paper, and woodworking industries	Pharmaceutical manufacturing plants	Fur processing plants	Offices (including data processing)	
Printing using flammable inks		Printing and publishing plants	Gasoline service stations	Police stations	
Rubber reclaiming		Restaurants	Glass and glass products manufacturing plants	Prisons	
Sawmills		Rope and twine manufacturing plants	Horse stables	Schools	
Solvent extracting		Textile manufacturing plants	Mortuaries	Theaters without stages	
Straw or hay in baled storage				Municipal buildings	
Textile picking				Post offices	
Upholstering with plastic foams				Slaughterhouses	
				Telephone exchanges	
				Wineries	

4.02-3 The construction classification number (value) in the formula shall be derived from the following table:

**Table 4.02-3  
Construction Classification Numbers**

<i>International Building Code</i> <sup>®</sup> Construction Type	Construction Classification Number
IA, IB	0.5
IIA, IIB	0.75
IIIA, IIIB	1.0
IV	0.75
VA, VB	1.5

4.02-4 Regardless of the results derived from the formula, the minimum water supply required for building or facility without exposure hazards shall not be less than 2000 gallons.

Buildings or Facilities with Exposure Hazards

4.02-5 For buildings or facilities with unattached structural exposure hazards, the minimum water supply, in gallons, shall be determined by the cubic footage of the structure, divided by the Occupancy Hazard Classification number (from Table 4.02-1), multiplied from the Construction Classification Number (from Table 4.02-3) and multiplied by 1.5.

$$\text{Minimum Water Supply} = \frac{\text{Total Structure Volume}}{\text{Occupancy Hazard Classification}} \times \text{Construction Classification Number} \times 1.5$$

(total gallons)

4.02-6 Regardless of the results derived from the formula, the minimum water supply required for buildings or facilities with exposure hazards shall not be less than 3000 gallons.

Structures with Automatic Sprinkler Protection

4.02-7 A separate fire protection water supply is not required when a building or facility in rural areas is protected by an automatic sprinkler system that meets the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, including water supplies for hose streams. Sprinkler systems designed and installed in accordance with NFPA 13-R, *“Automatic Sprinkler Systems for Multi-Family Residential Occupancies up to and Including Four Stories in Height”* shall not satisfy this requirement.

4.02-8 A separate fire protection water supply is not required when a Group R-3 occupancy in rural areas is protected by an automatic sprinkler system that meets the requirements of NFPA 13D, *Standard for the Installation of Sprinkler System in One- and Two-Family Dwellings and Manufactured Homes*.

**4.03 Fire Flow : Suburban and Urban Areas**

**IFC: 508.3**

*For water supply and fire flow requirements in rural areas, refer to Section 4.02.*

4.03-1 The required fire flow in amount and duration for buildings or facilities constructed in suburban and urban areas shall be derived from the following table with surcharges and credits as described in this section.

**Table 4.03-1  
Fire Flow and Duration**

Fire Flow Calculation Area (square feet)					Fire Flow (gpm)	Flow Duration (hours)
Construction Type						
IA & IB	IIA & IIIA	IV & VA	IIB & IIIB	VB		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701 - 30,200	12,701 - 17,000	8,201 - 10,900	5,901 - 7,900	3,601 - 4,800	1,750	
30,201 - 38,700	17,001 - 21,800	10,901 - 12,900	7,901 - 9,800	4,801 - 6,200	2,000	
38,701 - 48,300	21,801 - 24,200	12,901 - 17,400	9,801 - 12,600	6,201 - 7,700	2,250	
48,301 - 59,000	24,201 - 33,200	17,401 - 21,300	12,601 - 15,400	7,701 - 9,400	2,500	
59,001 - 70,900	33,201 - 39,700	21,301 - 25,500	15,401 - 18,400	9,401 - 11,300	2,750	3
70,901 - 83,700	39,701 - 47,100	25,501 - 30,100	18,401 - 21,800	11,301 - 13,400	3,000	
83,701 - 97,700	47,101 - 54,900	30,101 - 35,200	21,801 - 25,900	13,401 - 15,600	3,250	
97,701 - 112,700	54,901 - 63,400	35,201 - 40,600	25,901 - 29,300	15,601 - 18,000	3,500	
112,701 - 128,700	63,401 - 72,400	40,601 - 46,400	29,301 - 33,500	18,001 - 20,600	3,750	
128,701 - 145,900	72,401 - 82,100	46,401 - 52,500	33,501 - 37,900	20,601 - 23,300	4,000	4
145,901 - 164,200	82,101 - 92,400	52,501 - 59,100	37,901 - 42,700	23,301 - 26,300	4,250	
164,201 - 183,400	92,401 - 103,100	59,101 - 66,000	42,701 - 47,700	26,301 - 29,300	4,500	
183,401 - 203,700	103,101 - 114,600	66,001 - 73,300	47,701 - 53,000	29,301 - 32,600	4,750	
203,701 - 225,200	114,601 - 126,700	73,301 - 81,100	53,001 - 58,600	32,601 - 36,000	5,000	
225,201 - 247,700	126,701 - 139,400	81,101 - 89,200	58,601 - 65,400	36,601 - 39,600	5,250	
247,701 - 271,200	139,401 - 152,600	89,201 - 97,700	65,401 - 70,600	39,601 - 43,400	5,500	
271,201 - 295,900	152,601 - 166,500	97,701 - 106,500	70,601 - 77,000	43,401 - 47,400	5,750	
295,901 or more	166,501 or more	106,501 - 115,800	77,001 - 83,700	47,401 - 51,500	6,000	
--	--	115,801 - 125,500	83,701 - 90,600	51,501 - 55,700	6,250	
--	--	125,501 - 135,500	90,601 - 97,900	55,701 - 60,200	6,500	
--	--	135,501 - 145,800	97,901 - 106,800	60,201 - 64,800	6,750	
--	--	145,801 - 156,700	106,801 - 113,200	64,801 - 69,600	7,000	
--	--	156,701 - 167,900	113,201 - 121,300	69,601 - 74,600	7,250	
--	--	167,901 - 179,400	121,301 - 129,600	74,601 - 79,800	7,500	
--	--	179,401 - 191,400	129,601 - 138,300	79,801 - 85,100	7,750	
--	--	191,401 or more	138,301 or more	85,101 or more	8,000	

4.03-2 Where municipal type water systems are not capable of supplying the required fire flow, additional approved storage capacity to supplement the municipal type system shall be provided as approved by the Fire Chief or Code Official. The additional storage capacity may consist of tanks, reservoirs, cisterns, ponds or other fixed supply within 1000 feet of the nearest portion of the fire apparatus access roadway into subject property, measured along an approved fire apparatus access roadway.

**4.04 Fire Flow Surcharges**

**IFC: 508.3**

4.04-1 Required fire flow may be modified upward where conditions indicate an unusual susceptibility to group fires or conflagrations or as specified below. These modifications shall be made after credit for automatic sprinkler protection is applied.

4.04-2 Required fire flow shall be increased by 250 gallons per minute for each side of a building or structure that is within 20 feet of an exposure hazard, adjacent structure or property line.

Exception: The side facing a public street or road with a right-of-way at least 40 feet wide shall not be included as an exposure hazard.

4.04-3 Required fire flow shall be increased by 500 gallons per minute when the nature of the occupancy is unknown, or such that it contains any of the following hazardous operations or materials or similar processes or storage in excess of the maximum allowable amounts per control area:

**Table 4.04-3  
Hazardous Operations or Materials**

<b>Hazardous Material</b>	<b>Environment</b>
Aerosol products (Class 2 or 3)	Use, storage, handling or dispensing
Flammable or combustible liquid	Use, storage, handling or dispensing
Woodworking.	Any amount
Flammable or combustible paint	Spray, dipping or electrostatic operations
Hazardous materials	Use, storage, handling or dispensing
High-piled or rack storage	More than 500 sq. ft. of storage area
Combustible dust	Production
Combustible fibers	Use, storage, handling
Toxic or highly toxic materials	Use, storage, handling or dispensing
Compressed or liquefied flammable or oxidizing gases	Use, storage, handling or dispensing
Cryogenic or pyrophoric gases	Use, storage, handling or dispensing

**4.05 Credit for Automatic Sprinkler Systems**

**IFC: 508.3**

4.05-1 Fire flow credit for automatic sprinkler protection shall be granted only when the entire building or structure is protected by an approved automatic sprinkler system that meets the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*. Sprinkler systems designed and installed in accordance with NFPA 13-R, "*Automatic Sprinkler Systems for Multi-Family Residential Occupancies up to and Including Four Stories in Height*" shall not satisfy this requirement



Exception: There shall be no credit granted toward fire flow requirements when sprinklers are installed to protect hazardous operations or storage, or in any Group H or I occupancy as defined in the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup>.

4.05-2 Fire flow may be reduced by the following amounts when the building or structure is protected by an approved automatic sprinkler system and the construction type is:

**Table 4.05-2  
Sprinkler Credit Based on Construction**

<i>International Building Code</i> <sup>®</sup> <b>Construction Type</b>	<b>Allowable Reduction</b>
IA, IB	75%
IIA, IIIA	60%
IIB, IIIB	60%
IV, VA, VB	50%

4.05-3 In no case shall the fire flow be less than 1,500 gallons per minute after all surcharges and credits are applied.

**4.06 Fire Flow Calculations for Non-Structural Facilities IFC: 508.3**

4.06-1 Fire flow shall be provided for facilities in accordance with these standards. The quantity and duration shall be based on an engineering analysis performed by a qualified engineer, specialist, laboratory or fire safety specialty organization acceptable to the Fire Chief or Code Official. A written report of the engineering analysis shall be provided to the Fire Chief or Code Official.

**4.07 Fire Flow Calculations for Remodeled Buildings or Structures IFC: 508.3**

4.07-1 Existing buildings or structures undergoing renovation, remodel or repair where no building area is added shall not be subject to fire flow calculations, provided that the construction type and occupancy classification remain the same.



**4.10 Wet Hydrants**

**IFC: 508.2**

- 4.10-1 Wet hydrants shall be equipped with two 2½-inch outlets and one 6-inch outlet. Threads on 2½-inch fire hydrant outlets shall be American National Fire Hose Connection Screw Threads. The 6-inch outlet shall be equipped a 6- to 5-inch reducing adapter with a 5-inch Storz fitting and blind cap.
- 4.10-2 All fire hydrant outlets shall be equipped with protective caps or covers. The caps or covers shall be permanently attached by a chain or cable installed in accordance with manufacturer’s specifications.
- 4.10-3 Wet hydrants shall be provided with a reflective identification rod or “snow flag” as approved by the Fire Chief or Code Official.
- 4.10-4 Wet hydrant bonnets shall be painted to identify the available fire flow in accordance with the following table:

**Table 4.10-4(a)  
Hydrant Identification Colors**

<b>Available Flow in GPM</b>	<b>Bonnet Color</b>
Less than 500	Red
500 to 1000	Orange
1000-1499	Green
1500 or more	Light Blue

Colors shall be in accordance with the following table:

**Table 4.10-4(b)  
Color Selections**

<b>Color</b>	<b>Manufacturer</b>
Red	Duron Dura Clad DTM Safety Red
Orange	Duron Dura Clad DTM Safety Orange
Green	Duron Dura Clad DTM Safety Green
Light Blue	Duron Dura Clad DTM Dynamic Blue

**4.11 Dry Hydrants and Drafting Sites**

**IFC: 503.1.2**

- 4.11-1 Where fire flow water supplies are taken from draft such as a pond, lake, reservoir, swimming pool, manmade or natural watercourse or other approved open source, dry hydrants or drafting sites shall be installed in number and locations approved by the Fire Chief or Code Official.

4.11-2 Dry hydrants shall be designed in accordance with the specifications found in NFPA 1142, "Standard on Water Supplies for Suburban and Rural Fire Fighting" and as amended by these standards.

Dry hydrant system piping shall be supported and/or stabilized using approved engineering design practices. Thrust blocks, or equivalent protection, shall be employed at elbows and other system stress points.

In addition to strength of materials and structural support criteria, dry hydrant design shall address appropriate aggregates and soil materials to be used to backfill/cover piping during installation.

4.11-3 All dry hydrant systems shall be designed and constructed to provide a minimum flow of 1000 gpm at draft.

4.11-4 Dry hydrants shall be constructed of coated black iron, galvanized steel or polyvinyl chloride pipe. Only Schedule 40 or better pipe and component fittings shall be used. All connections shall be clean and the appropriate sealing materials shall be used according to manufacturer's specifications so as to ensure that all joints are airtight. System strainers shall be constructed to permit required fire flow, in accordance with approved engineering practices.

4.11-5 Dry hydrant systems shall be designed and constructed so that slope and piping configuration does not impede drafting capability.

4.11-6 All exposed surfaces and all underground metal surfaces shall be protected to prevent deterioration.

4.11-7 Subject to alternative engineering practices, no more than the equivalent of two 90-degree elbows shall be used in the total system.

4.11-8 Dry hydrant(s) shall be designed and constructed with a hose connection consisting of a 6-inch diameter National Standard Thread male fitting with blind cap.

4.11-9 Dry hydrants shall be installed with consideration of variable water levels. There shall be at least 2 feet of water above the strainer during low water level periods and 12 to 18 inches below the strainer depending on bottom condition of the body of water.

**4.12 Access to Dry Hydrants and Drafting Sites**

**IFC: 508.2**

- 4.12-1 Dry hydrants and drafting sites shall be located to be accessible under all weather conditions by fire apparatus weighing not less than 72,000 pounds.
- 4.12-2 Any dry hydrant or drafting site shall be positioned so fire apparatus can reach the dry hydrant or static water source with one 10-foot length of hard suction hose.
- 4.12-3 Dry hydrants shall have a minimum clearance of 20 feet on each side and be located a minimum of 40 feet from any structure. The dry hydrant location shall be arranged so public or private street or road traffic are not impaired during the use of the dry hydrant.
- 4.12-4 Dry hydrants shall be protected from vehicular damage and other perils, including freezing and damage from ice and other objects. (See **Section 7**.)
- 4.12-5 Dry hydrant and drafting site locations shall be visible from the main roadway during emergencies by reflective marking and signage approved by the authority having jurisdiction. All identification signs shall be approved by the highway authority prior to installation if they are to be located on the right-of-way or are subject to state laws
- 4.12-6 Drafting sites shall be provided with a level space immediately adjacent and contiguous to an approved fire apparatus access road. Drafting sites shall measure not less than 12 feet x 40 feet, with the long dimension parallel to the water source and be within 10 feet of the static water source. Drafting sites shall meet all other requirements of this section.

**4.13 Wet Hydrant Numbers and Placement**

**IFC: 508.2**

- 4.13-1 The minimum number and placement of wet fire hydrants for buildings and facilities shall be in accordance with Table 4.13-3 and this section.

Exception: The minimum number and placement of wet fire hydrants for residential subdivisions shall be in accordance with spacing requirements in Table 4.13-3 when applied to approved fire apparatus access roadways and perimeter public streets or roads from which fire operations may be conducted.

4.13-2 The number and distribution of fire hydrants shall be as follows:

**Table 4.13-3  
Number and Distribution of Fire Hydrants**

Fire Flow Required (gpm)	Minimum Number of Hydrants	Average Spacing between Hydrants (feet)	Maximum Distance from Any Point on Street or Road Frontage to a Hydrant
1,750 or less	1	500	250
1,751– 2,249	2	450	225
2,500 – 2,999	3	450	225
3,000 – 3,499	3	400	225
3,500 – 3,999	4	350	210
4,500 – 4,999	5	300	180
5,000 – 5,999	6	300	180
6,000 – 6,999	6	250	150
7,000 – 7,499	7	250	150
7,500 or more	8	200	120

4.13-3 The average spacing between hydrants shall be reduced by 100 feet on dead-end streets or roads.

4.13-4 The maximum distance from any point on a street or road frontage to a hydrant shall be reduced by 50 feet for dead-end streets or roads.

4.13-5 Where streets or divided entrances are provided which can be crossed by fire fighters pulling hose lines, or where arterial streets are provided with four or more traffic lanes and have an average traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street, and hydrants shall be arranged on an alternating sides of the street or divided entry.

4.13-6 In other than Group R-3 and U occupancies, there shall be at least one hydrant within 600 feet of the most remote portion of the first floor exterior wall providing openings into the building or structure.

4.13-7 For average conditions, hydrants shall be located at least 40 feet from a building or facility.

Exceptions:

1. When, in the opinion of the Fire Chief or Code Official, the materials or processes in a building or facility constitute a hazardous condition, hydrants shall be located at least 80 feet from the building or facility.

2. Where property lines, topography or other features prevent this spacing, hydrants may be located closer to the building or facility if, in the opinion of the Fire Chief or Code Official, suitable safeguards such as four-hour fire resistive walls without openings are provided to protect fire apparatus and fire fighters using the hydrant from radiant heat.

- 4.13-8 Fire hydrants shall be located within 6 feet of the edge of the pavement unless the Fire Chief or Code Official determines another location is more acceptable for fire department use. Where fire hydrants are installed along fire apparatus access roads, the area adjacent to the hydrant shall be paved to permit flowing or flushing the hydrant without creating property damage.
- 4.13-9 Fire hydrants shall be free from obstructions on all sides by a minimum clearance of 3 feet. Fire hydrants shall be visible for not less than 100 feet from all directions along an approved fire apparatus access road
- 4.13-10 When, in the opinion of the Fire Chief or Code Official, fire hydrants are installed in locations vulnerable to damage, vehicular protection shall be provided as required in these standards. (See Section 7.)

SECTION 5

**EMERGENCY ENTRY  
TO BUILDINGS OR FACILITIES**

**5.00 Key Boxes: General Requirements IFC: 506.1**

5.00-1 Key boxes for fire department access to individual buildings, structures, facilities or tenant spaces shall be in accordance with this section.

**5.01 Specifications IFC: 506.1**

5.01-1 Key boxes for fire department access shall be manufactured by Knox Company, 1601 Deer Valley Road, Phoenix, AZ 85027 or approved equal.

5.01-2 The key box master key shall be cut to the local fire company standard. The key box shall have a red reflective label as provided by the manufacturer.

5.01-3 Key boxes may be obtained from any vendor approved by the manufacturer.

5.01-4 The owner shall obtain written permission from the Fire Chief or Code Official prior to installing any key box. Documentation shall be in a form approved by the Fire Chief or Code Official.

**5.02 Occupancy Requirements IFC: 506.1**

5.02-1 Key boxes shall be provided for the following buildings, structures, facilities or occupancies:

- 1) Any Group R occupancy as defined by the *International Building Code*<sup>®</sup> or *International Fire Code*<sup>®</sup> except one- and two-family dwellings and individual dwelling units.
- 2) Buildings outfitted with fire protection systems such as sprinklers, fire alarms, standpipes, fire pumps, or range hood suppression systems.
- 3) Buildings or facilities containing hazardous materials in excess of the allowable amounts specified in the *International Fire Code*<sup>®</sup> or *International Building Code*<sup>®</sup>.
- 4) Self-service storage buildings where access to individual storage areas is through interior hallways or corridors.
- 5) Where, in the opinion of the Fire Chief or Code Official, rapid access for emergency medical services is required.

**5.03 Locations IFC: 506.1**

5.03-1 Key boxes shall be installed in the following locations:

- 1) Adjacent to the main entrance.



- 2) At the bottom of stairway enclosures exiting directly to the exterior of a building or structure more than 30 feet high from the lowest point of fire department access.
- 3) Adjacent to the exterior door providing access to the fire protection equipment rooms, electrical rooms or mechanical spaces when those doors are more than 100 feet from the main entrance measured in a route around the exterior of the building or structure.
- 4) On gates or barricades across fire apparatus access roads.
- 5) Where unusual conditions exist, the Fire Chief or Code Official may require key boxes at alternate locations.

5.03-2 Key boxes shall be installed adjacent to the hinge side of the door, within 5 feet of the door, and not more than 5 feet above grade.

5.03-3 Key boxes installed on gate posts shall be located on the post nearest the right hand driving lane and be mounted within 24 inches of the top of the post.

#### **5.04 Contents**

**IFC: 506.1**

5.04-1 The key box shall contain a grand master key to open doors or other access means at the following locations:

- 1) The main entrance,
- 2) Individual tenant spaces, except for self-service storage areas,
- 3) Rooms containing controls for any fire protection system or device, excluding portable fire extinguishers,
- 4) Rooms containing elevator, heating, ventilation, air conditioning, or other mechanical services,
- 5) Rooms containing main electrical service equipment,
- 6) Rooms or other areas where the Fire Chief or Code Official determines immediate access is necessary.

5.04-2 The key box also shall contain keys that operate elevator recall and emergency override systems (Phase I and II).

5.04-3 All keys shall be clearly marked as to which door, room, area, or lock they serve.

5.04-4 The key box shall contain a weather resistant card or similar document that includes the name, address and telephone numbers for 24-hour emergency contacts.

#### **5.05 Indemnification Agreement**

**IFC: 506.1**

5.05-1 An approved indemnification agreement holding the Fire Chief or Code Official or his designate harmless from damage or loss that may result from a lost or stolen key shall be signed by the property owner or person responsible for the premises, and a copy submitted to the fire department.

SECTION 6

**FIRE DEPARTMENT CONNECTIONS FOR FIRE PROTECTION SYSTEMS**

**6.00 General Requirements IFC: 912**

6.00-1 The fire department connection for any water-based fire protection system shall be in accordance with this section.

**6.01 Specifications IFC: 912**

6.01-1 The fire department connection for any water-based fire protection system shall be outfitted with a 5-inch diameter Storz fitting on a 30° elbow with blind cap. The cap shall be permanently attached by a chain or cable installed in accordance with manufacturer's specifications.

Exception: Fire department connections on water-based fire protection systems having a riser less than 3-inches in diameter may be a single 2½-inch female connection with American National Fire Hose Connection Screw Threads and listed thread plugs or breakaway caps. Thread plugs shall be permanently attached by a chain or cable installed in accordance with manufacturer's specifications.

**6.02 Location IFC: 912**

6.02-1 The fire department connection for any water-based system shall be located on the side of the building or facility facing the street.

Exception: Limited area or specialty systems protecting only a portion of the building or facility may have their fire department connection installed in a location approved by the Fire Chief or Code Official.

6.02-2 The fire department connection shall be located so it is within 75 feet of a wet or dry hydrant or drafting site, measured along an approved fire apparatus access roadway.

6.02-3 The fire department connection shall be located on the same side of any driveway or fire apparatus access road entrance as the wet or dry hydrant or drafting site so hose placement will not impede fire apparatus travel.

6.02-4 The fire department connection shall be installed so of the hose connection is between 18 and 30 inches above the finished grade at that point.

6.02-5 The fire department connection shall be located so building access or egress is not impeded by fire department hoses.

**6.03 Identification**

**IFC: 912.4**

6.03-1 The fire department connection shall be identified as to which portion of the fire protection system, building or facility it serves. A permanent sign that identifies the fire protection system, building or facility it serves shall be posted on the wall adjacent to or attached to the riser of a fire department connection. The sign shall have reflective letters not less than 1-inch high on a contrasting background.

**6.04 Access and Visibility**

**IFC: 912.4**

6.04-1 There shall be no landscaping, decorative features, or other obstructions within five feet of the fire department connection, and it shall be visible from the street or road nearest the connection.

## SECTION 7

# VEHICLE IMPACT PROTECTION

### 7.00 General Requirements

IFC: 312

7.00-1 Where vehicle impact protection is specified in these standards, it shall be designed and installed in accordance with the requirements of the *International Fire Code*<sup>®</sup> and these standards.

### 7.01 Specifications

IFC: 312

7.01-1 Motor vehicle impact protection shall be provided in accordance with the following:

Protective posts shall:

- 1) be 4-inch Schedule 40 or better steel posts set 36 inches deep in a concrete footing at least 15 inches in diameter. The inside of the posts also shall be filled with concrete.
- 2) be spaced not more than 4 feet apart on center.
- 3) be located at least 3 feet from the object they are protecting.
- 4) extend not less than 3 feet above ground.

SECTION 8

**PREMISES IDENTIFICATION**

**8.00 General Requirements IFC: 505.1**

8.00-1 All new buildings and facilities shall have approved address numbers, building numbers or approved identification placed in a location that is plainly visible from the street or road fronting the property and as in accordance with this section.

8.00-2 Where, due to distance or visual obstruction, building numbers are not visible from the street or road, an approved address number sign shall be provided on the public road adjacent to the driveway or access road leading to the building.

**8.01 Street or Road Signs IFC: 505.1**

8.01-1 All new public and private fire apparatus access routes shall be provided with approved street or road identification signs at each intersection in accordance with municipal standards and naming conventions.

8.01-2 All new street or road signs shall have reflective letters or numbers on a contrasting background.

**8.02 Specifications IFC: 505.1**

8.02-1 All premise identification letters, numbers, and symbols shall be a minimum of 4 inches in height with a 1/2-inch stroke, and shall be reflective and contrasting with their background and in accordance with this section.

8.02-2 Address numbers facing the fire apparatus access road or street shall be in accordance with the requirements of Table 8.02-2:

**Table 8.02-2  
Minimum Address Number or Letter Sizes**

<b>Occupancy Group and Division</b>	<b>Minimum Height (inches)</b>	<b>Minimum Stroke (inches)</b>
R-1 and R-2 , Building	12	2
R-1 and R-2 Exterior Doors*	4	1/2
R-1 and R-2 Interior Doors*	2	1/2
R-3 and R-4	4	1/2
A, B, E, I, M Building	12	2
A, B, E, I, M Tenant Units	4	1/2
F, H and S Building	24	4

F, H and S Tenant Units	4	½
U	6	½

\* For the purpose of this table, “interior” doors are those doors into a dwelling unit that are accessed from an interior corridor, “exterior” doors are those that open directly onto a parking lot, exterior exit balcony or fire apparatus access road.

8.02-3 Address numbers at least 4 inches in height and having a stroke of not less than ½-inch shall be provided on rear entry or access doors when required by the Fire Chief or Code Official.

8.02-4 Where address numbers are placed on clear glazing, the numbers shall be white.

**8.03 Driveway Identification for Multiple Group R-3 Occupancies IFC: 505.1**

8.03-1 Where more than one Group R-3 occupancy share a common driveway, each lane, individual driveway, cartway, cart path or similar access road off the common driveway shall be provided with a clearly marked sign with letters not less than 4 inches in height and having a stroke of not less than ½-inch. The sign shall be visible from the common driveway.

SECTION 9

**REFERENCE STANDARDS**

American Association of State Highway and Transportation Officials *Standard Specification for Highway Bridges*, HB-17-2002.

NFPA 13, "Automatic Sprinkler Systems," 2002 Edition

NFPA 13-D, "Automatic Sprinkler Systems for One- and Two-Family Dwellings and Manufactured Homes," 2002 Edition

NFPA 13-R, "Automatic Sprinkler Systems for Multi-Family Residential Occupancies up to and Including Four Stories in Height" 2002 Edition

NFPA 22, "Water Tanks for Private Fire Protection," 2003 Edition

NFPA 24, "Private Fire Services Mains and Their Appurtenances," 2002 Edition

NFPA 1141, "Standard for Fire Protection in Planned Building Groups", 2003 edition

NFPA 1142, "Standard on Water Supplies for Suburban and Rural Fire Fighting", 2007 Edition

NFPA 1144, "Standard for Protection of Life and Property from Wildfire", 2002 Edition

NFPA 1963, Fire Hose Connections," 2003Edition