

Building on Strong and Safe Foundations

2. Foundations

This chapter discusses the primary issues related to designing foundations for residential buildings in coastal areas: foundation design criteria, National Flood Insurance Program (NFIP) requirements on coastal construction in A and V zones, the performance of various foundation types, and foundation construction.

2.1 Foundation Design Criteria

Foundations in coastal areas should be designed in accordance with the 2006 or 2009 edition of the IBC or IRC; both contain up-to-date wind provisions and are consistent with NFIP flood provisions. In addition, any locally adopted building ordinances must be addressed. Foundations should be designed and constructed to:

- n** Properly support the elevated home and resist all loads expected to be imposed on the home and its foundation during a design event
- n** Prevent flotation, collapse, or lateral movement of the building

- n Function after being exposed to the anticipated levels of erosion and scour that may occur over the life of the building.

In addition, the foundation should be constructed with flood-resistant materials below the Base Flood Elevation (BFE).

2.2 Foundation Design in Coastal Areas

Building in a coastal environment is different from building in an inland area because:

- n Storm surge, wave action, and erosion in coastal areas make coastal flooding more damaging than inland flooding.
- n Design wind speeds are higher in coastal areas and thus require buildings and their foundations to be able to resist higher wind loads.

Foundations in coastal areas must be constructed such that the top of the lowest floor (in A zones) or the bottom of the lowest horizontal structural members (in V zones) of the buildings are elevated above the BFE, while withstanding flood forces, high winds, erosion and scour, and floodborne debris. Deeply embedded pile or other open foundations are required for V zones because they allow waves and floodwaters to pass beneath elevated buildings. Because of the increased flood, wave, floodborne debris, and erosion hazards in V zones, NFIP design and construction requirements are more stringent in V zones than in A zones.

Some coastal areas mapped as A zones may also be subject to damaging waves and erosion (referred to as “Coastal A zones”). A Coastal A zone is also known as the Limit of Moderate Wave Action (LiMWA), which is the landward extent of coastal areas designated Zone AE where waves higher than 1.5 feet can exist during a design flood. Buildings in these areas that are constructed to minimum NFIP A zone requirements may sustain major damage or be destroyed during the base flood. ***It is strongly recommended that buildings in A zones subject to breaking waves and erosion be designed and constructed with V zone type foundations*** (Figure 2-1). Open foundations are often recommended instead of solid wall, crawlspace, slab, or shallow foundations, which can restrict floodwaters and be undermined easily. Figure 2-2 shows examples of building failures due to erosion and scour under a slab-on-grade foundation.

NFIP Minimum Elevation Requirements for New Construction*

A zone: Elevate top of lowest floor to or above BFE

V zone: Elevate bottom of lowest horizontal structural member supporting the lowest floor to or above BFE

In both V and A zones, many property owners have decided to elevate one full story above grade, even if not required, to allow below-building parking. Fact Sheet No. 2 of FEMA 499 contains information about NFIP requirements and recommended best practices in A and V zones (see Appendix F).

* For floodplain management purposes, “new construction” means structures for which the start of construction began on or after the effective date of the floodplain management regulation adopted by a community. Substantial improvements, repairs of substantial damage, and some enclosures must meet most of the same requirements as new construction.

