



PDHonline Course C816 (3 PDH)

Coastal Buildings – Maintenance and Retrofits

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Repairs, Remodeling, Additions, and Retrofitting – Flood

Purpose: *To outline National Flood Insurance Program (NFIP) requirements for repairs, remodeling, and additions, and opportunities for retrofitting in coastal flood hazard areas; to provide recommendations for exceeding those minimum requirements.*

Key Issues

- Existing buildings that sustain substantial damage or that are substantially improved (see box on page 3) will be treated as new construction and must meet the community's current flood-resistant construction requirements (e.g., lowest floor elevation, foundation, and enclosure requirements).
- Work on post-Flood Insurance Rate Map (FIRM)¹ existing buildings that are not substantially damaged or substantially improved (see box on page 3) must meet the community's flood-resistant construction requirements that were in effect when the building was originally constructed.
- Work on pre-FIRM¹ existing buildings that are not substantially damaged or substantially improved (see box on page 3) is not subject to NFIP flood-resistant construction requirements.
- With some minor exceptions (e.g., code violations and historic buildings), substantial damage and substantial improvement requirements apply to all buildings in the flood hazard area, whether or not a flood insurance policy is in force.
- Buildings damaged by a flood and covered by flood insurance may be eligible for additional payments through the Increased Cost of Compliance (ICC) policy provisions. Check with an insurance agent and the authority having jurisdiction (AHJ) for details.
- Repairs and remodeling—either before or after storm damage—provide many opportunities for retrofitting homes and making them more resistant to flood damage.

Factors That Determine Whether and How Existing Buildings Must Comply With NFIP Requirements

Rules governing the applicability of NFIP new construction requirements to existing buildings are confusing to many people; this fact sheet and Fact Sheet No. 1.2, Summary of Coastal Construction Requirements and Recommendations for Flood Effects provide guidance on the subject.

When repairs, remodeling, additions, or improvements to an existing building are undertaken, four basic factors determine whether and how the existing building must comply with NFIP requirements for new construction:

- **Value of damage/work**— whether the cost of repairs to the damaged building triggers substantial damage or substantial improvement regulations (see page 3).
- **Nature of work**— whether the work involves an expansion of the building, either laterally or vertically (an addition), or an enclosure of space below the Base Flood Elevation (BFE), or the demolition and reconstruction of an existing building, or the relocation of an existing building.

Note: Repairs, remodeling, additions, and retrofitting may also be subject to other community and code requirements, some of which may be more restrictive than the NFIP requirements. Check with the AHJ before undertaking any work.

¹ Pre-FIRM is defined as a building for which construction or substantial improvement occurred on or before December 31, 1974, or before the effective date of the initial Flood Insurance Rate Map (FIRM) for the community. Post-FIRM is defined as a building for which construction or substantial improvement occurred after December 31, 1974, or on or after the effective date of the initial Flood Insurance Rate Map (FIRM) for the community.

² This fact sheet and Fact Sheet No. 2 recommend meeting current NFIP/community requirements in these instances.



- **Pre-FIRM or post-FIRM building**– different requirements may apply to pre-FIRM existing buildings.
- **Flood zone**– different requirements may apply in V Zones and A Zones (this includes both the Coastal A Zone and A Zone).

Two other factors may need to be considered (consult the AHJ regarding whether and how these factors apply):

- **Code violations**– if cited by a code official, the NFIP regulations exempt certain work to correct existing violations of state or local health, sanitary, or safety code requirements from the substantial improvement and substantial damage calculations.
- **Historic structures**– a building that is on the National Register of Historic Places or that has been designated as historic by federally certified state or local historic preservation offices (or that is eligible for such designation) may be exempt from substantial damage and substantial improvement requirements, provided any work on the building does not cause the building to lose its historic designation.

A Zones Subject to Breaking Waves and Erosion

Home Builder's Guide to Coastal Construction (HBGCC) Recommendations: Treat buildings and lateral additions in A Zones subject to breaking waves and erosion like V Zone buildings. Elevate all A Zone lateral additions (except garages) such that the bottom of the lowest horizontal structural member is at, or above, the DFE. For garages (in A Zones subject to breaking waves and erosion) below the DFE, construct with breakaway walls.

Code Compliance

Definitions from the International Code Council Model Building Codes

ADDITION: An extension or increase in floor area or height of a building or structure.

ALTERATION: Any construction or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a mechanical system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

REPAIR: The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

2009 International Residential Code Requirements for Additions, Alterations or Repairs

R102.7.1 Additions, alterations or repairs. Additions, alterations, or repairs to any structure shall conform to the requirements for a new structure without requiring the existing structure to comply with all of the requirements of this code, unless otherwise stated. Additions, alterations or repairs shall not cause an existing structure to become unsafe or adversely affect the performance of the building.

What Is Substantial Damage?

Substantial damage is damage, **of any origin**, where the cost to restore the building to its pre-damage condition equals or exceeds 50 percent of the building's market value before **the damage occurred**.

What Is Substantial Improvement?

Substantial improvement is any reconstruction, rehabilitation, addition, or improvement of a building, the cost of which equals or exceeds **50 percent of the building's pre-improvement market value**.

When repairs and improvements are made simultaneously, all costs are totaled and compared with the 50 percent of market value threshold.

Substantial Damage and Substantial Improvement

It is not uncommon for existing coastal buildings to be modified or expanded over time, often in conjunction with the repair of storm damage. *All repairs, remodeling, improvements, additions, and retrofitting to buildings in flood hazard areas must be carried out in conformance with floodplain management ordinances pertaining to substantial improvement and substantial damage.*

What Costs Are Included in Substantial Damage and Substantial Improvement Determinations?

- All **structural items and major building components** (e.g., foundations; beams; trusses; sheathing; walls and partitions; floors; ceilings; roof covering; windows and doors; brick, stucco, and siding; attached decks and porches).

- **Interior finish elements** (e.g., tile, vinyl flooring, stone, carpet; plumbing fixtures; gypsum wall-board and wall finishes; built-in cabinets, book-cases and furniture; hardware).
- **Utility and service equipment** (e.g., HVAC equipment; plumbing and wiring; light fixtures and ceiling fans; security systems; built-in appliances; water filtration and conditioning systems).
- Market value of **all labor and materials** for repairs, demolition, and improvements, including management, supervision, overhead, and profit (do not discount volunteer or self-labor or donated/discounted materials).

What Costs Are Not Included in Substantial Damage and Substantial Improvement Determinations?

- **Design costs** (e.g., plans and specifications, surveys and permits).
- **Clean-up** (e.g., debris removal, transportation, and landfill costs).
- **Contents** (e.g., furniture, rugs, appliances not built in).
- **Outside improvements** (e.g., landscaping, irrigation systems, sidewalks and patios, fences, lighting, swimming pools and hot tubs, sheds, gazebos, detached garages).

Note: Some jurisdictions have enacted more restrictive requirements—some use a less-than-50-percent damage/improvement threshold. Some track the cumulative value of damage and improvements over time. Consult the AHJ for local requirements.

Additions

Additions increase the square footage or external dimensions of a building. They can be divided into *lateral additions*, *vertical additions*, and *enclosures of areas below existing buildings*. When considering additions, it is important to consider that changes to the shape of the building may impact the potential damages to the house. A lateral addition may change the way flood waters travel around the structure and potentially create obstructions for flood-borne debris that may require additional foundation modifications. Vertical additions may also impose greater loads on the existing structure. A qualified design professional should evaluate the loading to the entire structure to see if additional structural modifications are required in order to maintain the structure's ability to sustain flood loading.

Lateral Additions

- If a *lateral addition* constitutes a substantial improvement to a V Zone building, *both the addition and the existing building must comply with the effective base flood elevation, foundation, and other flood requirements for new V Zone construction* (see Figure 1).

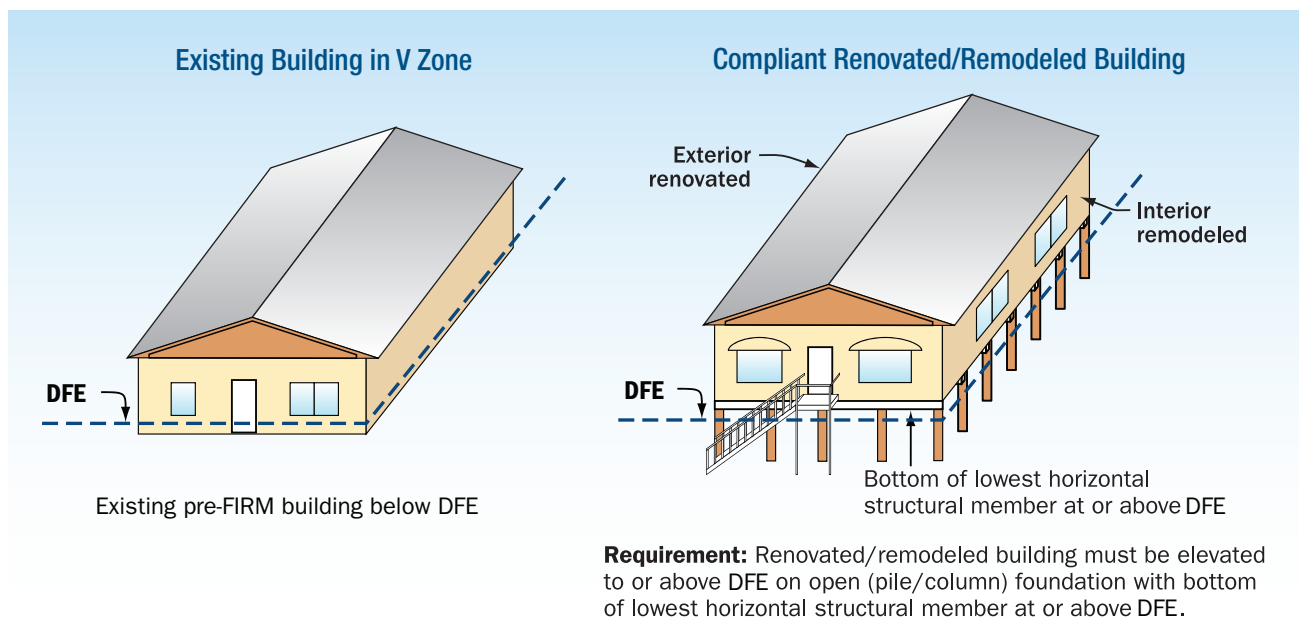


Figure 1. Substantial improvement: Renovated/remodeled building in a V Zone.

- If a lateral addition constitutes a substantial improvement to an A Zone building, only the addition must comply with the current floor elevation, foundation, and other flood requirements for new construction, as long as the alterations to the existing building are the minimum necessary.³ *Minimum alterations necessary* means the existing building is not altered, except for cutting an entrance through the existing building wall into the addition, and except for the minimum alterations necessary to tie the addition to the building. If more extensive alterations are made to the existing building, it too must be brought into compliance with the requirements for new construction.
- If a lateral addition to a pre-FIRM building does not constitute a substantial improvement, neither the addition nor the existing building must be

elevated. However, the HBGCC recommends that both the existing building and the addition be elevated to, or above, the current DFE, in a manner consistent with current NFIP requirements for new construction, and using a V Zone-type foundation in V Zones and in Coastal A Zones.

- If a lateral addition to a post-FIRM building does not constitute a substantial improvement, the addition must be elevated in accordance with the flood requirements in effect at the time the building was originally constructed, even if the BFE and flood hazard have changed over time. The HBGCC recommends that both the existing building and the addition be elevated to, or above, the current DFE, in a manner consistent with current NFIP requirements for new construction, and using a V Zone-type foundation in V Zones and in Coastal A Zones (see Figure 2).

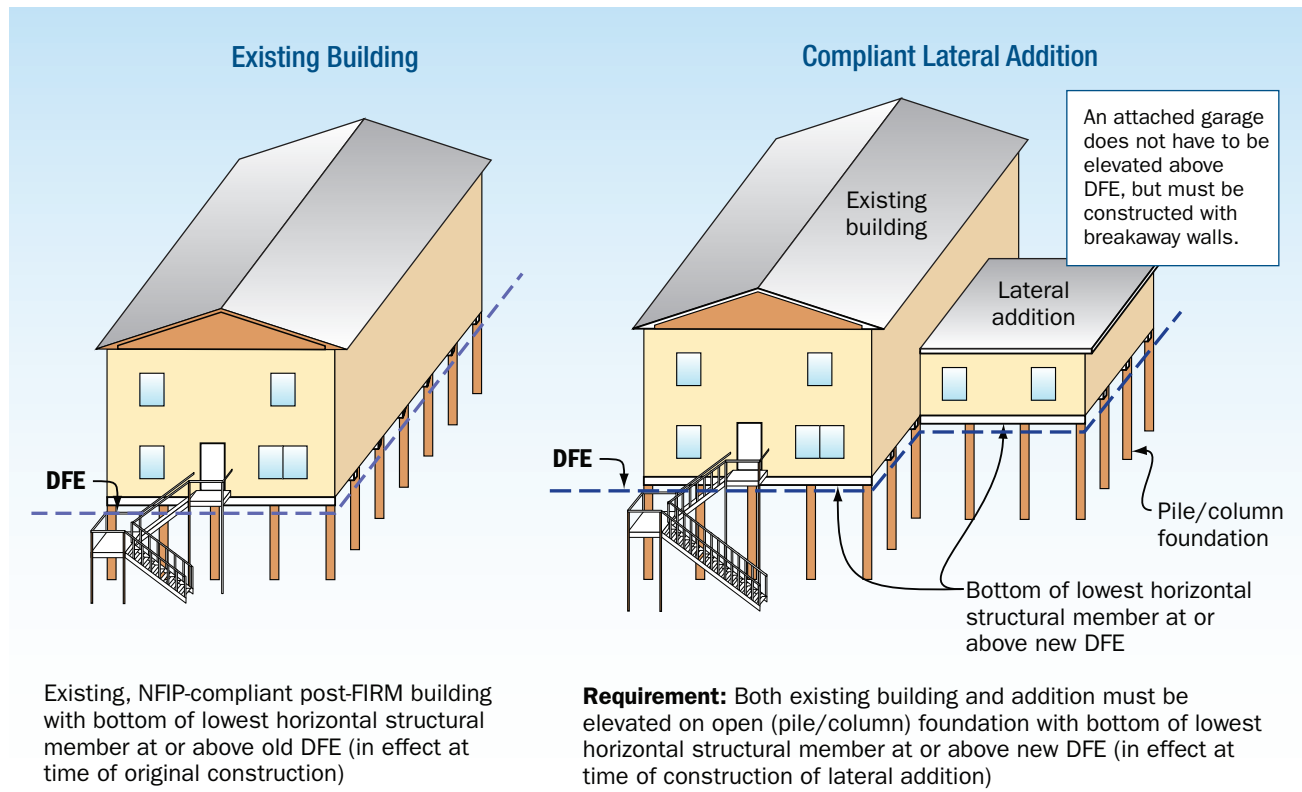
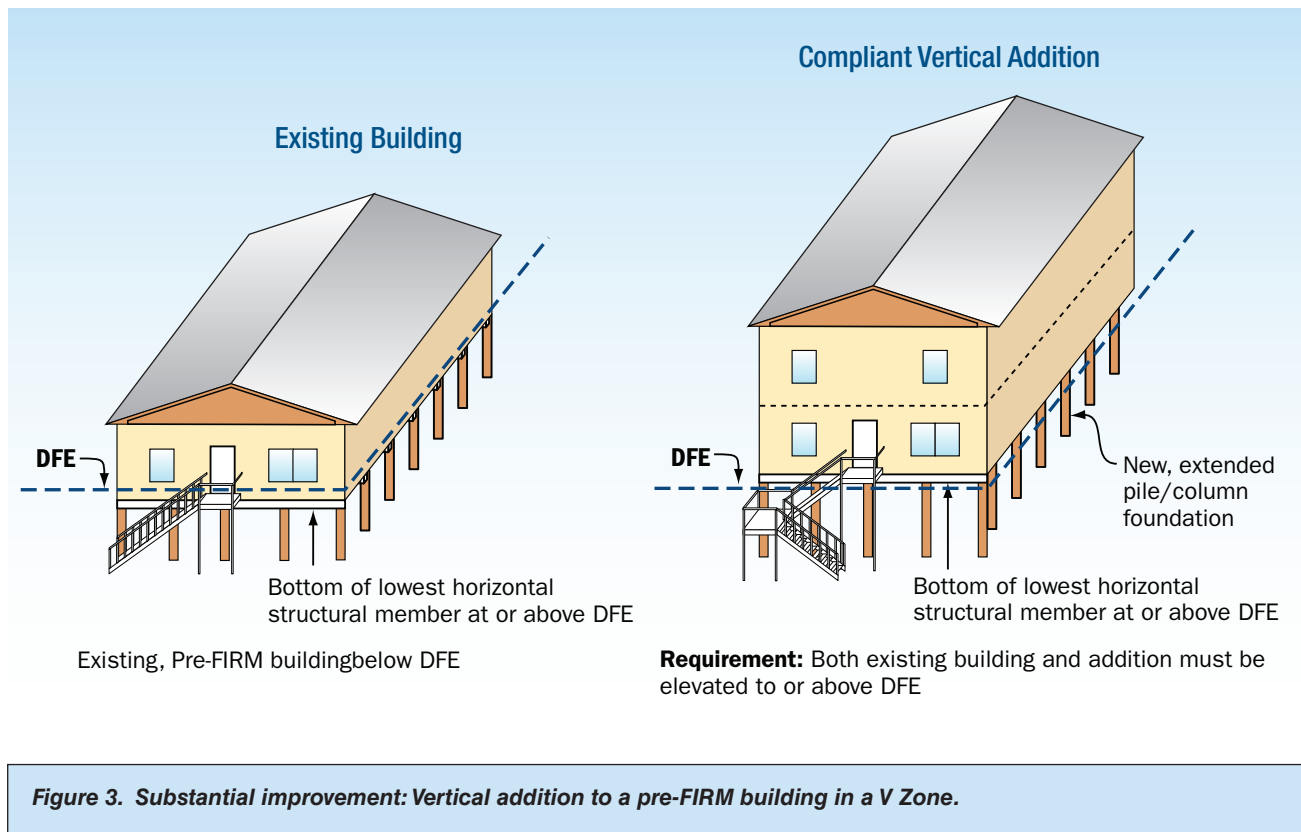


Figure 2. Substantial improvement: Lateral addition to a pre-FIRM building in a V Zone.

³ However, the HBGCC recommends that both the existing building and the addition be elevated to, or above, the current DFE, in a manner consistent with current NFIP requirements, and using a V Zone-type foundation in Coastal A Zones.

Vertical Additions

- If a vertical addition to a V Zone or A Zone building constitutes a substantial improvement, both the addition and the existing building must comply with the effective base flood elevation, foundation, and other flood requirements for new construction (see Figure 3).
- If a vertical addition to a pre-FIRM V Zone or A Zone building does not constitute a substantial improvement, neither the addition nor the existing building must be elevated or otherwise brought into compliance with NFIP requirements. However, the HBGCC recommends that both the addition and the existing building be elevated to, or above, the current DFE in a manner consistent with current NFIP requirements for new construction, and using a V Zone-type foundation in V Zones and in Coastal A Zones (see Figure 3). The HBGCC also recommends strongly against using any space below the current BFE for habitable uses (uses permitted by the NFIP are parking, storage, and building access).
- If a vertical addition to a post-FIRM V Zone or A Zone building does not constitute a substantial improvement, the addition must be designed and constructed in accordance with the flood requirements in effect at the time the building was originally constructed. However, BFEs and flood zones change over time as areas are remapped. The HBGCC recommends that both the addition and the existing building be elevated to, or above, the current DFE in a manner consistent with current NFIP requirements for new construction, and using a V Zone-type foundation in V Zones and in Coastal A Zones. The HBGCC also recommends strongly against using any space below the current BFE for habitable uses (uses permitted by the NFIP are parking, storage, and building access).



Enclosures of Areas Below Existing Buildings

Enclosures below existing buildings are treated like vertical additions.

Existing NFIP requirements: (1) do not enclose and convert to habitable use any space below the BFE under any circumstances, and (2) construct only breakaway enclosures below existing buildings in V Zones and in Coastal A Zones. HBGCC recommendation: in V Zones and Coastal A Zones the area below the BFE should be built free of obstruction. Use open lattice, screening, or breakaway walls. For requirements concerning enclosures below elevated buildings see Fact Sheet 8.1. It should be noted that enclosures built with breakaway walls below the BFE may result in increased insurance premiums when compared to an open foundation.

Reconstruction of a Destroyed or Razed Building

In all cases (pre-FIRM or post-FIRM, V Zone or A Zone) where an entire building is destroyed or purposefully demolished or razed, the replacement building is considered “new construction” and *the replacement building must meet the current NFIP requirements*, even if it is built on the foundation of the original building.

Moving an Existing Building

When an existing building (pre-FIRM or post-FIRM, V Zone or A Zone) is moved to a new location or site, the work is considered “new construction” and if the relocated building is in the SFHA, it must be installed so as to comply with NFIP requirements.

Materials

When constructing in coastal environments, carefully consider what construction materials to select. The NFIP Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements* (August 2008), provides valuable information regarding the applicability of various construction materials in a coastal environment. For additional information, see Fact Sheet 1.7, Coastal Building Materials. Following a storm event, repairs should not be started until the problem is properly evaluated and materials are selected that will entirely remedy the damage. All costs of repairs should be identified and quantified prior to starting repairs.

Repairs

Correction of only the apparent surface damage can lead to unaddressed or overlooked problems beneath the surface that can potentially cause major issues with the structural stability of the building. Proper inspections of damage often not only require demolition or removal of the physically damaged

building component, but also removal of associated exterior cladding. Wind-driven rain for example can lead to compromised connections and the decaying or rotting of building materials that may not be visible without further investigation.

Insurance Consequences

Designers and owners should know that the work described previously may have insurance consequences, especially if not completed strictly in accordance with NFIP requirements.

In general, most changes to an existing building that result from less-than-substantial damage, or that do not constitute substantial improvement, will not change the status from pre-FIRM to post-FIRM. However, it is required that substantially improved or substantially damaged buildings be brought into compliance. NFIP flood insurance policies on those buildings are written using rates based on elevation. In most cases, the premium will decrease when a pre-FIRM building is substantially improved and brought into compliance. The building becomes a post-FIRM building and premiums are calculated using elevation rates. Failure to comply with the substantial damage or substantial improvement requirements will result in a building’s status being changed and in higher flood insurance premiums. For example:

- If an NFIP-compliant enclosure built with breakaway walls is added below a post-FIRM V Zone building, the building will no longer be rated as “free of obstructions.” Flood insurance premiums on these buildings will be higher. If the enclosure is not compliant with all NFIP requirements, higher premiums will result.
- If work on an existing V Zone building constitutes a substantial improvement, the building will be rated on a current actuarial basis. Any pre-FIRM designation will be lost and current post-FIRM rates will be used.
- If an NFIP-compliant lateral addition constituting a substantial improvement is made to a pre-FIRM A Zone building and no changes were made to the existing building, the building will retain its pre-FIRM designation and rating. However, if the addition does not comply with all requirements, or if more than the minimum alteration necessary was made to the existing building, the building and addition’s lowest floor must be elevated to or above the BFE. The building including the addition will be rated with post-FIRM actuarial rates.

Retrofit and Remodeling Opportunities

Retrofit opportunities will likely present themselves any time repair or maintenance work is undertaken for a major element of a building. Improvements to the building that are made to increase resistance to

the effects of natural hazards should focus on those items that will potentially return the largest benefit to the building owner. Some examples of retrofit opportunities may include:

- Improving **floor-framing-to-beam** connections whenever they are accessible (see Fact Sheet 4.1, *Load Paths* and Fact Sheet 4.3, *Use of Connectors and Brackets* for additional information).
- Improving **beam-to-pile connections** whenever they are accessible (see Fact Sheet 3.3, *Wood-Pile-to-Beam Connections* for additional information).
- Periodically checking and inspecting **flood openings** to make sure that they are not blocked and functioning properly. If the house is older, check to make sure that flood openings are sized correctly. Consult NFIP Technical Bulletin 1, *Openings In Foundation Walls and Walls of Enclosures* (August 2008) for proper flood opening guidance. Also see Fact Sheet 3.5, *Foundation Walls* for additional information.
- At any time deficient **metal connectors** are found, they should be replaced with stainless steel connectors or metal connectors with proper corrosion protection, such as hot-dip galvanized steel (see Fact Sheet 1.7, *Coastal Building Materials* for additional information).
- When **HVAC equipment** is replaced, the replacement equipment selected should incorporate a more corrosion-resistant design—so that it will last longer in a coastal environment—and should be elevated to, or above, the DFE. The equipment should be adequately anchored to resist wind and seismic loads (see Fact Sheet 8.3, *Protecting Utilities* for additional information).
- Improving **utility attachments** when the outside equipment is replaced or relocated (see Fact Sheet 8.3, *Protecting Utilities* for additional information).
- To minimize the effects of corrosion, carbon steel **handrails** can be replaced at any time with vinyl-coated, plastic, stainless steel, or wood handrails. Wood handrails may require frequent treatment or painting and appropriate fasteners must be used (see Fact Sheet 1.7, *Coastal Building Materials* for additional information). Carbon steel handrails may also be painted with a zinc-rich, vinyl, or epoxy paint appropriate for exposed wet and salt-spray environments. Regardless of the product used, proper maintenance is always necessary in order to ensure a safe handrail.
- Consider **sewer backflow preventer** valves if they are not currently part of the building's plumbing.

The installation should be done by a licensed plumber.

- If the current water heater is at, or below, the DFE, consider switching to a tankless water heater. A tankless water heater will take up less space and can be mounted to a wall due to its small size. In addition to allowing the user to mount it higher than a traditional water heater, it may also result in reduced energy costs.
- Older structures should consider elevation as a possible retrofit or mitigation opportunity. Older pre-FIRM structures can be at significant risk to flooding events. In coastal environments, even a little additional elevation can result in improved flood resistance. Costs can vary greatly depending on the type of foundation. It is important when considering an elevation project to consult a design professional before considering how much elevation and the appropriate foundation type. A contractor experienced with the elevation of buildings should be used for the actual lifting of the house. It is common for the house to require other structural work to the interior and exterior following the elevation. Before undertaking an elevation, consider the elevation process, which usually results in the structure being set on top of a foundation that is more level than the original foundation. This process can result in cosmetic cracking as the structure's foundation settles again and may require additional work to get the structure's aesthetics back to a pre-elevation appearance.

Additional Resources

FEMA. 2010. *Substantial Improvement/Substantial Damage Desk Reference*. FEMA P-758. <http://www.fema.gov/library/viewRecord.do?id=4160>

FEMA. 2005. *Coastal Construction Manual*, Chapter 14. FEMA 55. (<http://www.fema.gov/library/viewRecord.do?id=1671>)

Florida Department of Community Affairs. 2000. *A Local Official's Guide to Implementing the National Flood Insurance Program in Florida*. (See Chapter 6). (<http://www.floridadisaster.org/Mitigation/NFIP/NFIPStudyCourse/Appendix%20E%20-%20FL%20Handbook.pdf>)

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