TOWN OF VAIL

**VAIL FIRE & EMERGENCY SERVICES**
**CRITERIA FOR REQUIREMENTS**
**TO INSTALL**
**FIRE SPRINKLER SYSTEMS**

The following criteria shall be used in determining whether a fire sprinkler system will be required to be installed in single family / duplex residences for which a Building Permit is required. Fire sprinkler systems shall not be required for existing single family / duplex residences where no Building Permit is required.

**Exemptions:** Work including but not limited to the following is EXEMPT from any requirement to install a new fire sprinkler system. Work in structures with an existing fire sprinkler system will require the fire sprinkler system be altered, amended, added to or reconfigured to meet the minimum code requirements.

Exempt:

1 Exterior Modifications.
2. Remodel of interior space that does not include removal of ceilings.
3. Re-configuration of existing interior space that includes removal of ceilings, less than 60% the existing GRFA..
4. Addition of dormers,
5. Conversion of crawl spaces to habitable space,
6. Replacement of doors and windows and what is reasonably considered trim.
7. The addition of new habitable space less than 25% of the existing GRFA.
8. Mechanical, plumbing, and electrical permits.

**NOTE:**
**Due to the unique environment, inherent limitations on building sites, topography, climatic conditions, existing vehicular access, and other elements beyond the control of the applicant, due regard shall be given for existing but non-conforming conditions. Redevelopment, remodels, improvements, and changes to existing structures that do not result in an increase in the fire and/or occupant load, may propose alternate means and methods to mitigate the impact of the proposed work.**

**Alternate means and methods to mitigate the impact of proposed work shall be submitted and reviewed on a "performance based design."**

**New and Existing Single Family / Duplex Other Than Exempt Work**

**Background:** All seven of the requirements listed below are included in the body of the Fire Code in various sections. These code sections have existed in some format since about 1983. The cited sections form the foundation for the "matrix" Vail has used for more than 20 years.

New single family / duplex construction and existing single family / duplex construction other than that listed under the Exempt Category shall be evaluated according to the following process:

1. **Evaluate site plan to determine if the exterior perimeter is in excess of 300 ft.**
   **IFC 503.1.1**
   **If <u>YES</u>, sprinkler system is required.**

2 **If the structure perimeter is less than or equal to 300 ft., does the site provide for year round access by foot?**
   **IFC 504.1** **If <u>NO</u>, sprinkler system is required.**

3.. **Does the driveway between the staging area and the ROW comply with TOV Municipal Code Driveway Standards as set forth in Chapter 3, Title 14, Tables 1, 2 and 3?**
   **If <u>NO</u>, sprinkler system is required.**

4. **Determine whether the point of fire apparatus access meets minimum staging requirements per TOV Municipal Code 14-4-1. Does fire department access and staging meet the minimum requirements of 14-4-1?**

   **If <u>NO</u>, sprinkler system is required.**

5. **Fire Flow - Does the site have adequate fire flow from a public water supply as prescribed by the Fire Code, from a minimum of two fire hydrants within 500 ft of approved fire apparatus staging?**
   **IFC 507.1**
   **If <u>NO</u>, sprinkler system is required.**

6. **Urban Wildfire Interface – Does the structure meet the minimum requirements for the Urban Wildfire Interface Code?**
   **TOV Municipal Code 5-11**
   **If <u>NO</u>, sprinkler system is required.**

7. **Direct Attack Option: Structures 2 Stories or Less - Are all portions of the interior within 30 feet "line of sight" of a maximum of 150 foot route of an approved hose lay and have an approved monitored addressable fire alarm and detection system?**
   **IFC 904** **If <u>NO</u>, sprinkler system is required.**

TOWN OF VAIL

# VAIL FIRE & EMERGENCY SERVICES
# SINGLE FAMILY AND TWO-FAMILY RESIDENCES
# REQUIREMENTS TO INSTALL
# FIRE SPRINKLER SYSTEMS
# OCTOBER 20, 2009

The following criteria shall be used in determining whether a fire sprinkler system will be required to be installed in a new single family or two-family residence. Installation of a fire sprinkler system will not be required for existing single family or two-family residences when no Building Permit is required.

Work requiring a Building Permit in residences with an existing fire sprinkler system will be required to configure the fire sprinkler system to continue to meet minimum Code requirements.

Work including, but not limited to the following, shall be EXEMPT from any requirement to install a fire sprinkler system:

1) Exterior modifications.
2) Remodel of interior space that does not include removal of ceiling.
3) Re-configuration of existing interior space that includes removal of ceiling, but less than sixty percent (60%) of the existing Gross Residential Floor Area (GRFA).
4) Addition of dormers.
5) Conversion of crawl space to habitable space.
6) Replacement of doors or windows or trim.
7) The addition of new habitable space totaling less than 25% of the existing GRFA.
8) Mechanical, plumbing, and electrical permits.

NOTE: Due to the unique environment, inherent limitations on building sites, topography, climatic conditions, existing vehicular access, and other elements beyond the control of the applicant, due regard shall be given for existing non-conforming conditions. Redevelopment, remodels, improvements, and changes to existing structures that do not result in an increase in the fire and/or occupant load, may propose alternate means and methods to mitigate the impact of the proposed work. Alternate means and methods to mitigate the impact of proposed work shall be submitted and reviewed with performance based design criteria.

For new or existing single family and two-family residences other than Exempt, if the answer to any of the following questions is NO a sprinkler system is required to be installed.

1) Is the exterior perimeter of the structure less than 300 feet? (IFC 503.1.1)

2) If the structure perimeter is less than or equal to 300 ft., does the site provide for year round access by foot? (IFC 504.1)

3) Does the driveway between the staging area and the right-of-way comply with Vail Town Code? (Chapter 14-3, Vail Town Code)

4) Does the point of fire apparatus access comply with the minimum staging requirements per Vail Town Code? (Chapter 14-4, Vail Town Code)

5) Does the fire department access and staging comply with the Vail Municipal Code requirements? (IFC 507.1)

6) Does the site have an adequate fire flow from a minimum of two fire hydrants within five hundred feet (500 ft) of approved fire apparatus staging? (IFC 507.1)

7) Does the structure meet the requirements for the Urban Wildfire Interface Code? (Chapter 5-11, Vail Town Code)

8) For structures 2 stories or less: Are all portions of the interior within a thirty (30) foot line of sight of a maximum of a one hundred and fifty (150) foot route of an approved hose lay and have an approved monitored addressable fire alarm and detection system? (IFC 904)

**APPENDIX**
**Specific Criteria Used for Evaluation**

**Question No. 1**

Approved access by foot shall be determined by measuring the perimeter at a point away from the foundation, not less than ¼ of the height of the highest opening (to allow for placement of ground ladders).

Elements that preclude “approved access” include but are not limited to;

- Retaining walls without approved steps or ladders
- Slope greater than 8% unheated or 15% heated,
- Water features, boulders, and other encumbrances

**Question No. 2**

Pre-connected fire hoses are two hundred (200) feet in length. The first one hundred and fifty (150) feet is intended to reach from the fire apparatus to the structure. The last fifty (50) feet of hose is intended for operation inside the structure.

Note: Fire fighter safety standards require a minimum of two (2) hose lines; one to fight the fire and the second to protect the personnel working inside the structure.

**Question No. 3**

Title 14, Chapter 3
RESIDENTIAL AND COMMERCIAL ACCESS, DRIVEWAY AND PARKING STANDARDS

14-3-1: MINIMUM STANDARDS:

This section (Tables 1 and 2) specifies the access, driveway and parking standards for residential and commercial development. These standards are subject to all conditions and exceptions described herein. These standards shall be considered the minimum standards. When two (2) or more standards conflict, the more restrictive standard shall apply.

TABLE 1[1] DRIVEWAY / FEEDER ROAD STANDARDS

| **Standard** | **Single-Family, Two-Family, Primary/Secondary**<br>- Access to not more than 3 dwelling units (including EHUs)<br>- Structures and all portions thereof within 150' from edge of street pavement | **Multiple-Family**<br>- Access to 4 to 11 dwelling units<br>- Feeder road only | **Multiple-Family And Commercial**<br>- Access to more than 11 dwelling units and/or commercial properties<br>- Feeder road only |
|---|---|---|---|
| Driveway/Feeder Road | | | |
| Q 3 Table 1 Cont. | | | |
| Minimum width normal (detail 1) | 12' | 20'<br>- Access from feeder road to units shall comply with single-family requirements contained herein | 22'<br>- Access from feeder road to units shall comply with single-family requirements contained herein |
| Minimum width 90 degree corner (crossover) (detail 2) | 15' | 24' | 24' |
| Minimum width entrance/curb cut (detail 1) | 16'<br>(flare to 16') | 24'<br>(flare to 24' with 10' curb return radius) | 28'<br>(flare to 28' with 15' curb return radius) |
| Maximum width entrance/curb cut Table 1 (cont)<br><br>(Detail 3) | 24' head in<br>48' back out | 36' | 36' |
| Minimum grade centerline (detail 4) | 0.5% | 0.5% | 0.5% |
| Maximum grade centerline (detail 4) | 10% unheated<br>12% heated | 9% unheated<br>12% heated | 9% unheated<br>12% heated |
| Maximum grade centerline corner/ Table 1 (cont.)<br><br>Crossover (detail 2) | 8% unheated<br>12% heated | 8% unheated<br>12% heated | 8% unheated<br>10% heated |
| Maximum cross slope grade (detail 1) | 8% | 8% | 8% |
| Entry angle minimum deflection for first 30' of Driveway length (detail 5) | 45° | 70° | 70° |
| Maximum centerline breakover grade (detail 6) | 14% | 6% | 4% |
| Maximum grade at edge of public road asphalt (detail 4) | 8% | 6% | 4% |
| Maximum length of maximum grade at edge of public road asphalt (detail 4) | 10' | 15' | 30' |
| Minimum centerline turning radius (detail 7) | 20' | 30' | 40' |

| | | | |
|---|---|---|---|
| Sight distance triangle (detail 3) | Forward movement: 10' perpendicular x 250' lateral<br><br>Backward movement: 15' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator | 10' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator | 10' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator, or by an approved mitigation device |
| Backout / Turnaround area (detail 7) | 12' wide<br>20' centerline radius<br>Designed for 3 point turn or less<br>Required when:<br>- crossover angle is greater than 120°;<br>- entry angle is less than 70°;<br>- accessing a collector, arterial, or commercial street; or<br>- backout sight triangle requirement<br>is not met | Backout into right of way prohibited<br><br>Turnaround area:<br>12' wide<br>20' centerline radius<br>Designed for 3 point turn or less | Backout into right of way prohibited<br><br>Car turnaround area:<br>12' wide<br>20' centerline radius<br>Designed for 3 point turn or less<br><br>Truck turnaround area: Shall be designed so trucks exit site forward as determined by traffic engineer based on uses proposed |
| Driveway pan (Drainage) (detail 1) | 4' wide concrete pan at edge of asphalt for the full width driveway pavement including returns | 4' wide concrete pan at edge of asphalt for the full width driveway pavement including returns | 8' wide concrete pan at edge of asphalt for the full width driveway pavement including returns |

(Ord. 28(2007) § 12: Ord. 14(2006) § 5: Ord., 9-21-1999)

TABLE 2[2]
RESIDENTIAL ACCESS AND PARKING STANDARDS

| **Standard** | **Single-Family, Two-Family, Primary/Secondary**<br>- Access to not more than 3 dwelling units (including EHUs)<br>- Structures and all portions thereof within 150' from edge of street pavement | **Multiple-Family**<br><br>- Access to 4 to 11 dwelling units<br>- Feeder road only | **Multiple-Family**<br><br>- Access to more than 11 dwelling units<br>- Feeder road only |
|---|---|---|---|
| Curb Cuts | | | |
| Curb cuts permitted (number) | 1 per street per unit<br>Maximum of 2 curb cuts per lot | 2 per parcel | Minimum necessary for adequate access |
| Parking Requirements | | | |
| Minimum horizontal clearance between garage doors (parallel to road) to edge of public street pavement (detail 3) | 24' | n/a | n/a |
| Minimum horizontal clearance between required parking space and edge of public street or feeder road pavement | 5' | 5' | 5' |
| Minimum horizontal clearance from feeder road to structures/ obstructions (e.g., guardrails, trees, retaining walls, etc.) (detail 8) | n/a | 2' from obstructions<br>5' from buildings | 5' from obstructions<br>10' from buildings |

| | | | |
|---|---|---|---|
| Parking space size | 9' x 19' surface<br>9' x 18' enclosed | See table 5, section 14-5-1 of this title, commercial/ multiple-family parking lot standards | See table 5, section 14-5-1 of this title, commercial/ multiple-family parking lot standards |
| Sight distance triangle (detail 3) | Forward movement: 10' perpendicular x 250' lateral<br><br>Backward movement: 15' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator | 10' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator | 10' perpendicular x 250' lateral or per AASHTO intersection sight distance standards if required by the administrator, or by an approved mitigation device |
| Backout / Turnaround area (detail 7) | 12' wide<br>20' centerline radius<br>Designed for 3 point turn or less<br><br>Required when:<br>- crossover angle is greater than 120°;<br>- entry angle is less than 70°;<br>- accessing a collector, arterial, or commercial street; or<br>- backout sight triangle requirement is not met | Backout into right of way prohibited<br><br>Turnaround area:<br>12' wide<br>20' centerline radius<br>Designed for 3 point turn or less | Backout into right of way prohibited<br><br>Car turnaround area:<br>12' wide<br>20' centerline radius<br>Designed for 3 point turn or less<br><br>Truck turnaround area: Shall be designed so trucks exit site forward as determined by traffic engineer based on uses proposed |
| Driveway pan (Drainage) (detail 1) | 4' wide concrete pan at edge of asphalt for the full width driveway pavement including returns | 4' wide concrete pan at edge of asphalt for the full width driveway pavement including returns | 8' wide concrete pan at edge of asphalt for the full width driveway pavement including returns |

(Ord. 28(2007) § 12: Ord. 14(2006) § 5: Ord., 9-21-1999)

## Question No. 4

Title 14, Chapter 4
RESIDENTIAL FIRE DEPARTMENT ACCESS STANDARDS

14-4-1: MINIMUM STANDARDS:

This section (table 4) specifies residential fire department access standards for residential development. These standards are subject to all conditions and exceptions described herein. These standards shall be considered the minimum standards. When two (2) or more standards conflict, the more restrictive standard shall apply.

TABLE 4[1]
RESIDENTIAL FIRE DEPARTMENT ACCESS STANDARDS

| Standard | Single-Family, Two-Family, Primary/Secondary, And Multiple-Family<br>- Requiring on site fire department access (structures or portions thereof greater than 150' from edge of street pavement) |
|---|---|
| Minimum pavement radii for fire truck access | A. For structures with the highest floor level 30' or less in |

| | |
|---|---|
| and minimum pavement crossover width (including curb cut accessing site) | elevation from staging area:<br><br>29' inside radius<br>44' outside radius<br>36' centerline radius<br>20' crossover width |
| | B. For structures with the highest floor level greater than 30' in elevation from staging area:<br><br>31' inside radius<br>48' outside radius<br>40' centerline radius<br>22' crossover width |
| | Note: The Town of Vail reserves the right in unique circumstances to utilize a computer modeling technique to determine radii needed for access. |
| Turnaround area | Required if fire department staging area is 150' or more from edge of roadway pavement. |
| Minimum on site fire department staging area (detail 9) | A. For structures with the highest floor level 30' or less in elevation from staging area:<br><br>12' wide and 35' long pavement area<br>32' wide useable clear area inclusive of paved area |
| | The staging area must be located less than the minimum distance required to reach all areas of structures using a 150' curvilinear line with a minimum radius of 8'. |
| | B. For structures with the highest floor level greater than 30' in elevation from staging area:<br><br>12' wide and 50' long pavement area<br>32' wide useable clear area inclusive of paved area |
| | The staging area must commence a maximum of 20' from the face of structure. |
| If the Fire Department makes the determination that access standards cannot physically be met, the structure must be sprinklered in accordance with fire and building codes. | |

(Ord. 28(2007) § 14: Ord., 9-21-1999)

OPTIONAL APPROACH – With the approval of the Fire Department, Appendix D of the Fire Code may be used in a performance based approach to meet minimum access requirements. Note: Credit is only given for a single staging point.

**APPENDIX D**
**FIRE APPARATUS ACCESS ROADS**

SECTION 0101 GENERAL

DI01.1 Scope. Fire apparatus access roads shall be in accordance with this appendix and all other applicable requirements of the International Fire Code.

SECTION 0102 REQUIRED ACCESS

DI02.1 Access .and loading. Facilities, buildings or portions of buildings hereafter constructed shall be accessible to fire department apparatus by way of an approved fire apparatus access road with an asphalt, concrete or other approved driving surface capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds (34050 kg).

SECTION 0103 MINIMUM SPECIFICATIONS

DI03.1 Access road width with a hydrant. Where a fire hydrant is located on a fire apparatus access road, the minimum road width shall be 26 feet (7925 mm), exclusive of shoulders (see Figure D103.1).

DI03.2 Grade. Fire apparatus access roads shall not exceed 10 percent in grade.
Exception: Grades steeper than 10 percent as approved by the Fire Code Official.

DI03.3 Turning radius. The minimum turning radius shall be determined by the Fire Code Official.

DI03.4 Dead ends. Dead-end fire apparatus access roads in excess of 150 feet (45720 mm) shall be provided with width and turnaround provisions in accordance with Table D103.4.

TABLE D103.4 REQUIREMENTS FOR DEAD-END FIRE APPARATUS ACCESS ROADS

| LENGTH (feet) | Width (feet) | Turnaround Required |
|---|---|---|
| 0-150 | 20 | Not required |
| 151-500 | 20 | 120-foot Hammerhead, 60-foot "Y" or 96-foot-diameter cul-de-sac |
| 501-750 | 26 | 120-foot Hammerhead, 60-foot "Y" or 96-foot-diameter cul-de-sac |
| Over 750 | Special Approval Required | |

APPENDIX D (continued)

DI03.5 Fire apparatus access road gates. Gates securing the fire apparatus access roads shall comply with all of the following criteria:

1) The minimum gate width shall be twenty (20) feet (6,096 mm).
2) Gates shall be of the swinging or sliding type.
3) Construction of gates shall be of materials that allow manual operation by one person.
4) Gate components shall be maintained in an operative condition at all times and replaced or repaired when defective.
5) Electric gates shall be equipped with a means of opening the gate by fire department personnel for emergency access. Emergency opening devices shall be approved by the Fire Code Official.

*6)* Manual opening gates shall not be locked with a padlock or chain and padlock unless they are capable of being opened by means of forcible entry tools or when a key box containing the keys) to the lock is installed at the gate location.
7) Locking device specifications shall be submitted for approval by the Fire Code Official.
8) Electric gate operators, where provided, shall be listed in accordance with UL 325.
9) Gates intended for automatic operation shall be designed, constructed and installed to comply with the requirements of ASTM F 2200.

DI03.6 Signs. Where required by the Fire Code Official*,* fire apparatus access roads shall be marked with permanent NO PARKING-FIRE LANE signs complying with Figure D103.6. Signs shall have a minimum dimension of 12 inches (305 mm) wide by 18 inches (457 mm) high and have red letters on a white reflective background. Signs shall be posted on one or both sides of the fire apparatus road as required by Section D103.6.1 or D103.6.2.

DI03.6.1 Roads 20 to 26 feet in width. Fire apparatus access roads 20 to 26 feet wide (6096 to 7925 mm) shall be posted on both sides as a fire lane*.*

DI03.6.2 Roads more than 26 feet in width. Fire apparatus access roads more than 26 feet wide (7925 mm) to 32 feet wide (9754 mm) shall be posted on one side of the road as a fire lane*.*

SECTION 0104 COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

DI04.1 Buildings exceeding three stories or 30 feet in height. Buildings or facilities exceeding 30 feet (9,144 mm) or three stories in height shall have at least two means of fire apparatus access for each structure.

DI04.2 Buildings exceeding 62,000 square feet in area. Buildings or facilities having a gross building area of more than 62,000 square feet (5760 m2) shall be provided with two separate and approved fire apparatus access roads.

Exception: Projects having a gross building area of up to 124,000 square feet (11 520 m2) that have a single approved fire apparatus access road when all buildings are equipped throughout with approved automatic sprinkler systems.

DI04.3 Remoteness. Where two access roads are required, they shall be placed a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses.

SECTION 0105 AERIAL FIRE APPARATUS ACCESS ROADS

DI05.l Where required. Buildings or portions of buildings or facilities exceeding 30 feet (9144 mm) in height above the lowest level of fire department vehicle access shall be provided with approved fire apparatus access roads capable of accommodating fire department aerial apparatus. Overhead utility and power lines shall not be located within the aerial fire apparatus access roadway.

DI05.2 Width. Aerial fire apparatus access roads shall have a minimum unobstructed width of 26 feet (7925 mm), exclusive of shoulders, in the immediate vicinity of any building or portion of building more than 30 feet (9144 mm) in height.

DlO5.3 Proximity to building. At least one of the required access routes meeting this condition shall be located within a minimum of 15 feet (4572 mm) and a maximum of 30 feet (9144 mm) from the building, and shall be positioned parallel to one entire side of the building.

SECTION 0106 MULTIPLE-FAMILY RESIDENTIAL DEVELOPMENTS

DI06.1 Projects having more than 100 dwelling units. Multiple-family residential projects having more than 100 dwelling units shall be equipped throughout with two separate and approved fire apparatus access roads.

Exception: Projects having up to 200 dwelling units may have a single approved fire apparatus access road when all buildings, including nonresidential occupancies, are equipped throughout with approved automatic sprinkler systems installed in accordance with Section 903.3.1.1 or 903.3.1.2.

DI06.2 Projects having more than 200 dwelling units.

Multiple-family residential projects having more than 200 dwelling units shall be provided with two separate and approved fire apparatus access roads regardless of whether they are equipped with an approved automatic sprinkler system.

2009 INTERNATIONAL FIRE CODE@

**Question No. 6**

International Fire Code Section 507.1
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

Background: “Fire flow” refers to two different requirements. Domestic supply to a structure from a public water supply usually consists of an underground line intended to supply the domestic needs of the household. When a fire sprinkler system is installed, the domestic supply must be capable of providing sufficient water and pressure for whatever domestic uses are actively running at the time of the fire plus the needed volume and pressure to supply the fire sprinkler system.

Example: Where the existing domestic water supply to the structure is incapable of supporting the required minimum fire flow for a fire sprinkler system, the installation of a jockey pump and interior water tank with a capacity of not less than 1500 gallons (density of .1 gallons per minute per square foot over 1500 sq. ft. for ten minutes) could be used to mitigate the impacts vs. installation of a larger water line from the main to the structure. A pump and tank assembly could be used as a temporary solution until a new water line could be installed.

The second element of “fire flow” is the volume, pressure and distance from fire hydrants. The required fire flow from fire hydrants is based on the tables below.

SECTION B101 GENERAL

B101Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102 DEFINITIONS

For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m2), used to determine the required fire flow.

SECTION B103 MODIFICATIONS

BI03.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

BI03.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

BI03.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the Fire Code Official is authorized to utilize NFPA 1142 or the International Wildland-Urban Interface Code.

SECTION B104 FIRE-FLOW CALCULATION AREA

BI04.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

BI04.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the International Building Code, are allowed to be considered as separate fire-flow calculation areas.

BI04.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105 FIRE-FLOW REQUIREMENTS FOR BUILDINGS

BIOS.I One and Two-Family Dwellings:
The minimum fire-flow and flow duration requirements for one- and two-family dwellings having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m2) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for

dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5m2) shall not be less than that specified in Table B105.I.

Exception: A reduction in required fire-flow of 50 percent, as approved, is allowed when the building is equipped with an approved automatic sprinkler system.

BIOS.2 Buildings other than One and Two-Family Dwellings:
The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B 105. I.

Exception: A reduction in required fire-flow of up to fifty (50) percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B 105.1.

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APPENDIX B

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS
FIRE-FLOW CALCULATION AREA (square feet)
I FIRE-FLOW FLOW DURATION

| **Type IA / IBa** | **Type IIA /IIA"** | **Type IV / V-A"** | **Type IIB /IIBa** | **Type V_B** | **Flow Duration(hours)** | |
|---|---|---|---|---|---|---|
| 0-22,700 | 0-12,700 | 0-8,200 | 0-5,900 | 0-3,600 | 1,500 | |
| 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 | 2 |
| 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 | |
| 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 | 3 |
| 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 | |
| 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 | 36,001-39,600 | 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-Greater | 166,50 I-Greater | 106,501-115,800 | 77,001-83,700 | 47,401-51,500 | 6,000 | 4 |
| - | - | 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 ,40 I-Greater | 138,301-Greater | 85,10 I-Greater | 8,000 | |

.For SI: 1 square foot = 0.0929 m2, 1 gallon per minute = 3.785 Lim, 1 pound per square inch = 6.895kPa.
a. Types of construction are based on the International Building Code.
b. Measured at 20 psi residual pressure.

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APPENDIX C
**FIRE HYDRANT LOCATIONS AND DISTRIBUTION**

SECTION C101 GENERAL

CI01.1 Scope. Fire hydrants shall be provided in accordance with this appendix for the protection of buildings, or portions of buildings, hereafter constructed.

SECTION C102 LOCATION

CI02.1 Fire hydrant locations. Fire hydrants shall be provided along required fire apparatus access roads and adjacent public streets.

SECTION C103 NUMBER OF FIRE HYDRANTS

CI03.1 Fire hydrants available. The minimum number of fire hydrants available to a building shall not be less than that listed in Table ClOS.1. The number of fire hydrants available to a complex or subdivision shall not be less than that determined by spacing requirements listed in Table CIOS.I when applied to fire apparatus access roads and perimeter public streets from which fire operations could be conducted.

SECTION C104 CONSIDERATION OF EXISTING FIRE HYDRANTS

CI04.1 Existing fire hydrants. Existing fire hydrants on public streets are allowed to be considered as available. Existing fire hydrants on adjacent properties shall not be considered available unless fire apparatus access roads extend between properties and easements are established to prevent obstruction of such roads.

SECTION C105 DISTRIBUTION OF FIRE HYDRANTS

CI05.1 Hydrant spacing. The average spacing between fire hydrants shall not exceed that listed in Table C 105.1.

Exception: The Fire Chief is authorized to accept a deficiency of up to 10 percent where existing fire hydrants provide all or a portion of the required fire hydrant service. Regardless of the average spacing, fire hydrants shall be located such that all points on streets and access roads adjacent to a building are within the distances listed in Table C 105.1

TABLE C105.1 NUMBER AND DISTRIBUTION OF FIRE HYDRANTS

| FIRE·FLOW REQUIREMENT (gpm) | MINIMUM NUMBER of Hydrants | AVERAGE SPACING BETWEEN HYDRANTS | MAXIMUM DISTANCE FROM ANY POINT ON STREET OR ROAD FRONTAGE TO A HYDRANT |
|---|---|---|---|
| 1,750 or less | 1 | 500 | 250 |
| 2,000-2,250 | 2 | 450 | 225 |
| 2,500 | 3 | 450 | 225 |
| 3,000 | 3 | 400 | 225 |
| 3,500-4,000 | 4 | 350 | 210 |
| 4,500-5,000 | 5 | 300 | 180 |
| 5,500 | 6 | 300 | 180 |
| 6,000 | 6 | 250 | 150 |
| 6,500-7,000 | 7 | 250 | 150 |
| 7,500 or more | 8 or more | 200 | 120 |

For SI: 1 foot = 304.8 mm, 1 gallon per minute = 3.785 LIm.

a. Reduce by 100 feet for dead-end streets or roads.
b. Where streets are provided with median dividers which cannot be crossed by fire fighters pulling hose lines, or where arterial streets are Provided with four or more traffic lanes and have a traffic count of more than 30,000 vehicles per day, hydrant spacing shall average 500 feet on each side of the street and be arranged on an alternating basis up to a fire-flow requirement of 7,000 gallons per minute and 400 feet for higher fire-flow requirements.
c. Where new water mains are extended along streets where hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.
d. Reduce by 50 feet for dead-end streets or roads.
e. One hydrant for each 1,000 gallons per minute or fraction thereof.
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**Question No. 7**

The applicant does have the option to amend the landscaping plan and bring the structure into compliance with the Urban Wildfire Interface Code or Firewise Criteria.

**Question No. 8**

Direct Attack is not an option for structures three or more stories due to the amount of time and personnel required to advance a pre-connected fire hose attack line.