FIRE-FLOW REQUIREMENTS FOR BUILDINGS

Based on the 2012 Edition of the International Fire Code

One of the basic essentials needed to control and extinguish a structure fire is an adequate water supply. Designing the water supply for new buildings is an important part of the initial planning for new development projects whether the new building is a 1500 square foot house or a 200,000 square foot retail store.

The City of Grand Junction has adopted the 2012 edition of the International Fire Code, which has minimum standard requirements for fire flow and fire hydrant locations listed in Appendix B and C. These standards are based on fire flow calculations originally developed by the Insurance Services Office (ISO). The Fire Code standard is a modified version of the ISO calculation method, and it utilizes a table of fire flows to simplify the calculation procedure. This guide is intended for developers of new projects to help explain how to calculate the required fire flows for new buildings and for additions to existing buildings.

Included at the end of this guide are the text and tables from Appendix B and C of the International Fire Code, 2012 Edition. Also included is a copy of the **New Development Fire Flow Form**. This form must be completed for new developments before a Planning Clearance is approved by the Fire Department. To complete the form:

1. The developer must fill out Section A.
2. The developer then has the water provider (Ute Water, Clifton Water, or Grand Junction) complete Section B.

3. The last part of the form is completed by the developer (or by a Colorado licensed engineer if required).

Once the completed form is reviewed and approved by the Fire Department, we can give a Planning Clearance for the project.

DETERMINING REQUIRED FIRE FLOW FOR NEW DEVELOPMENTS

Follow these steps to determine required flows:

1. Determine the use of the buildings-all buildings will be either:
    - One and two-family dwellings, or
    - Buildings other than one and two family dwellings.

    A. For buildings that are one and two-family dwellings:
    - For all dwellings with a **fire area** up to 3600 square feet, the required fire flow is 1000 gallons per minute.
    - For all dwellings with a **fire area** larger than 3600 square feet, use Table B105.1 to determine the required flow (look under the column heading Type VB). Find the number in the column corresponding to the fire area. The Fire flow is the number under the Fire Flow heading corresponding to the fire area. For example: a 4500 square foot home would have a required fire flow of 1750 gallons per minute.

    B. ***For buildings other than one or two family dwellings:***
    - Determine the **fire area** and **type of construction** for each building.

    If you don't know the construction type, consult your architect.
    - Use Table B105.1 to determine the fire flow. Some examples:
    - A 25,000 square foot Type V-A building has a fire flow requirement of 2,750 gallons per minute.
    - A 10,000 square foot Type IIIB building has a fire flow requirement of 2,250 gallons per minute.
    - A 100,000 square foot Type IIB building has a fire flow of 6,750 gallons per minute.

2. ***The required fire flow for a building can be reduced by two methods:***

    A. Installing an approved fire sprinkler system:
    - For one and two-family dwellings, the required fire flow is reduced by 50% in sprinkled buildings.
    - For buildings other than one and two-family dwellings, the fire flow can be reduced up to 75%, ***but the resulting fire flow cannot be reduced below 1,500 gallons per minute.*** For example: a 50,000 square foot Type IIIB building has a fire flow of 4,750 gallons per minute. If equipped with a fire sprinkler system, the

fire flow can be reduced by up to 75%-to 1,188 gallons per minute. But, the minimum fire flow in this case is 1,500 GPM because this is the minimum allowed by the code.

Please note the following **definitions** for the item B below:

Fire Flow Calculation Area (2012 IFC, B104.1): 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)

Separate Fire Flow Calculation Areas (2012 IFC, B104.2): Portions of a building which are separated by fire walls WITHOUT OPENINGS, and are constructed in accordance with the International Building Code (IBC 702.1), are allowed to be considered as separate fire-flow calculation areas.

> **Fire Wall** (per the 2012 International Building Code, 702.1): a fire-resistance rated wall having protected openings (NO OPENINGS OF ANY KIND, whether protected or otherwise, are allowed for separating fire flow calculation areas) which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

B. Dividing the building into separate **fire flow calculation areas** constructed in accordance with the International Building Code.

The fire flow for each **fire flow calculation area** with the building is then calculated according to Table B105.1. For example, if a 50,000 square foot Type IIIB building is separated into two 25,000 square foot **fire flow calculation areas** by a fire wall, the fire flow for each area is 3,250 gallons per minute. Without the fire wall, the 50, 000 square foot **fire flow calculation area** has a fire flow of 4,750 gallons per minute.

C. For most development projects, the building with the largest fire flow determines the fire flow requirements for the entire project. For larger projects with buildings of different sizes and types of construction, the design of the water distribution system for the project may depend on the type and size of buildings in a given area.

- As a general rule, water mains supplying fire hydrants should be at least 8" in size.
- Larger water mains may be required depending on the fire flow available at the point of connection to the existing water-distribution system.

FIRE HYDRANT LOCATIONS AND DISTRIBUTION

Project developers should refer to appendix C of the Fire Code to determine the number and placement of fire hydrants for a given project. A few general rules apply:

1. For single family residential subdivisions:

    - Fire hydrants should be located at all major intersections. All residential lots must have a fire hydrant within 250 of the lot frontage as measured along the street. For smaller size lots located on a cul-de-sac, the distance to the nearest fire hydrant can be increased to 450 feet.

2. For commercial developments, refer to Table C105.1. and follow these steps in order:

    1. Determine the fire flow requirement.
    2. Determine the required number of fire hydrants.
    3. Determine the maximum spacing between hydrants.
    4. Provide an approved access road so a fire truck can be located within 150 feet walking distance of all exterior portions of the building.
    5. **Based on the required fire flow,** a fire hydrant must be within the required distance from the fire truck as shown in the right hand column from the Table. For example: if the required fire flow is 3,000 GPM, three fire hydrants are required; their average spacing cannot exceed 400 feet and at any point along the required access road, a fire hydrant must be within 225 feet.

NOTE: For buildings equipped with an approved fire sprinkler system, hydrant spacing can be increased as long as the distance from the nearest fire hydrant to the fire truck does not exceed 450 feet.

WHEN ARE LOOPED WATER LINES REQUIRED?

Looped water lines are fed from two directions in such a way that a line break at any point along the looped line does not result in shutting off the water supply. Looped lines are important in a fire situation because a water main break could result in loss of a building or group of buildings if a second source of supply is not available.

The City of Grand Junction has adopted (through Ordinance No. 4500) the following rules for when looped lines are required:

> Section C102.2 **Water supply lines.** Hydrants shall be on a looped (receiving water from more than one direction) water supply line of at least six inches (6") in diameter.

Exceptions:

1. One or two-family residential developments may have hydrants supplied by a dead-end water line where there are 30 or fewer dwelling units. Up to 60 dwelling units may have hydrants supplied by a dead-end water line when all units are protected by an approved residential fire sprinkler system. In any case, the Fire Chief may require such developments provide for water line connections to adjacent properties to ensure the overall water distribution system meets recognized standards.

2. Multiple family residential developments having up to 100 dwelling units may be protected by fire hydrants supplied by a dead-end water line. Up to 200 dwelling units may be protected by fire hydrants supplied by a dead-end water line when all units are protected by an approved residential fire sprinkler system. In no case shall such developments be supplied by a dead-end line exceeding 1,000 feet in length. The Fire Chief may require such developments provide for water line connections to adjacent properties to ensure the overall water distribution system meets recognized standards.

3. For commercial and industrial developments, any building not exceeding three stories or 30 feet in height may be protected by fire hydrants supplied by a dead-end water line.

4. For commercial and industrial developments, buildings or facilities having a gross building area up to 62,000 square feet may be protected by fire hydrants supplied by a dead-end water line. The gross building area may be increased to 124,000 square feet without a looped water line when all buildings are equipped with an approved automatic fire sprinkler system. In no case shall such developments be supplied by a dead-end line exceeding 1,000 feet in length. The Fire Chief may require such developments to provide for water line connections to adjacent properties to ensure the overall water distribution system meets recognized standards.

5. The Fire Chief may allow a new development, that would otherwise be required to provide a looped water line for required fire hydrants, to have a dead-end line as long as the development provides a means to connect to a looped system as future development occurs. The time period and conditions under which this exception is allowed shall be as determined by the Chief.

6. The Fire Chief may allow fire hydrants to be supplied by a means other than a looped water line when the permittee can demonstrate, to the satisfaction of the Fire Chief, that a looped system is not practicable. In such event, the Fire Chief shall make his findings in writing and shall copy such findings to the Public Works Director and the Director of Community Development. In such cases, additional fire protection may be required as determined by the chief.

The Fire Department recognizes that for many new development projects it is not always practical to **immediately** provide looped water lines. For example, if the new project is surrounded by undeveloped land or by areas that are already developed with no means of connecting to existing lines, dead-end lines **may** be allowed according to two basic rules:

1. If the required fire flows can be provided with dead-end lines, the looping can be delayed until either a later phase of the project is completed, or until adjacent properties are developed so that water line extensions result in completion of the loop.

2. If the required fire flows can be provided with dead-end lines and looping the water lines is demonstrated to be impracticable, then the Fire Chief may allow the project to develop.

In all cases, if looping the water lines is the only way to provide the required fire flows, then the project will not be approved without the looping.