

## Non-Residential Structures in the Floodplain

***New non-residential construction located in the regulated floodplain must be protected against flood damage from a 100-year flood event by elevation of the structure or dry floodproofing.*** In addition to new buildings, “new construction” also includes all improvements to existing post-FIRM structures (built after the community began regulating floodplain development). If a building is “substantially improved” or has been “substantially damaged” the entire structure must be brought into compliance with the current standards for new non-residential construction.

***The Base Flood Elevation (BFE)*** is the calculated water height for the flood that has a 1% probability of being equaled or exceeded in any given year (the 100-year flood).

### What is the Flood Protection Level?

If a “Base Flood Elevation” is indicated on the floodplain map issued by FEMA or is available from another source, then non-residential buildings must be protected from flood damage to that height. Some communities require an additional foot or more of “freeboard” above the BFE as the flood protection level.

### Elevation of the Building

Elevation is the preferred method of protecting non-residential buildings from flood damage. In non-coastal floodplains, this requires ***location of the lowest floor at or above the flood protection level.*** A basement that is below grade on all sides is prohibited.

Elevation can be accomplished by:

- Elevation on properly compacted fill;
- Elevation on piles, posts, piers, or columns; or
- Elevation on walls or a crawl space.

### Elevation Certificate

To ensure that a building is properly elevated, the lowest floor is surveyed and an elevation certificate<sup>1</sup> is obtained and kept by the local permit office.



### Enclosed Areas Below the Lowest Floor

An unfinished, flood-resistant, enclosed area below the lowest floor can be permitted if it is usable solely for vehicle parking, building access, or limited storage. This area must be properly vented to allow for equalization of hydrostatic forces and meet design and use criteria (see *Floodplain Facts #8: Enclosed Areas Below the Flood Protection Level*).

### Dry Floodproofing

As an alternative to elevation, floodproofing of non-residential buildings is permitted. ***Dry floodproofing requires that the structure be watertight below the flood protection level, with walls substantially impermeable to the passage of water.*** All structural components located below the flood protection level must be capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy. Utilities must be protected from flood damage. Most floodproofing is appropriate only where floodwaters are less than three feet deep, because walls and floors may collapse under higher water levels. Techniques that require human intervention are only appropriate if there is adequate warning time (12 hours is a recommended minimum) and someone will be present who is capable of implementing or installing the required measures.

<sup>1</sup> Elevation Certificate and Instructions are available at <https://www.fema.gov/media-library/assets/documents/160>.

## Floodproofing Certificate

A registered professional engineer or architect must prepare the building plans and certify that the proposed dry floodproofing measures will meet the required criteria. Upon completion of the floodproofed portion of the structure, the as-built floodproofed elevation is certified by a licensed professional.<sup>2</sup>

## Anchoring

The building, any gas or liquid storage tanks, and any equipment servicing the building must be designed and anchored to prevent flotation, collapse, or lateral movement during the 100-year flood event. In addition to anchoring the building to its foundation, it is necessary to ensure that the foundation won't move (due to hydrostatic forces, hydrodynamic forces, or undercutting by erosion or scour). In areas where flood velocities exceed five feet per second, additional anchoring measures may be required, such as reinforcing crawlspace walls, using deeper footings, using extra bolts to connect the sill to the foundation, or installing rods to connect the cap to the sill.

## Flood Resistant Design, Materials, and Utilities

Whether the structure is elevated or floodproofed, all parts of the building that are exposed to floodwaters must be resistant to flood damage. This involves the use of flood resistant materials and designs. (Additional information and references are provided in *Floodplain Facts #9: Flood Resistant Design*.)

## Additional Resources

- *Elevated Residential Structures*, FEMA 54 (1984), available at <https://www.fema.gov/media-library/assets/documents/3289> provides information about elevating buildings, including site analysis, architectural design examples, and construction guidelines.
- *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe from Flooding*, Technical Bulletin 10-01, FEMA FIA-TB-10 (2001), available at <https://www.fema.gov/media-library/resources-documents/collections/4>. This technical bulletin provides guidance on the construction of buildings on land elevated through the placement of fill.
- *Above the Flood: Elevating Your Floodprone House*, FEMA 347 (2000), available at <https://www.fema.gov/media-library/assets/documents/725>, describes alternative techniques that can be used to elevate existing floodprone buildings and presents case studies of homes in south Florida that were elevated above the 100-year flood level following Hurricane Andrew.
- *Non-Residential Floodproofing - Requirements and Certification for Buildings Located in Special Flood Hazard Areas*, Technical Bulletin 3-93, FEMA FIA-TB-3 (1993), available at <https://www.fema.gov/media-library/resources-documents/collections/4> provides guidance on the NFIP regulations concerning watertight construction and the required certification for floodproofed non-residential buildings.
- *Floodproofing Non-Residential Structures* (Full Document), FEMA 102 (1986), available at <https://www.fema.gov/media-library/assets/documents/15599>. This document provides detailed technical information for building owners, designers and contractors on wet and dry floodproofing techniques.
- *Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas*, Technical Bulletin 6-93, FEMA FIA-TB-6 (1993), available at <https://www.fema.gov/media-library/collections/4> provides guidance on the NFIP regulations concerning the design of dry-floodproofed below-grade parking garages for non-residential buildings.
- *Flood-Resistant Design and Construction*, American Society of Civil Engineers (ASCE) 24-05, purchase at [www.asce.org](http://www.asce.org), highlights available at <http://www.fema.gov/library/viewRecord.do?id=3515>.

<sup>2</sup> Floodproofing Certificate for Non-Residential Structures is available at <https://www.fema.gov/media-library/assets/documents/2748>.