



THE TOWN OF  
CORTE MADERA  
MARIN COUNTY CALIFORNIA

# PUBLIC WORKS/ENGINEERING DEPARTMENT

## Elevating a Structure within the Floodplain

### Introduction

The Special Flood Hazard Area (SFHA), more commonly referred to as the "floodplain", is delineated on a Flood Insurance Rate Map (FIRM) prepared by FEMA. In Corte Madera, the SFHA consists of properties within zones AE and VE as shown on the FIRM for our community. Associated with these zones is a Base Flood Elevation (BFE). This BFE represents the level to which a flood having a 1-percent chance of being equaled or exceeded in any given year (commonly called the "100-year" flood) will rise. For Corte Madera, the BFE is equal to an elevation of 10.0 NAVD (North American Datum).

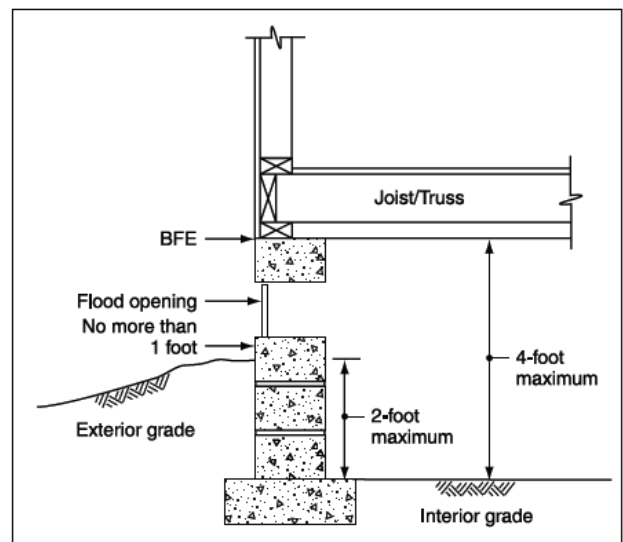
The National Flood Insurance Program (NFIP) requires that the Town examine the construction of all new structures, and the improvement, modification, or repair of existing structures that are located within the SFHA. This examination which is detailed in Public Works handout entitled "Floodplain Development Permit Checklist", may trigger the requirement to raise the structure above the BFE.

This handout provides general information applicable to elevating a structure above the base flood elevation. Detailed discussions on the topics included in this handout can be found in the following FEMA publications: Technical Bulletin 1 "**Openings in Foundation Walls and Walls of Enclosures**", Technical Bulletin 2 "**Flood Damage-Resistant Materials Requirements**", and Technical Bulletin 3 "**Non-Residential Floodproofing**".

### Elevating a Residential Structure within the SFHA

According to the NFIP, elevating a structure requires that the "lowest floor" of the structure be raised above the BFE. The "lowest floor" is defined as the floor of the lowest enclosed area of a building. An unfinished or flood-resistant enclosure that is solely used for parking of vehicles, building access, or storage (such as an attached garage) is not the lowest floor, provided the enclosure is built in compliance with applicable requirements. The NFIP defines a "basement" as any area that is below-grade on all sides, and the regulations do not allow basements to extend below the BFE.

Within AE zones (as shown on the FIRM), the NFIP requires that openings be provided within any walls or foundations extending below the BFE. These openings allow floodwaters to reach equal levels on both sides of the walls, thereby lessening the potential for damage caused by flood forces. In VE zones the area below the lowest floor must be free of obstructions or have break-away walls to allow floodwaters to pass.



## Information about Openings

**Minimum Number of Openings:** Each enclosed area is required to have a minimum of two openings on exterior walls to allow floodwaters to enter directly. It is recommended that openings be reasonably distributed around the perimeter of the enclosed area.

**Height of Openings above Grade:** The bottom of each opening is to be located no higher than 1 foot above the grade that is immediately under each opening. Note that the openings must be located below the BFE.

**Non-Engineered Openings:** Non-engineered openings are openings that are used to satisfy the prescriptive requirement that calls for 1 square inch of net open area for each square foot of enclosed area.

**Engineered Openings:** Openings that are designed and certified by a registered design professional as meeting the performance required by the regulations are called "engineered openings." ASCE 24 Section 2.6.2.2 contains installation and design criteria for engineered openings. As with non-engineered openings, engineered openings must be designed to allow automatic entry and exit of floodwaters.

**Building Vents:** Building code requirements may call for ventilation of certain under-floor spaces. Ventilation openings typically are positioned near the top of the foundation wall to facilitate air flow. In most cases, ventilation openings will be too high above grade to satisfy the requirements for flood openings.

**Note:** If openings are not compliant, the floor of the crawlspace or the floor of the enclosure becomes the "lowest floor." In those cases, the result may be significantly higher flood insurance premiums, especially if the floor of the crawlspace or enclosure is more than a foot or two below the BFE.

## Garages Attached to Elevated Structures

Many homes within the SFHA are designed with attached garages. An attached garage may have its floor below the BFE provided the garage meets all of the requirements for an enclosed area below the BFE. The use of the garage space must be limited to parking of vehicles, building access, and storage.

Openings are required in the exterior walls of the garage, and openings may be installed in exit doors and garage doors. It is important to note that garage doors themselves do not meet the requirements for openings. If an attached garage is built with its floor below the BFE and it does not have compliant openings, the garage floor becomes the lowest floor. Flood insurance premiums may be significantly higher than if the garage complies with the requirements for openings and other requirements, such as flood damage-resistant materials and elevated utilities.

## Accessory Structures

Detached garages and detached storage buildings in AE and VE zones may be permitted without requiring them to be elevated if they comply with all of the requirements for enclosures. Garages and other accessory buildings must be used only for parking of vehicles and storage, utilities must be elevated, flood damage-resistant materials must be used below the BFE, the requirements for flood openings must be satisfied, and they must be anchored to resist flotation, collapse, or lateral movement under flood conditions.

## FLOOD DAMAGE - RESISTANT MATERIALS

Since all construction below the BFE is susceptible to flooding, portions of a structure that sit below the BFE require the use of construction materials that are resistant to flood damage. Flood damage-resistant material is defined by the NFIP as "any building product material, component or system capable of withstanding direct and

prolonged contact with floodwaters without sustaining significant damage." **All building materials below the BFE must be flood damage-resistant.**

### Non-Residential Structures within the SFHA

For non-residential structures located within the SFHA, the procedures vary slightly from those used for residential structures. The Town will make a determination of "substantial improvement" or "substantial damage" during the Design Review and/or Building Permit process. This determination may result in the requirement to either: raise the structure above the BFE, or provide dry-floodproofing measures to portions of the structure that lie below the BFE. The choice of these two methods lies with the owner. Should dry-floodproofing be employed, the Town will require supporting documentation, engineering analysis, an emergency operations plan, and regular inspection and maintenance.

### Documenting Elevations

For both new buildings and existing buildings that are substantially improved, the Town is required to collect data to document the surveyed elevation of the lowest floor. The NFIP's Elevation Certificate (FEMA Form 81-31) is designed specifically for this purpose, and provides the data necessary for the proper rating of NFIP flood insurance. Two Elevation Certificates are typically prepared for a project. The first will document the finish floor elevation during construction to verify that the proper elevation has been achieved to raise the structure above the BFE. The second is prepared at the completion of the project to document all of the elevations required by FEMA, and supply the insurance provider with appropriate information so that a suitable flood insurance premium can be determined.

### Plan Requirements

- Indicate the Base Flood Elevation (BFE) on a cross-section through the structure. Also indicate the finish floor elevation of the "lowest floor", and the typical ground elevation at the foundation.
- Show the layout and details for flood venting around the structure, and include a calculation of required venting area.
- No "basements" construction is allowed within the SFHA.
- Provide an "interim" Elevation Certificate at the stage of construction when the lowest floor is first established and still correctable with minimum effort. Prepare a "final" Elevation Certificate upon completion of the project.

*NOTE: This publication is intended to be an informal means of informing the public about a Town process. Although it is assumed the information provided is accurate, the document is not intended to create any sort of legal obligation on the Town's part. The actual process is governed by Town ordinances, regulations and procedures, and the reader should make specific inquiry to the Town for specific cases.*

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