

Residential Structures in the Floodplain

New residential construction in the regulated floodplain must be elevated, anchored, and otherwise protected against flood damage from a 100-year flood event. In addition to new buildings, “new construction” also includes all improvements to existing post-FIRM houses (built after the community began regulating floodplain development). If a home is “substantially improved” or has been “substantially damaged” the entire structure must be brought into compliance with the current standards for new residential construction.

How Is the Flood Protection Level Determined?

If a “Base Flood Elevation” is indicated on the floodplain map issued by FEMA or is available from another source, then 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.

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).



How Should the House Be Elevated?

In non-coastal floodplains, ***the top of the lowest floor must be elevated to 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 Certificate¹ is obtained and kept by the local permit office. This certificate is also used to rate flood insurance policies.

Enclosed Areas Below the Lowest Floor

An unfinished flood-resistant enclosed area below the lowest floor (or an attached garage below the flood protection level) 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*).

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.

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

Flood Resistant Design, Materials, and Utilities

All parts of the building that are located below the flood protection level must be resistant to flood damage. This is generally accomplished by locating machinery, equipment, and other vulnerable components above the first floor. Those parts of the building located below the flood protection level (such as foundation elements, floor beams and joists, and utility equipment) must be made of flood-resistant materials and constructed using methods and practices that are resistant to flood damage. (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 residential 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/assets/documents/3522>. 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 houses and presents case studies of homes in south Florida that were elevated above the 100-year flood level following Hurricane Andrew.
- *Flood-Resistant Design and Construction*, American Society of Civil Engineers (ASCE) 24-05, purchase at www.asce.org, highlights available at <http://www.fema.gov/library/viewRecord.do?id=3515>.