CHAPTER 5
FIRE SERVICE FEATURES

SECTION 501
GENERAL

501.1 Scope.
Fire service features for buildings, structures and premises shall comply with this chapter.

501.2 Permits.
A permit shall be required as set forth in Sections 105.6 and 105.7.

501.3 Construction documents.
Construction documents for proposed fire apparatus access, location of fire lanes, security gates/barriers across fire apparatus access and construction documents and hydraulic calculations for fire hydrant systems shall be submitted to the fire department for review and approval prior to construction.

501.4 Timing of installation.
When fire apparatus access roads or a water supply for fire protection is required to be installed, such protection shall be installed and made serviceable prior to and during the time of construction except when approved alternative methods of protection are provided. Temporary street signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles in accordance with Section 505.5.

SECTION 502
DEFINITIONS

502.1 Definitions.
The following terms are defined in Chapter 2:

ADDRESS DIRECTORIES

AGENCY.

ALTERNATIVE SURFACE ACCESS ROADS

CONTROLLED ACCESS GATES / SECURITY GATES/Barriers
SECTION 503
FIRED APPARATUS ACCESS ROADS

503.1 Where required.
Fire apparatus access roads shall be provided and maintained in accordance with Sections 503.1.1 through 503.1.3.

The Phoenix Fire Department is the only authority authorized to designate a fire apparatus access road.

503.1.1 Buildings and facilities.
Approved fire apparatus access roads shall be provided for every facility, building or portion of a building hereafter constructed or moved into or within the jurisdiction. The fire apparatus access road shall comply with the requirements of this section and shall extend to within 200 feet (60 960 mm) 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.

Exception: The fire code official is authorized to increase the dimension to 350 feet (106 680 mm) where one or more of the following apply:

1. The building is equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3.

2. Fire apparatus access roads cannot be installed because of location on property, topography, waterways, nonnegotiable grades or other similar conditions, and an approved alternative means of fire protection is provided.
3. There are not more than two Group R-3 or Group U occupancies.

4. The building is equipped with an automatic standpipe system in accordance with Section 905.

503.1.2 Additional access and obstructions to access.
The fire code official is authorized to require more than one fire apparatus access road based on the potential for impairment of a single road by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

503.1.2.1 Fences.
When installed fences cause the distances from an approved fire department access road to exceed the maximum distance allowed in Section 503, a pedestrian gate shall be provided in the fence to maintain the required fire department access. The gate shall be a minimum 4 feet (1219 mm) in width and be equipped with a key box in accordance with Section 506.

503.1.2.2 Other obstructions to access.
When other obstructions are installed that cause the distances from an approved fire department access road to exceed the maximum distance allowed in Section 503, the Fire Code Official is authorized to require additional fire protection as specified in Section 901.4.3.

503.1.2.3 Pedestrian gates.
Pedestrian gates installed as part of the required fire department access shall comply with Section 511.1.3.1.

503.1.3 High-piled storage.
Fire department vehicle access to buildings used for high-piled combustible storage shall comply with the applicable provisions of Chapter 32.

503.2 Specifications.
Fire apparatus access roads shall be installed and arranged in accordance with Sections 503.2.1 through 503.2.8.

503.2.1 Dimensions.
Fire apparatus access roads shall have an unobstructed width of not less than 20 feet (6096 mm), exclusive of shoulders, except for approved security gates in accordance with Section 503.6 and an unobstructed vertical clearance of not less than 14 feet (4267 mm).

503.2.2 Authority.
The fire marshal shall have the authority to require an increase in the minimum access widths where they are inadequate for fire or rescue operations.

503.2.3 Surface.
Fire apparatus access roads shall be designed and maintained to support the imposed live load of 70,000 pounds (31 751 kg) with a maximum axle load of 28,000 pounds (12 715 kg). Fire apparatus access roads shall be provided and maintained with all-weather driving capabilities surface. When a surface other than paving is used for a fire apparatus access road, it shall comply with Section 503.7.
503.2.4 Turning radius.
Fire apparatus access roads shall have a minimum 45-foot (13,716 mm) centerline radius [35-foot (10,668 mm) inside radius, 55-foot (16,764 mm) outside radius] on curves (see Appendix D).

503.2.5 Dead ends.
Dead-end fire apparatus access roads in excess of 200 feet (60,960 mm) in length shall terminate in an approved turnaround at the end of the fire apparatus access road (see Appendix D).

503.2.6 Bridges and elevated surfaces.
Where a bridge or an elevated surface is part of a fire apparatus access road, the bridge shall be constructed and maintained in accordance with AASHTO HB-17. Bridges and elevated surfaces shall be designed for a live load sufficient to carry the imposed loads of fire apparatus 70,000 pounds (31,751 kg) with a maximum axle load of 28,000 pounds (12,712 kg). Vehicle load limits shall be posted at both entrances to bridges when required by the fire code official. Where elevated surfaces designed for emergency vehicle use are adjacent to surfaces which are not designed for such use, approved barriers, approved signs or both shall be installed and maintained when required by the fire code official.

503.2.7 Grade.
The grade of the fire apparatus access road shall not exceed 15 percent [15 feet in 100 feet (4,572 mm in 30,480 mm)]. Cross-slope of an access road shall not exceed a depth of 6 inches (152 mm).

503.2.8 Angles of approach and departure.
The angles of approach and departure for fire apparatus access roads shall be within the limits established by the fire code official based on the fire department's apparatus.

503.2.9 Drainage.
Water drainage shall be directed away from or piped under the fire apparatus access roads. Ponding of water on an access road shall not exceed a depth of 6 inches (152 mm).

503.2.10 Stabilized edge.
A stabilized edge meeting Maricopa Association of Governments standards or equivalent is required on fire apparatus access roads.

503.2.11 Loading areas and passenger drop-off areas.
On private property, where fire apparatus access roads are utilized for loading or unloading or are utilized for passenger drop off or pickup, an additional 8 feet of width shall be added to the fire apparatus access road. This width is in addition to the minimum 20-foot (6,096 mm) access road width exclusive of shoulders. Fire apparatus access roads established and approved per Phoenix Fire Department or Planning and Development Department site plan prior to the effective date of this code are not required to be widened if maintained and marked in accordance with this chapter.

503.2.12 Vehicle passing points.
When fire department access roads exceed 300 feet (91,440 mm) in length, vehicle passing points shall be installed at intervals not to exceed 300 feet (91,440 mm). Vehicle passing
points shall be a minimum of 30 feet (9144 mm) in width exclusive of shoulders and 50 feet (15 240 mm) in length.

**Exception:** When code compliant fire lanes are continuous through a property leading to an approved exit point, no passing points are required.

**503.3 Alternative surface fire apparatus access roads.**
*Alternative surface fire apparatus access roads* shall be in accordance with this section and sections 503.2 and 503.7 through 503.7.7.

The surface of *fire apparatus access roads* may differ from the above requirements if it is shown that the surface provided is sufficient to support an imposed live load of 70,000 pounds (29 964 kg) with a maximum axle load of 28,000 pounds (12 712 kg). An engineer registered by the State of Arizona shall prepare and seal the soil compaction report. The report shall be available for review by the *fire code official*.

**503.3.1 Report.**
*Alternative surface fire apparatus access roads* shall be designed by an engineer registered by the State of Arizona. The engineer shall prepare a sealed design report for submittal to and approval by the fire department. Plans shall be sealed and submitted with the report also see section 501.3.

**503.3.2 Stabilization.**
Stabilization of the *fire apparatus access road* surface shall be addressed in the *alternative surface fire apparatus access road* report and may be accomplished by curbing.

At a minimum, the surface of *fire apparatus access roads* shall be as follows:

1. Minimum 6 inches (152 mm) of native soil compacted to 95 percent of standard proctor density (ASTM D 698), and

2. Minimum 4 inches (102 mm) of aggregate base compacted to 100 percent of standard proctor density (ASTM D 698).

The surface of *fire apparatus access roads* may differ from the above requirements if it is shown that the surface provided is sufficient to support an imposed live load of 70,000 pounds (29 964 kg) with a maximum axle load of 28,000 pounds (12 712 kg). An engineer registered by the State of Arizona shall prepare and seal the soil compaction report. The report shall be available for review by the Fire Code Official.

**503.3.3 Compaction.**
Minimum 95 percent compaction of sub-grade soil is required.

**503.3.4 Curbs.**
A rolled curb shall be installed at the entrances to *fire apparatus access roads*. See Chapter 80 Referenced Standards for Maricopa Association of Government Standards with City of Phoenix supplements.

**503.3.5 Marking.**
The curb shall be painted red or red reflectors shall be installed to define the width of alternative surface *fire apparatus access roads*. The reflectors shall be imbedded into bordering curbing at intervals not exceeding 25 feet (4572 mm) (see Appendix D).

503.3.6 Special inspections.
An Arizona-registered professional engineer shall conduct a special inspection prior to final approvals being issued for the alternative surface fire apparatus access road (see Chapter 1).

503.3.7 Special inspection documentation.
The special inspection documentation shall include, but not be limited to, the following:

1. Subgrade soil compaction report.
2. Base material quality, thickness and compaction.
3. Concrete depth and compressive strength, when applicable.
4. An evaluation of the installation in accordance with design drawings and manufacturer specifications.
5. Crown and drainage requirements.
6. Stabilization (if curbing is not used).

503.4 *Fire apparatus access roads during construction.*
Fire department access during construction shall comply with this section.

503.4.1 Required access.
Fire apparatus access is required within 200 feet (60960mm) of all points on the exterior of the building. *Fire apparatus access roads* shall be provided prior to introducing combustible materials on the construction site.

*Fire apparatus access roads* on construction sites shall not be obstructed.

503.4.2 Width.
*Fire apparatus access roads* shall be a minimum of 20 feet (60960 mm) in width.

503.4.3 Surface.
At a minimum, the surface of *fire apparatus access roads* shall be as follows:

1. Minimum 6 inches (152 mm) of native soil compacted to 95 percent of standard proctor density (ASTM D 698), and

2. Minimum 4 inches (102 mm) of aggregate base compacted to 100 percent of standard proctor density (ASTM D 698).

The surface of *fire apparatus access roads* may differ from the above requirements if it is shown that the surface provided is sufficient to support an imposed live load of 70,000 pounds (31751kg) with a maximum axle load of 28,000 pounds (12712kg). An engineer registered by the State of Arizona shall prepare and seal the soil compaction report. The report shall be available for review by the fire code official.
503.4.4 Stabilization.
Curbs are not required for fire apparatus access roads for sites under construction.

503.4.5 Turning radius.
Fire apparatus access roads shall have a minimum 45-foot (13 716 mm) center line radius [35-foot (10 668 mm) inside radius, 55-foot (16 764 mm) outside radius] on curves (see Appendix D).

503.4.6 Dead ends.
Dead-end fire apparatus access roads in excess of 200 feet (60 960 mm) in length shall terminate in an approved turnaround as shown in Appendix D.

503.4.7 Drainage.
Water drainage shall be directed away from the fire apparatus access road.

503.5 Marking.
Where required by the fire code official, approved signs or other approved notices or markings that include the words NO PARKING—FIRE LANE shall be provided for fire apparatus access roads to identify such roads or prohibit the obstruction thereof. The means by which fire lanes are designated shall be maintained in a clean and legible condition at all times and be replaced or repaired when necessary to provide adequate visibility.

503.3.1 Fire lane signs.
Fire apparatus access roads shall be identified by fire lane signs as follows also see Appendix D:

1. Signs shall be attached to an approved stationary pole set in concrete a minimum of depth of 18 inches (457 mm).

2. The bottom of each sign shall be 7 feet (2137 mm) above grade.

3. Signs shall face oncoming traffic.

4. Signs shall be set back from the curb line or sidewalk a minimum of 12 inches (305 mm) to a maximum of 18 inches (457 mm).

5. Signs shall be plainly visible at all times. Vegetation or other obstructions shall be located such that a minimum 3-foot (914 mm) clearance is maintained along the line of sight.

6. Spacing of signs and marking of curbs shall be as follows:

   6.1. A sign shall be installed a maximum of 15 feet (4572 mm) from the beginning and end of the fire lane.

   6.2 When spacing between signs is less than or equal to 75 feet (22 860 mm), the curb on the sign side of the fire lane shall be painted red (see Appendix D).

   6.3 When spacing between signs exceeds 75 feet (30 480 mm), curb on the sign side of the fire lane shall be painted red and stenciled “FIRE LANE --NO PARKING” midway between signs (see Appendix D).
6.4 Spacing between signs shall not exceed 100 feet (30 480 mm).

6.5 Fire lane marking on bull-nose or islands shall have one double-faced sign located in the center and the curb painted red (see Appendix D).

503.5.2 Curbs.
Fire apparatus access roads shall be identified by curbs painted red on both the top and face along the entire length of the fire apparatus access road. Where no curb exists or a rolled curb is installed, a 6-inch (152 mm) wide red stripe applied the full length of the fire apparatus access road shall be installed.

503.5.3 Stenciling.
The fire department is authorized to require stenciling or other permanent markings to improve the identification of fire apparatus access roads. When required, the stenciling shall state “FIRE LANE NO PARKING.” Lettering shall be white on a red painted curb and shall be a minimum of 3 inches (76 mm) high with ½ inch (13 mm) brush stroke (see Appendix D).

503.5.4 Marking not required.
A fire apparatus access road that is greater than 36 feet (10 973 mm) in width shall not be required to have signs and red painted curbs on either side of the fire apparatus access road.

503.5.5 Signs required on both sides of a road.
When a fire apparatus access road is less than 28 feet (8534 mm) in width, fire lane signs and red painted curbs are required on both sides of the fire apparatus access road.

Fire apparatus access roads serving only Group R-3 occupancies are required to have signs and red painted curbs installed on both sides of the road when they are 20 feet (6096 mm) or less in width.

503.5.6 Signs required on one side of road.
When a fire apparatus access road is 28 feet (8534 mm) or greater and less than or equal to 36 feet (10 973 mm) in width, fire lane signs and red painted curbs are required to be installed on a minimum of one side of the access road.

Fire apparatus access roads serving only Group R-3 occupancies require signs and red painted curbs on a minimum of one side of the fire apparatus access road when it is greater than or equal to 20 feet (6096 mm) and less than or equal to 28 feet (8534 mm) in width.

503.5.7 Maintenance of fire apparatus access roads.
Fire apparatus access roads shall be maintained by the owner at all times. Faded, damaged or vandalized signs and painted curbs shall be replaced with approved signs and posts or repainted.

503.6 Obstruction of fire apparatus access roads.
Fire apparatus access roads shall not be obstructed in any manner, including the parking of vehicles. The minimum widths and clearances established in Section 503.2.1 shall be maintained at all times.
503.6.1. **Traffic calming devices.**
Traffic calming devices shall be prohibited unless approved by the fire code official and coordinated with the City of Phoenix Streets Department.

503.7 **Required gates or barricades.**
The fire code official is authorized to require the installation and maintenance of gates or other approved barricades across fire apparatus access roads, trails or other accessways, not including public streets, alleys or highways. Electric gate operators, where provided, shall be listed in accordance with UL 325. Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F 2200.

503.7.1 **Secured gates and barricades.**
When required, gates and barricades shall be secured in an approved manner. Roads, trails and other access ways that have been closed and obstructed in the manner prescribed by Section 503.5 shall not be trespassed on or used. Locks, gates, doors, barricades, chains, enclosures, signs, tags or seals which have been installed by the fire department or by its order or under its control shall not be removed, unlocked, destroyed or tampered with in any manner.

**Exception:** The restriction on use shall not apply when authorized by the fire code official or public officers acting within the scope of duty.

503.8 **Security gates.**
The installation of security gates across a fire apparatus access road shall be approved by the fire code official. Where security gates are installed, they shall have an approved means of emergency operation. The security gates and the emergency operation shall be maintained operational at all times. Electric gate operators, where provided, shall be listed in accordance with UL 325. Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F 2200.

503.8.1 **Chains.**
Chains alone across a fire apparatus access road are prohibited.

---

**SECTION 504**
**ACCESS TO BUILDING OPENINGS AND ROOFS**

504.1 **Required access.**
Exterior doors and openings required by this code or the International Building Code shall be maintained readily accessible for emergency access by the fire department. An approved access walkway leading from fire apparatus access roads to exterior openings shall be provided when required by the fire code official.

Key boxes, keys, toggle switches and padlocks required for fire department access shall be in accordance with Section 506 and Chapter 10.

504.2 **Maintenance of exterior doors and openings.**
Exterior doors and their function shall not be eliminated without prior approval. Required exterior doors shall have a key cylinder or other means to be opened from the exterior. Exterior doors that have been rendered nonfunctional and that retain a functional door exterior appearance shall have a sign affixed to the exterior side of the door with the words THIS DOOR BLOCKED.
The sign shall consist of letters having a principal stroke of not less than 3/4 inch (19.1 mm) wide and at least 6 inches (152 mm) high on a contrasting background. Required fire department access doors shall not be obstructed or eliminated. Exit and exit access doors shall comply with Chapter 10. Access doors for high-piled combustible storage shall comply with Section 3206.6.1.

504.3 Stairway access to roof.
New buildings four or more stories above grade plane, except those with a roof slope greater than four units vertical in 12 units horizontal (33.3-percent slope), shall be provided with a stairway to the roof. Stairway access to the roof shall be in accordance with Section 1009.13. Such stairway shall be marked at street and floor levels with a sign indicating that the stairway continues to the roof. Where roofs are used for roof gardens or for other purposes, stairways shall be provided as required for such occupancy classification.

SECTION 505
PREMISES IDENTIFICATION

505.1 Address identification.
New and existing buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. Where required by the fire code official, address numbers shall be provided in additional approved locations to facilitate emergency response. Address numbers shall be Arabic numbers or alphabetical letters. Numbers shall be a minimum of 4 inches (101.6 mm) high with a minimum stroke width of 0.5 inch (12.7 mm) on a contrasting background. Where access is by means of a private road and the building cannot be viewed from the public way, a monument, pole or other sign or means shall be used to identify the structure. Address numbers shall be maintained.

505.2 Premise identification for residential occupancies.
Premise identification for residential occupancies shall be in accordance with Section 505.

505.2.1 Single-family homes.
The address numbers for single-family homes that are Group R-3 occupancies shall be a minimum of 3 inches (74 mm) high, with a minimum 3/8-inch (9.53 mm) brush stroke on a contrasting background.

505.2.2 Address marking of multifamily residential occupancies other than Group R-3 occupancies.
The address, individual building, spread, and dwelling numbers in other than Group R-3 occupancies shall be in accordance with Sections 505.2.2.1 through 505.2.2.6.

505.2.2.1 Building or site address.
The street address numbers shall be a minimum 12 inches (305 mm) high with a minimum 2-inch (51 mm) wide brush stroke on contrasting color. For buildings less than 100 feet (30 480 mm) long, a minimum of one address shall be provided. For buildings greater than 100 feet (30 480 mm) in length, the address is required in a minimum of two places. Each building in a complex shall display its own identification.

505.2.2.2 Building identification numbers.
Each building shall display its specific alphabetical or numerical designation which must be clearly visible from the fire apparatus access road. The building identification numbers shall be a minimum of 18 inches (457 mm) high with a minimum 3-inch (76 mm) brush stroke on contrasting color. For buildings less than 100 feet (30 480 mm) long, a minimum of one building identification number per building shall be provided. The building identification number is required to be internally or externally illuminated.

505.2.2.3 Spread numbers.
Spread numbers shall be provided adjacent to the building identification numbers to indicate the apartment or unit numbers by floors in the building. Spread numbers shall be a minimum of 7 inches (178 mm) high with a 1-inch (25 mm) brush stroke on a contrasting background. The spread numbers are required to be internally or externally illuminated.

505.2.2.4 Unit identification at entrances.
When more than one dwelling or unit is accessed from an entrance, a spread plate is required (see Appendix D).

505.2.2.5 Apartment or unit numbers.
Individual apartment or unit numbers shall be a minimum 4-inch high with a minimum 3/8- inch (9.52 mm) brush stroke on a contrasting background.

505.2.2.6 Additional unit identification signs.
Where a building is not visible from the fire apparatus access road, a directional sign indicating the location of the unit is required (see Appendix D for sign specifications).

505.3 Premise identification for commercial buildings.
Commercial buildings less than 200 feet (60 960 mm) long and less than 100 feet (30 480 mm) from the road shall be identified with building address numbers that are a minimum of 12 inches (305 mm) high with a minimum 2-inch (51 mm) brush stroke on contrasting background. The address shall be visible from all access directions.

When buildings are more than 200 feet (60 960 mm) long or set back from the road more than 100 feet (30 480 mm) they shall be identified with building address numbers that are a minimum of 24 inches (610 mm) high with a 4-inch (102 mm) brush stroke of a contrasting color.

When buildings are greater than 500 feet (152 400 mm) in length, the number and address shall be provided in a minimum of two locations. When buildings have multiple access points, numbers and addresses shall be provided at each access point.

505.3.1 Multitenant commercial buildings. Individual tenant spaces in multitenant commercial buildings shall have their address or suite number posted at the front entrance and rear access doors. This number shall be a minimum of 6 inches (152 mm) high with a 1-inch (25 mm) brush stroke on a contrasting background.

505.3.2 Multiple buildings at a single address. Each building shall display its specific alphabetical or numerical designation that shall be clearly visible from the fire apparatus access road (see Section 505.2.1 for minimum letter height and brush stroke requirements).

505.4 Address directories.
505.4.1 When required.
An approved address directory shall be provided at properties containing any one of the following:

1. More than one principal building.

2. Buildings with unit identification numbers that are randomly numbered or sequenced.

3. When, in the opinion of the fire marshal, emergency response may be delayed due to the physical layout of the complex.

505.4.2 Specifications.
Address directories shall be constructed and installed in accordance with this section and Appendix D.

505.4.3 Dimensions.
The number of buildings in the complex shall determine the minimum dimensions of the directory. Minimum directory dimensions shall be as follows:

1. Complexes containing 12 or fewer buildings require a minimum 3 by 3 feet (914 by 914 mm) [9 square feet (0.836 m²)] site directory.

2. Complexes containing 13 to 30 buildings require a minimum 4 by 4 feet (1219 by 1219 mm) [16 square feet (1.486 m²)] site directory.

3. Complexes containing 31 or more buildings require a minimum 5 by 5 feet (1524 by 1524 mm) [(25 square feet (2.323 m²)] site directory. Stanchions or supports shall not be included in the 5 by 5 feet (1524 by 1524mm) required size of the directory.

505.4.4 Framing.
Framing materials shall not encroach upon the directory face by more than 1½ inches (39 mm).

505.4.5 Protection.
The directory shall be protected against vandalism and disfigurement by a clear polycarbonate cover, which shall have a minimum thickness of 1/8 inch (3.17 mm), and be sealed to protect the directory from weather.

505.4.6 Illumination.
Address directories shall be internally illuminated utilizing white light.

505.4.7 Installation requirements.
Support posts or stanchions shall be set in concrete. Directories with dimensions of 3 by 3 feet (914 by 914 mm) [9 square feet (0.836 m²)] shall be mounted with the bottom of the directory not less than 36 inches (914 mm) above grade.

Directories with dimensions of 4 by 4 feet (1219 by 1219 mm ) [16 square feet (1.486 m²)] and 5 by 5 feet (1524 by 1524 mm) [25 square feet (2.32 m²)] shall be mounted with the bottom of the directory not less than 24 inches (610 mm) above grade.

505.4.8 Depictions.
All depictions must be clear, easily understood, and legible at a distance of 8 feet (2438 mm). The directory shall depict structures, building numbers, units, apartment or space numbers, tennis courts, swimming pools, elevators, driveways, streets, laundry rooms, fire hydrants, fire apparatus access roads and other features as determined by the fire department. The depictions shall comply with the following:

1. Directories shall be a dark print on a contrasting light background. Buildings shown on the directory shall not be the same color as other features indicated on the directory.

2. The name and address of the complex are required and shall not exceed 10 percent of the total size of the site directory.

3. Swimming pools, canals, and waterway areas shall be translucent blue.

4. Tennis courts shall be translucent green.

5. Fire hydrants shall be a \(\frac{1}{4}\)-inch (6.35 mm) diameter black circle filled in with a translucent yellow center. The abbreviation “HYD” must be affixed by the location of the fire hydrant on the directory.

6. The directory shall be properly oriented to the viewer with a red dot that is 1-inch (25 mm) in diameter, with the words “YOU ARE HERE” affixed at the appropriate location on the directory.

7. A north arrow shall be included in the upper-right quadrant of the directory. The arrow shall be a minimum of 3 inches (76 mm) in length with a minimum 1-inch (25 mm) brush stroke.

8. Interior fire apparatus access roads, where provided, shall be marked on the directory with red cross-hatching.

### 505.4.9 Setbacks.

The directory shall be installed on the occupancy’s property, at locations approved by the fire department. Placement of the address directory shall be as follows:

1. The directory shall be set back from the street or curbing at least 25 feet (7620 mm) to allow emergency vehicles to clear the public right-of-way.

2. Shall not exceed a distance of 4 feet (1219 mm) from the edge of the fire apparatus access road facing the direction of oncoming traffic.

3. Shall not conflict with traffic visibility zones as provided for by other ordinances.

4. Shall be immediately visible and free from obstructions including architectural design and landscaping.

### 505.4.10 Prohibitions.

Information such as advertising or additional art work shall not be allowed on the address directory.

### 505.4.11 Maintenance.
All premise identification shall be maintained clearly visible and free from obstructions, including landscaping.

505.5 Street or road signs.
Streets and roads shall be identified with approved signs. Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles. Signs shall be of an approved size, weather resistant and be maintained until replaced by permanent signs.

SECTION 506
KEY BOXES

506.1 Where required.
Where access to or within a structure or an area is restricted because of secured openings or where immediate access is necessary for life-saving or fire-fighting purposes, the fire code official is authorized to require a key box to be installed in an approved location. The key box shall be of an approved type listed in accordance with UL 1037, and shall contain keys, toggle switch or other devices to gain necessary access as required by the fire code official.

When a building, other than Group R-3 occupancies, is monitored off-site for security, fire, or other service that notifies the fire department, a key box shall be installed in an accessible location.

Card access, magnetic locks and electronic type locks on ingress/egress control doors that are required for firefighter access within suites and buildings are required to unlock upon fire alarm, other than manual pulls. Electric strikes shall release unless keys are provided in accordance with section 506.1.4 and free exit is provided in accordance with section 1008.1.3.4.

506.1.1 Height.
The key box shall be mounted between 4 to 5½ feet (1219 mm to 1677 mm) above grade.

506.1.2 Visibility.
The key box shall be illuminated to be immediately visible to fire personnel from the emergency apparatus. Posts, fences, vehicles, growth, trash, storage, and other materials shall not be placed or kept near key boxes in a manner that would prevent the key boxes from being immediately discernible.

506.1.3 Marking of keys for fire department access.
Each key shall be provided with a water-resistant tag and color-coded to identify its function as follows:

1. Green for access gates.
2. Yellow for elevators.
3. Red for the Fire Command Center.
4. Blue for keys related to water access (e.g., gates to swimming pools).
5. White for master keys.

Keys that are required to access secured areas for a function not listed above, shall be provided with water-resistant tags. The tags shall be marked in a contrasting color with the key’s function and room number. The terminology used to mark the tags shall provide immediate understanding as to the key function.

**506.1.4 Number of sets of keys.**
All keys shall be provided in full sets a minimum of three sets for access shall be provided. Buildings with stairways shall provide 3 sets per stairway. Buildings with elevators shall provide three sets per fire service designated elevator.

**506.2 Key box maintenance.**
The operator of the building shall immediately notify the fire code official and provide the new key when a lock is changed or rekeyed. The key to such lock shall be secured in the key box.

**506.3 Locks.**
An approved lock shall be installed on gates or similar barriers when required by the fire code official.

**506.4 Swimming pool gates.**
All swimming pool pedestrian access gates in multi-family and commercial occupancies that are locked shall be provided with an approved key box in accordance with Section 506. If a card reader system is installed, a key box with toggle switch must be installed.

**SECTION 507**

**FIRE PROTECTION WATER SUPPLIES**

**507.1 Required water supply.**
An approved water supply capable of supplying the required fire flow for fire protection shall be provided to premises prior to combustibles being on site upon which facilities, buildings or portions of buildings are hereafter constructed or moved into or within the jurisdiction. Water supplies for manual fire suppression and fire hydrants shall be in accordance with Appendix B.

**507.1.1 Required water supply.** 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 hereafter constructed or moved into or within the jurisdiction.

**507.1.2 Minimum standards.**
When a water supply for fire protection is not available from the City of Phoenix, or if the flow rate, pressure, or duration of the water supply available from the city does not meet the minimum requirements of this code, the owner shall be responsible for installing all of the infrastructure required to meet the fire flow, pressure, and duration requirements of this code.

**507.1.3 Failure to provide water supply.**
Failure to provide the required water supply necessary for fire protection shall be considered a hazard to life or property and is subject to enforcement under section 104 of this code.

507.1.4 Design information required.
Plans, hydraulic calculations, and specifications shall be submitted to the fire code official for review and approval prior to installation of the on-site water supply system. Underground fire main systems shall be installed in accordance with NFPA 24, *Private Fire Service Mains and Their Appurtenances*. Water tank installations shall be in accordance with NFPA 22, *Water Tanks for Private Fire Protection*. Fire pumps shall be installed in accordance with NFPA 20, *Standard for Water Tanks for Private Fire Protection*.

**Exception:** Public water distribution mains approved by the City of Phoenix Water Services Department.

507.2 Type of water supply.
A water supply shall consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow. Components of such installations are required to be listed or approved for the intended use and installed in accordance with the appropriate nationally recognized standard.

507.2.1 Private fire service mains.
Private fire service mains and appurtenances shall be installed in accordance with NFPA 24.

507.2.1.1 Hydraulic calculations.
Calculations shall be submitted to verify the private fire service main(s) will provide the minimum required fire flow, as determined by section 507.3, to the hydraulically most demanding on-site hydrants with the water supply that is available to the system.

507.2.1.2 System flow requirement.
The minimum required fire flow rate shall be calculated using 1,000 gpm (4546 L) increments starting at the hydraulically most-demanding hydrant. An additional 1,000 gpm (4546 L), or remainder of the required fire flow, as determined by section 507.3 shall be added at each successive hydrant until the minimum required fire flow has been reached.

507.2.1.3 System pressure requirement.
A minimum 20 psi (138 kPa) residual pressure shall be maintained in the system. All pressure losses in the system including friction loss through pipe and fittings and changes in elevation shall be accounted for from the hydraulically most demanding hydrant(s) back to the location of the water flow test that was used to determine the water supply available to supply the new private hydrants and mains.

507.2.1.4 Method for determining friction loss.
Friction loss through pipe and fittings shall be determined using the Hazen-Williams formula or other approved hydraulic formula. The Hazen-Williams formula is as follows:

\[
P = 4.52 \times \frac{Q^{1.85}}{C^{1.85} \times D^{4.87}}
\]

Where:
- \(P\) = friction loss in psig per foot of pipe.
- \(Q\) = flow in gpm.
$C =$ Hazen-Williams co-efficient of roughness, friction loss coefficient, pipe roughness coefficient.
$D =$ actual internal diameter of the pipe in inches.

507.2.1.5 Backflow prevention assembly.
The pressure loss through any backflow prevention assembly installed on the system shall be included in the hydraulic calculations. The model and size of the backflow prevention assembly shall be noted on the plans.

507.2.1.6 Water supply data.
Water supply test information for public mains shall be obtained from the City of Phoenix Water Services Department within 180 days of plan submittal. The water services department hydrant flow test report form shall be submitted with the plans. Water supply tests conducted on private fire service mains shall be witnessed by the fire code official.

507.2.2 Water tanks.
Water tanks for private fire protection shall be installed in accordance with NFPA 22.

507.3 Fire flow.
Fire flow requirements for buildings or portions of buildings and facilities shall be determined by an approved method, see Appendix B.

507.3.1 Reduction in the required fire flow.
A 50 percent reduction of the minimum required fire flow amount determined by using Appendix B is allowed when the building is protected throughout by an automatic fire sprinkler system designed for the hazard and installed in accordance with NFPA13, Standard for the Installation of Sprinkler Systems (see B105.1). The flow required to supply the sprinkler system is not required to be added to the fire flow. No other reductions shall be allowed without an approved appeal to the fire marshal.

507.3.2 Fire flow in public mains.
The fire flow in public water mains shall be in accordance with the design standards found in the City of Phoenix Water Services Department Design Standards Manual for Water Systems.

507.3.3 Storage of combustible or hazardous materials.
When there is exterior storage of combustible or hazardous materials the required fire flow to protect exterior storage shall be determined by an engineering analysis. If the fire flow required to protect the exterior storage exceeds the fire flow required to protect the building, the higher flow shall be provided.

507.3.4 Temporary water supply.
When constructing one-and two-family houses, a temporary water supply for use during construction is allowed only by appeal to the fire marshal. The installation of a temporary water supply shall only be allowed for construction of model homes. Construction shall occur only on every other lot, or with a minimum of 30-foot (9144 mm) spacing between structures. The following documentation is required to be submitted with the appeal:

1. A report, stamped by a professional engineer, shall be provided. This report shall include plans of the system and hydraulic calculations. A minimum 1,500 gpm at 25
psi (172 kPa) for a minimum of 2 hours duration shall be required for systems. Spacing of hydrants shall be in accordance with Section 508.4.4.

2. A permit shall be obtained from the Phoenix Fire Department before installation of the temporary water supply is commenced.

3. An inspection and test of the system shall be required prior to combustibles being brought on site.

507.3.5 Fire mains.
Fire mains and appurtenances shall be sized to accommodate the calculated fire flow but shall not be less than 6 inches (152 mm) in diameter. Dead-end fire mains shall not be less than 8 inches (203 mm) in diameter unless calculations determine otherwise.

507.4 Water supply test.
The fire code official shall be notified prior to the water supply test. Water supply tests shall be witnessed by the fire code official or approved documentation of the test shall be provided to the fire code official prior to final approval of the water supply system.

507.4.1 Water flow test location.
The location of hydrants used to determine the available water supply shall be shown on the plans. The plans shall provide detail on how the private fire service main is connected to the city main. The size and location of the city main in the street and whether the main is dead-end or circulating shall be shown on the plans. If the main is a dead-end, the direction and distance to the nearest circulating main shall be noted on the plans. The elevation of the static and residual pressure test gauge with relation to the on-site hydrants shall be noted on the plans.

507.4.2 Design safety factor.
The water flow test results shall be adjusted as noted in sections 508.1.4.5.3 and 508.1.4.5.4 to account for seasonal and daily flow calculations in the water supply system.

507.4.3 Static pressure equal to or more than 90 psi.
When the static pressure is over 90 pounds (621 kPa) per square inch (psi) the maximum design static pressure will be 80 psi (552 kPa) regardless of the actual test pressure. The slope of the original design curve shall be used even though the design pressure is reduced to 80 psi (552 kPa).

507.4.4 Static pressure less than or equal to 90 psi.
When the recorded static pressure is less than or equal to 90 psi (621 kPa), the system design shall include a minimum 10 psi (69 kPa) safety factor between the system flow and pressure demand and the available water supply.

507.5 Fire hydrant systems.
Fire hydrant systems shall comply with Sections 507.5.1 through 507.5.6. The installation of fire mains and fire hydrants in the public right-of-way shall also meet the Phoenix Water and Wastewater Department specifications. Fire hydrants shall be located not less than 1 foot (305 mm) and not more than 6 feet (1829 mm) from the back of the curb of the access road or other vehicle access point. The largest outlet on the hydrant shall face the access road.
507.5.1 Where required.
Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet (121 990mm) from a hydrant on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains shall be provided where required by the fire code official. For secondary hydrants the distance requirement shall be 700 feet (2131 mm).

Exceptions:

1. For Group R-3 and Group U occupancies, the distance requirement shall be 600 feet (183 m).

2. For buildings equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the distance requirement shall be 600 feet (183 m).

507.5.1.1 Hydrant for standpipe systems.
Buildings equipped with a standpipe system installed in accordance with Section 905 shall have a fire hydrant within 100 feet (30 m) of the fire department connections.

Exception: The distance shall be permitted to exceed 100 feet (30 m) where approved by the fire code official.

507.5.2 Hydrant specifications.
Hydrant installations shall comply with Sections 507.5.2.1 through 507.5.2.9.

507.5.2.1 City of Phoenix threads.
Fire hydrants shall comply with City of Phoenix specifications and be provided with Phoenix threads.

507.5.2.2 Height.
Fire hydrants shall be installed so that the centerline of the lowest outlet is not less than 18 inches (457 mm) above grade and the highest outlet does not exceed 30 inches (762 mm) above grade.

507.5.2.3 Color of hydrants.
The color of hydrants shall be fire hydrant yellow. Private fire hydrants shall have the bonnet painted reflective white. Hydrants not intended for fire department use shall have the bonnet painted black. The red bonnet indicates a hydrant coming off of a substandard main, or a low flow hydrant, normally coming off a 4-inch (101 mm) feed.

507.5.2.4 Hydrant location.
New hydrants shall be located on the right-hand (passenger) side of the street.

507.5.2.5 Hydrants on major streets.
Fire hydrants on major streets, collector streets, or any other streets that are not divided by raised median islands or light-rail tracks can be included in the coverage analysis. If those streets classes are divided by raised median islands or light-rail tracks then the existing hydrant can only be included in the coverage analysis if its location is on the same side of the median as the new development.
507.5.2.6 First new hydrant. The first new fire hydrant shall be located at the street intersection or at the main entrance(s) into a subdivision, apartment complex or commercial development. Additional hydrants shall be spaced per section 508.5.4.2.

507.5.2.7 Parking areas. In open-air, on-grade parking areas, at least one fire hydrant shall be located within 600 feet (121 920mm) of all areas.

507.5.2.8 Distance to fire department connection (FDC). At least one fire hydrant shall be located within 200 feet (6096 mm) of a fire department connection supplying building fire protection systems. The distance between the hydrant and FDC shall be measured along the path of the fire apparatus access road and as fire fighters would lay hose. See also section 912.

507.5.2.9 Hydrant spacing. Fire hydrants shall be spaced approximately 500 feet (152 400mm) apart in single-family residential developments and shall be approximately 300 feet (91 440mm) apart in all other development types. The distance between hydrants shall be measured along the path of the fire apparatus access road.

507.5.3 Inspection, testing and maintenance.
Fire hydrant systems shall be subject to periodic tests as required by the fire code official and NFPA 25. Fire hydrant systems shall be maintained in an operative condition at all times and shall be repaired where defective. Additions, repairs, alterations and servicing shall comply with approved standards.

507.5.3.1 Private fire service mains and water tanks.
Private fire service mains and water tanks shall be periodically inspected, tested and maintained in accordance with NFPA 25 at the following intervals:

1. Private fire hydrants (all types): Inspection annually and after each operation; flow test and maintenance annually.

2. Fire service main piping: Inspection of exposed, annually; flow test every 5 years.

3. Fire service main piping strainers: Inspection and maintenance after each use.

507.5.4 Obstruction.
Unobstructed access to fire hydrants shall be maintained at all times. The fire department shall not be deterred or hindered from gaining immediate access to fire protection equipment or fire hydrants.

507.5.4.1 Tampering and obstructions.
Vehicle parking shall be prohibited within 15 feet (4572 mm) in either direction, of a fire hydrant installed parallel to a curbline. For hydrants that are set back from the curb, the 15-foot (4572 mm) clearance shall be measured from the curb line.

Posts, fences, vehicles, growth, trash, storage and other materials or objects shall not be placed or kept near fire hydrants, fire department inlet connections or fire protection system control valves in a manner that would prevent such equipment or fire hydrants from being immediately discernible. The fire department shall not be deterred or hindered from gaining immediate access to fire protection equipment or fire hydrants.
507.5.5 Clear space around hydrants.  
A 3-foot (914 mm) clear space shall be maintained around the circumference of fire hydrants, except as otherwise required or approved.

507.5.5.1 Accessibility.  
Fire hydrants shall be accessible to the fire department apparatus by roads meeting the requirements of Section 503. Fire hydrants shall be located not less than 1 foot and not more than 6 feet (1828 mm) from the back of the curb of the access road or other vehicle access point. The largest outlet on the hydrant shall face the fire apparatus access road.

507.6 Physical protection.  
Where fire hydrants are subject to impact by a motor vehicle, guard posts or other approved means shall comply with Section 312.

507.7 Sectional valves.  
Sectional valves shall be provided to ensure minimal impairments to fire protection should any mains require repair or alteration. Backflow valves protect the integrity of the City of Phoenix water supply from possible contamination from backpressure or back-siphonage of water from nonpotable pipe or other cross contamination.

1. Every looped private main shall have backflow prevention serving as a minimum two sectional valves at the point of connection on each leg of the loop and a minimum of one sectional valve separating the supply line in two approximately equal sections. (See Appendix D) When any connection is made to the City of Phoenix water serving automatic sprinkler systems, backflow protection is required on the connections to private looped fire mains by City of Phoenix Water Department Policy State Plumbing Code and the Uniform Plumbing Code. The backflow valve assembly can serve as a sectional valve, see Appendix B for diagrams.

2. One sectional valve shall be placed on the private main supply to isolate every four to six connections to either sprinkler systems or hydrants, which each sprinkler lead in and hydrant feed require their own control valves by NFPA 13.8.16.1.1.1 and 24.7.1.1. When a large private fire main has six or more connections to the main then multiple sectional valves are required to minimize impairments. In no case shall more than six connections from supply main to sprinkler systems or hydrants be installed without providing sectional valves (see Appendix D).

3. The backflow supply valve installed on connection from City of Phoenix public water mains is required outside the City of Phoenix right-of-way. The backflow valve assembly may serve as the fire sprinkler connection valve for a dedicated sprinkler system supply (see Appendix D). A backflow device listed for fire vertical installation may be installed on the riser.

4. Private hydrant connections that are not looped and have no fire sprinkler connections need backflow protection.

5. Section 603.4.16 of the Uniform Plumbing Code dictates commercial sprinkler and one- or two family residential sprinkler systems shall be protected from back pressure and back siphonage by one of the following testable devices:
a. Double check valve assembly.
b. Double check detector assembly.
c. Reduced pressure backflow preventer.
d. Reduced pressure detector assembly.

6. If the sprinkler riser supply piping is run more than 5 feet (1524 mm) under the building, a Post Indicator Valve (PIV) shall be provided adjacent to the foundation, within 25 feet to isolate the pipe running under the foundation.

SECTION 508
FIRE COMMAND CENTER

508.1 General.
Where required by other sections of this code and in all buildings classified as high-rise buildings by the International Building Code, a fire command center for fire department operations shall be provided and shall comply with Sections 508.1.1 through 508.1.5.

508.1.1 Location, access and identification.
The location and accessibility of the fire command center shall be approved by the fire code official. The fire command center shall be identified by a permanently installed, readily visible sign noting “Fire Department Command Center” located or posted on the door to the fire command center (see Appendix D).

508.1.2 Separation.
The fire command center shall be separated from the remainder of the building by not less than a 1-hour fire barrier constructed in accordance with Section 707 of the International Building Code or horizontal assembly constructed in accordance with Section 711 of the International Building Code, or both.

508.1.3 Size.
The fire command center shall be a minimum of 200 square feet (19 m²) in area with a minimum dimension of 10 feet (3048 mm).

508.1.4 Layout approval.
A layout of the fire command center and all features required by this section to be contained therein shall be submitted for approval prior to installation.

508.1.5 Required features.
The fire command center shall comply with NFPA 72 and shall contain the following features:

1. The emergency voice/alarm communication system control unit via the fire alarm panel.
2. The fire department communications system via the fire alarm panel
3. Fire detection and alarm system annunciator or fire alarm panel.
4. Annunciator unit visually indicating the location of the elevators and whether they are operational.

5. Status indicators and controls for air distribution systems.

6. The fire-fighter’s control panel required by Section 909.16 for smoke control systems installed in the building.

7. Controls for unlocking stairway doors simultaneously.

8. Sprinkler valve and water-flow detector display panels via the fire alarm panel.

9. Emergency and standby power status indicators.

10. A telephone for fire department use with controlled access to the public telephone system.

11. Fire pump status indicators via the fire alarm panel.

12. Schematic building plans indicating the typical floor plan and detailing the building core, means of egress, fire protection systems, fire-fighting equipment and fire department access, and the location of fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions.

13. An approved Building Information Card that contains, but is not limited to, the following information:

   13.1. General building information that includes: property name, address, the number of floors in the building (above and below grade), use and occupancy classification (for mixed uses, identify the different types of occupancies on each floor), estimated building population (i.e., day, night, weekend);

   13.2. Building emergency contact information that includes: a list of the building’s emergency contacts (e.g., building manager, building engineer, etc.) and their respective work phone number, cell phone number, and e-mail address;

   13.3. Building construction information that includes: the type of building construction (e.g., floors, walls, columns, and roof assembly);

   13.4. Exit stair information that includes: number of exit stairs in the building, each exit stair designation and floors served, location where each exit stair discharges, exit stairs that are pressurized, exit stairs provided with emergency lighting, each exit stair that allows reentry, exit stairs providing roof access; elevator information that includes: number of elevator banks, elevator bank designation, elevator car numbers and respective floors that they serve, location of elevator machine rooms, location of sky lobby, location of freight elevator banks;
13.5. Building services and system information that includes: location of mechanical rooms, location of building management system, location and capacity of all fuel oil tanks, location of emergency generator, location of natural gas service;

13.6. *Fire protection system* information that includes: locations of standpipes, location of fire pump room, location of fire department connections, floors protected by automatic sprinklers, location of different types of automatic sprinkler systems installed (e.g., dry, wet, pre-action, etc.); and

13.7. Hazardous material information that includes: location of hazardous material, quantity of hazardous material.


15. Generator supervision devices, manual start and transfer features.

16. Public address system, where specifically required by other sections of this code.

17. Elevator fire recall switch in accordance with ASME A17.1.

18. Elevator emergency or standby power selector switch(es), where emergency or standby power is provided.

19. A key box shall be permanently installed near the door to the fire command center. The key box shall be located 4 to 5½ feet (1219 to 1677 mm) above grade in a clearly visible location, with a minimum of six and a maximum of eight sets of keys, unless additional keys are required by the fire marshal.

**SECTION 509**

FIRE PROTECTION AND UTILITY EQUIPMENT IDENTIFICATION AND ACCESS

509.1 Identification.
Fire protection equipment shall be identified in an *approved* manner. Rooms containing controls for air-conditioning systems, sprinkler risers and valves, or other fire detection, suppression or control elements shall be identified for the use of the fire department. *Approved* signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

509.1.1 Utility identification.
Where required by the fire code official, gas shutoff valves, electric meters, service switches and other utility equipment shall be clearly and legibly marked to identify the unit or space that it serves. Identification shall be made in an *approved* manner, readily visible and shall be maintained.

509.1.2 Exterior stairwells.
When determined by the Fire Code Official where access is necessary for life-saving or firefighting purposes, exterior stairwells providing access to fire protection equipment shall be marked in accordance with this chapter (see Appendix D for details).
509.2 Equipment access.  
*Approved* access shall be provided and maintained for all fire protection equipment to permit immediate safe operation and maintenance of such equipment. Storage, trash and other materials or objects shall not be placed or kept in such a manner that would prevent such equipment from being readily accessible.

SECTION 510
EMERGENCY RESPONDER RADIO COVERAGE

510.1 Emergency responder radio coverage in new buildings.
All new buildings shall have *approved* radio coverage for emergency responders within the building based upon the existing coverage levels of the public safety communication systems of the jurisdiction at the exterior of the building. This section shall not require improvement of the existing public safety communication systems.

Exceptions:

1. Where *approved* by the building official and the fire code official, a wired communication system in accordance with Section 907.2.13.2 shall be permitted to be installed or maintained in lieu of an *approved* radio coverage system.

2. Where it is determined by the fire code official that the radio coverage system is not needed.

3. In facilities where emergency responder radio coverage is required and such systems, components or equipment required could have a negative impact on the normal operations of that facility, the fire code official shall have the authority to accept an automatically activated emergency responder radio coverage system.

510.2 Emergency responder radio coverage in existing buildings.
Existing buildings shall be provided with *approved* radio coverage for emergency responders as required in Chapter 11.

510.3 Permit required.
A construction permit for the installation of or modification to emergency responder radio coverage systems and related equipment is required as specified in Section 105.7.5. Any entity installing a radio amplification system within the Regional Wireless Cooperative (RWC) service area and within the Federal Communications Commission (FCC) frequency shall be licensed by the RWC. Maintenance performed in accordance with this code is not considered a modification and does not require a permit.

510.4 Technical requirements.
Systems, components, and equipment required to provide emergency responder radio coverage system shall comply with Sections 510.4.1 through 510.4.2.5.

510.4.1 Radio signal strength.
The building shall be considered to have acceptable emergency responder radio coverage when signal strength measurements in 95 percent of all areas on each floor of the building meet the signal strength requirements in Sections 510.4.1.1 and 510.4.1.2.
510.4.1.1 Minimum signal strength into the building.
A minimum signal strength of -95 dBm shall be receivable within the building.

510.4.1.2 Minimum signal strength out of the building.
A minimum signal strength of -95 dBm shall be received by the agency’s radio system when transmitted from within the building.

510.4.2 System design.
The emergency responder radio coverage system shall be designed in accordance with Sections 510.4.2.1 through 510.4.2.5.

510.4.2.1 Amplification systems allowed.
Buildings and structures which cannot support the required level of radio coverage shall be equipped with a radiating cable system, a distributed antenna system with Federal Communications Commission (FCC)-certified signal boosters, or other system approved by the fire code official in order to achieve the required adequate radio coverage.

510.4.2.2 Technical criteria.
The fire code official shall maintain a document providing the specific technical information and requirements for the emergency responder radio coverage system. This document shall contain, but not be limited to, the various frequencies required, the location of radio sites, effective radiated power of radio sites, and other supporting technical information.

510.4.2.3 Secondary power.
Emergency responder radio coverage systems shall be provided with an approved secondary source of power. The secondary power supply shall be capable of operating the emergency responder radio coverage system for a period of at least 24 hours. When primary power is lost, the power supply to the emergency responder radio coverage system shall automatically transfer to the secondary power supply.

510.4.2.4 Signal booster requirements.
If used, signal boosters shall meet the following requirements:

1. All signal booster components shall be contained in a National Electrical Manufacturer’s Association (NEMA) 4-type waterproof cabinet.

2. Battery systems used for the emergency power source shall be contained in a NEMA 4-type waterproof cabinet.

3. The signal booster system and battery system shall be electrically supervised and monitored by a supervisory service, or when approved by the fire code official, shall sound an audible signal at a constantly attended location.

4. Equipment shall have FCC certification prior to installation.

510.4.2.5 Additional frequencies and change of frequencies.
The emergency responder radio coverage system shall be capable of modification or expansion in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC.
510.5 Installation requirements.
The installation of the public safety radio coverage system shall be in accordance with Sections 510.5.1 through 510.5.4.

510.5.1 Approval prior to installation.
Amplification systems capable of operating on frequencies licensed to any public safety agency by the FCC shall not be installed without prior coordination and approval of the fire code official.

510.5.2 Minimum qualifications of personnel.
The minimum qualifications of the system designer and lead installation personnel shall include:

1. A valid FCC-issued general radio operators license; and

2. Certification of in-building system training issued by a nationally recognized organization, school or a certificate issued by the manufacturer of the equipment being installed.

These qualifications shall not be required where demonstration of adequate skills and experience satisfactory to the fire code official is provided.

510.5.3 Acceptance test procedure.
When an emergency responder radio coverage system is required, and upon completion of installation, the building owner shall have the radio system tested to ensure that two-way coverage on each floor of the building is a minimum of 90 percent. The test procedure shall be conducted as follows:

1. Each floor of the building shall be divided into a grid of 20 approximately equal test areas.

2. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency’s radio communications system.

3. Failure of a maximum of two nonadjacent test areas shall not result in failure of the test.

4. In the event that three of the test areas fail the test, in order to be more statistically accurate, the floor shall be permitted to be divided into 40 equal test areas. Failure of a maximum of four nonadjacent test areas shall not result in failure of the test. If the system fails the 40-area test, the system shall be altered to meet the 90 percent coverage requirement.

5. A test location approximately in the center of each test area shall be selected for the test, with the radio enabled to verify two-way communications to and from the outside of the building through the public agency’s radio communications system. Once the test location has been selected that location shall represent the entire test area. Failure in the selected test location shall be considered failure of that test area. Additional test locations shall not be permitted.
6. The gain values of all amplifiers shall be measured and the test measurement results shall be kept on file with the building owner so that the measurements can be verified during annual tests. In the event that the measurement results become lost, the building owner shall be required to rerun the acceptance test to reestablish the gain values.

7. As part of the installation a spectrum analyzer or other suitable test equipment shall be utilized to ensure spurious oscillations are not being generated by the subject signal booster. This test shall be conducted at time of installation and subsequent annual inspections.

510.5.4 FCC compliance.
The emergency responder radio coverage system installation and components shall also comply with all applicable federal regulations including, but not limited to, FCC 47 CFR Part 90.219.

510.6 Maintenance.
The emergency responder radio coverage system shall be maintained operational at all times in accordance with Sections 510.6.1 through 510.6.3.

510.6.1 Testing and proof of compliance.
The emergency responder radio coverage system shall be inspected and tested annually or whenever structural changes occur including additions or remodels that could materially change the original field performance tests. Testing shall consist of the following:

1. In-building coverage test as described in Section 510.5.3.

2. Signal boosters shall be tested to ensure that the gain is the same as it was upon initial installation and acceptance.

3. Backup batteries and power supplies shall be tested under load of a period of one hour to verify that they will properly operate during an actual power outage. If within the 1-hour test period the battery exhibits symptoms of failure, the test shall be extended for additional 1-hour periods until the integrity of the battery can be determined.

4. All other active components shall be checked to verify operation within the manufacturer’s specifications.

5. At the conclusion of the testing, a report, which shall verify compliance with Section 510.5.3, shall be submitted to the fire code official.

510.6.2 Additional frequencies.
The building owner shall modify or expand the emergency responder radio coverage system at their expense in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC. Prior approval of a public safety radio coverage system on previous frequencies does not exempt this section.

510.6.3 Field testing.
Agency personnel shall have the right to enter onto the property at any reasonable time to conduct field testing to verify the required level of radio coverage.
SECTION 511
CONTROLLED ACCESS/SECURITY GATES OR BARRIERS

511.1 General.
The installation of controlled access / security gates or barriers across a fire apparatus access road shall be approved by the fire code official and meet the requirements of Section 511.

511.1.1 Permits.
Permits shall be required to install or modify controlled access gates.

511.1.2 Gate installation companies.
When gates are installed at any location that obstructs a fire apparatus access road, the installing company shall be licensed by the Arizona Registrar of Contractors as L-5 or C-5.

511.1.3 Egress.
Fire apparatus access / security gates or barriers shall be designed and installed such that they do not obstruct the egress or departure of emergency vehicles.

511.1.3.1 Pedestrian gates.
Pedestrian gates installed as part of the means of egress shall comply with the Phoenix Building Code and Chapter 10 of this code.

511.1.4 Maintenance.
All fire apparatus access gates shall be maintained operable at all times and shall be inspected at least annually. Copies of the annual inspection report shall be maintained and be accessible for fire department review.

511.1.5 Inoperable gates.
Controlled access gates that are inoperable and impede the entrance of fire apparatus access road shall be chained open or removed at the owner’s expense.

511.1.6 Illegal gates.
Controlled access gates that cross fire apparatus access roads that have been installed without a permit shall be chained open or removed at the owner’s or installing contractor’s expense until a permit and final approval has been obtained from the fire department.

511.2 Fire apparatus access gates.

511.2.1 General.
Access openings are required to be automatic where no turnaround is provided for fire apparatus (see Appendix D).

511.2.2 Main entrance identification.
Access openings shall have signs that identify the location of the property’s primary entrance, and signs shall be bolted on the street side of the fire apparatus access gate (see Appendix D).

511.2.3 Marking and signage.
Manual and automatic access openings are required to be marked in accordance with Section 511.3.5. Signage shall be provided in accordance with Section 511.5.2.

511.3 Controlled access gate specifications.
When controlled access gates are installed across a fire apparatus access road the specifications in section 511.2 shall apply.

511.3.1 Opening width.
When the gate is fully opened, a minimum 20-foot (6096 mm) clear width shall be provided for both the entrance and exit gates. Gates installed and approved prior to Nov. 8, 2003, shall be maintained in accordance with the original approval. The fire code official shall require additional width opening when a 45-foot (13 716 mm) fire apparatus turning radius cannot be met.

511.3.2 Electric and solar voltaic power system operated gates.
Electric and solar operated gates shall be installed in accordance with this section.

511.3.2.1 Standby power systems.
Electric and solar operated gates shall be provided with a standby power system. Standby power is permitted to be, but not limited to, battery back-up or connection to an emergency generator. The activation of the system shall open gates and maintain them in the open position until primary power is restored to the system. Standby power systems are required to comply with the National Electrical Code Article 701.

Exception:
Controlled access gates installed at occupancies other than multifamily residential properties may remain closed until the emergency gate switch is activated and shall then remain open while the standby power system is operating the gate.

511.3.3 Opening time.
Electric and solar operated controlled access gates shall open at a minimum rate of 1 foot per second (0.305 m/s).

511.3.4 Key switch.
Each Electric and solar operated controlled access gate shall be equipped with an approved key switch on both sides of the gate. When separate entry and exit gates are provided, the emergency key switch shall open the entrance and exit gates.

511.3.5 Key switch identification.
An approved sign reading "F.D. ACCESS" shall be installed within 12 inches (305 mm) of the emergency key switch. The key switch shall be illuminated so as to be visible from fire apparatus (see Appendix D).

511.3.6 Height.
The key switch shall be mounted between 51/2 feet and 6 feet (1676 mm to 1829 mm) above grade.

511.3.6.1 Solar photovoltaic cell location.
The solar cell shall be located a minimum of 7 feet (2133 mm) above grade. The photovoltaic cell shall be located on the 4 x 4 inch preemption post as shown in the solar powered gate detail (see Appendix D).
511.3.7 Obstruction and impairment.
Posts, fences, vehicles, growth, trash, storage and other materials shall not be kept near key switches in a manner that would prevent the key switches from being visible.

511.3.8 Bypass of systems.
When activated, the emergency key switch shall bypass all occupant and loop switch systems.

511.4 Preemption devices.
Preemption devices are required on all new automatic fire access gates installed after Jan. 1, 2001, at residential properties. Gates installed without permits or proof of installation date require preemption devices. Voluntary installations of preemption devices shall comply with the requirements of section 511.4.2.

Exception:
Access road serving 3 or fewer Group R-3 occupancies.

511.4.1 Locations.
The devices shall be installed such that the gate will open for both ingress and egress of emergency vehicles.

511.4.2 Minimum installation standards.
The installation of preemption devices shall comply with the following:

1. Detectors shall be mounted 8 to 10 feet (2439 to 3048 mm) above grade.
2. Detectors shall be located a minimum of 18 inches (457 mm) behind the gate on the property side.
3. Detectors shall be mounted on a separate 4 by 4 inch (102 by 102 mm) metal post and not on the guide post. The metal post shall be cemented a minimum of 18 inches (457 mm) below grade.
4. Detectors shall activate at a minimum of 150 feet (45 720 mm) from the gate.
5. Detectors shall point toward both the approach and the exit path of the emergency vehicle.
6. The sight path of the detector shall be free of visual obstructions such as signs, covered parking, canopies and vegetation.
7. Individual detectors shall be mounted together with the power module in the dual detector-mounting box. Detectors shall be approved by the fire department. A list of approved devices will be maintained by the fire department and available to the public.

511.5 Manual controlled access gates.
Manual controlled access gates that cross fire apparatus access roads or other roads that, when determined by the fire code official, provide access to areas where immediate access is necessary for life-saving or fire-fighting purposes shall comply with section 511.3
511.5.1 Locking mechanism.
All manual controlled access gates that cross a fire apparatus access road shall use an approved dual padlock mechanism (see Appendix D). Gates installed and approved prior to Nov. 8, 2003, shall be maintained in accordance with the original approval.

511.5.2 Signs.
Approved signs shall be provided on the manual gates. The signs shall have a reflective background and shall be bolted back-to-back onto each side of the gate (see Appendix D).

511.5.3 Marking.
Minimum 6-inch (152 mm) wide red, crosshatched striping shall be painted on the ground surface on both sides of the manual access gate, including recessed areas as determined by the fire department. A minimum of two applications of paint is required.

SECTION 512
EMERGENCY MEDICAL ACCESS

512.1 Required access.
The distance from an emergency medical access road to the front entrance of all buildings or facilities shall not exceed 150 feet (45 720 mm). The emergency medical access road shall have an unobstructed width of not less than 16 feet (4871 mm) and a vertical clearance of not less than 14 feet (4267 mm).

512.1.1 Loading areas and passenger drop-off areas.
On private property, where fire apparatus access roads are utilized for loading or unloading or are utilized for passenger drop-off or pickup, an additional 8 feet (2438 mm) of width shall be added to the fire apparatus access road. This width is in addition to the minimum 16 foot (4876 mm) access road width.

512.2 Surface.
Fire apparatus access roads shall be designed and maintained to support the imposed live load of 70,000 pounds (29 964 kg) with a maximum axle load of 28,000 pounds (12 712 kg). Fire apparatus access roads shall be provided and maintained with all-weather driving capabilities surface. When a surface other than paving is used for a fire apparatus access road, it shall comply with Section 503.

512.3 Turning radius.
Fire apparatus access roads shall have a minimum 45-foot centerline radius [37-foot (11 298 mm) inside radius, 53-foot (16 154 mm) outside radius] on curves (see Appendix D).

512.4 Vehicle passing points.
When emergency medical access roads exceed 300 feet (91 440 mm) in length, vehicle passing points shall be installed at intervals not to exceed 300 feet (91 440 mm). Vehicle passing points shall be a minimum of 30 feet (9140 mm) in width and 50 feet (15 240 mm) in length (see Appendix D).

512.5 Dead ends.
Dead-end *fire apparatus access roads* in excess of 200 feet (60 960 mm) in length shall terminate in an *approved* turnaround at the end of the *fire apparatus access road* (see Appendix D).

**512.6 Bridges and elevated surfaces.**

Where a bridge or an elevated surface is part of a *fire apparatus access road*, the bridge shall be constructed and maintained in accordance with AASHTO HB-17. Bridges and elevated surfaces shall be designed for a live load sufficient to carry the imposed loads of fire apparatus 70,000 pounds (29 964 kg) with a maximum axle load of 28,000 pounds (12 712 kg). Vehicle load limits shall be posted at both entrances to bridges when required by the Fire Marshal. Where elevated surfaces designed for emergency vehicle use are adjacent to surfaces which are not designed for such use, approved barriers, approved signs or both shall be installed and maintained when required by the fire marshal.

**512.7 Grade.**

The grade of the *fire apparatus access road* shall not exceed 15 percent [15 feet in 100 feet (4572 mm in 30 480 mm)]. Cross-slope of an access road shall not exceed a depth of 6 inches (152 mm).

**512.8 Drainage.**

Water drainage shall be directed away from or piped under the *fire apparatus access roads*. Ponding of water on an access road shall not exceed a depth of 6 inches (152mm).

**512.9 Stabilization.**

A stabilized edge meeting Maricopa Association of Governments standards or equivalent is required on *fire apparatus access roads* to provide stabilization.

---

**SECTION 513**

**HILLSIDE DEVELOPMENT**

**513.1 Sprinkler requirement.**

An automatic sprinkler system shall be installed in Group R-3 and R-4 occupancies on hillside areas where the gradient for a *fire apparatus access road* exceeds 15 percent, or hydrant spacing does not comply with this section 508.4, or a reliable water supply is not available.

Group R-4 occupancies up to four stories in height shall require a minimum NFPA 13R *automatic sprinkler system* to be installed.

Group R-3 occupancies, one- and two-family dwellings and manufactured homes shall require a minimum NFPA 13D *automatic sprinkler system* to be installed.