

# 3. Regulatory Requirements

Federal, State, and local regulatory requirements must be identified and assessed as an initial step in the installation of manufactured housing. The following discussion provides a summary of the applicable NFIP minimum requirements for the installation of manufactured homes in floodplains. In addition, HUD MHCSS and model building code requirements are summarized. Appendix A provides a list of publications for further guidance for the installation and placement of manufactured homes in hazard-prone areas.

## 3.1 Introduction to the NFIP

The NFIP has three main elements:

1. Flood insurance that provides financial protection for property owners to cover flood-related damage to buildings and contents.
2. Floodplain management requirements within the mapped flood hazard areas that are designed to prevent new development from increasing the flood threat and to protect new and existing buildings from anticipated flood events.
3. Hazard identification and mapping under which engineering studies are conducted and flood maps are prepared to delineate areas that are predicted to be subject to flooding under certain conditions.

Federal flood insurance is designed to provide an alternative to disaster assistance and disaster loans for home and business owners. Disaster assistance rarely comes close to covering all of the costs to repair and cleanup. While available to qualified victims, disaster loans do not significantly ease the financial burden due to repayment terms. It is important to remember that disaster assistance is available only after floods have been declared major disasters by the President of the United States. In contrast, insurance claims will be paid any time damage from a qualifying flood event occurs.

The NFIP is intended to encourage States and local governments to recognize and incorporate flood hazards in land use and development decisions. In some communities, this is achieved by guiding development to areas with lower risk. When decisions result in development within floodplains, application of the criteria set forth in 44 CFR 59.1 and 60.3 is intended to minimize exposure and flood-related damage. These are the minimum requirements that a community must adopt in order to participate in the NFIP. In general, the NFIP minimum floodplain management regulations require that new residential structures or substantially improved or substantially damaged existing residential buildings in A zones must have their lowest floor (including basement) elevated to or above the BFE. Non-residential structures in A zones can be either elevated or dry-floodproofed to the BFE. In V zones, the building must be elevated on piles and columns such that the bottom of the lowest horizontal structural member of the

lowest floor of all new construction or substantially improved existing buildings must be elevated to or above the BFE.

Any community may exceed the minimum NFIP requirements by adopting more restrictive regulations. Communities often do this when they have access to information or knowledge of conditions that require, particularly for human safety, higher standards than the minimum NFIP requirements. Therefore, any floodplain management regulations that are more restrictive than the NFIP requirements shall take precedence.

By encouraging communities to guide development to lower risk areas, and by requiring the elevation of new construction and existing buildings that have been substantially improved or substantially damaged, one of the long-term objectives of the NFIP can be achieved: reducing flood damage and losses.

In addition to providing flood insurance and reducing flood damages through floodplain management regulations, the NFIP identifies and maps the nation's floodplains. Mapping flood hazards creates a broad-based awareness of the flood hazards and provides the data needed for floodplain management programs and to actuarially rate new construction for flood insurance.

## **3.2 Identifying and Mapping Flood Hazards**

FEMA is required by statute to identify and map the nation's flood-prone areas and to establish flood-risk zones in these areas. Since the inception of the NFIP, FEMA has complied with this statutory requirement by performing engineering studies of flood-prone communities and producing flood maps. The flood maps are used by mortgage lenders, insurers, real estate agents, map determination companies, community officials, land developers, engineers and surveyors, State and local emergency response officials, and property owners. The flood maps are also used by States and communities for emergency management, land use planning, and water resources planning and by Federal agencies implementing Executive Order 11988, Floodplain Management for Federal actions proposed in or affecting floodplains.

The NFIP would not be able to offer insurance at affordable rates without the existence of risk management (floodplain management) to reduce flood losses. To assess and manage the flood risk, a national standard was needed. The 1-percent annual chance flood was chosen on the basis that it provides a higher level of protection while not imposing overly stringent requirements or the burden of excessive costs on property owners. The 1-percent annual chance flood (or 100-year flood) represents a magnitude and frequency that has a statistical probability of being equaled or exceeded in any given year or, stated alternatively, the 100-year flood has a 26 percent (or 1 in 4) chance of occurring over the life of a 30-year mortgage.

FEMA performs a Flood Insurance Study (FIS) and creates FIRMs delineating the extent of the flood that has a 1-percent chance of being equaled or exceeded in any given year. The delineated area is designated an SFHA, which is the area in which development must be regulated by NFIP floodplain management regulations. Under the NFIP, a floodplain is defined as any land area susceptible to being inundated by floodwaters from any source.

When producing a new FIS and FIRMs or updating existing ones, FEMA typically uses a combination of the two study approaches (approximate and detailed) in identifying a community's flood hazards. Detailed study methods typically employ the use of engineering models and, at a minimum, result in the determination of BFEs or flood depths and floodways that will be displayed on the flood map. Approximate study methods are used to identify flood hazards, but they use more simplified engineering methods to determine the floodplain boundaries; however, BFEs and floodways are not identified or mapped.

In general, the decision on whether to use approximate or detailed study methods is based on existing and anticipated development in and near the floodplain in the community. Flood hazard information for flooding sources that affect developed or developing areas are based on detailed studies whenever possible; approximate study methods generally are used for undeveloped or sparsely developed areas.

When a new or updated detailed FIS is performed, the following information is usually generated:

- BFEs are presented as either water-surface elevations or average depths of flow above the ground surface. These elevations and depths were historically referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). However, as a result of advances in technology, an updated vertical datum – the North American Vertical Datum of 1988 (NAVD 88) – was created and has been officially adopted by the Federal Government as a new basis for measuring heights. Newly updated maps and BFEs are now generally referenced to NAVD 88.
- Water-surface elevations for the 10-year (10-percent annual chance), 50-year (2-percent annual chance), 100-year (1-percent annual chance), and 500-year (0.2-percent annual chance) floods.
- Boundaries of the regulatory floodway. The regulatory floodway is defined as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the entire base flood (1-percent annual chance flood) discharge can be conveyed with no greater than a 1.0-foot increase in the BFE.
- Boundaries of the 1- and 0.2-percent annual chance floodplains. The 1-percent annual chance floodplain is referred to as the SFHA. The 0.2-percent annual chance flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year and is also known as the 500-year flood.

The results of the FIS are presented on the FIRM. An example of a FIRM showing the map and title box is shown in Figure 5-1. FIRMs are now being prepared as a digital product, known as a Digital Flood Insurance Rate Map (DFIRM), which may involve converting an existing manually produced FIRM to digital format, or creating a product from new digital data sources using a Geographic Information System (GIS) environment. A sample DFIRM is shown in Figure 3-1.

Figure 3-1. Sample DFIRM.



The results of the FIS are also presented in a report that accompanies the FIRMs or DFIRMs. The FIS report contains a narrative that describes the flooding conditions in the community, and the types of studies that were performed. The report also contains tables and Flood Profiles. For determining a BFE at a building site, communities should use the Flood Profiles rather than the BFE on the FIRM. A sample FIS summary of discharges is shown in Figure 3-2(a), a sample FIS floodway data table is shown in Figure 3-2(b), and a sample FIS flood profile is shown in Figure 3-2(c). Refer to Section 5.1 for additional details on obtaining FIRM and FIS data. The NFIP FISs and FIRMs can be viewed and ordered online at <http://store.msc.fema.gov>.

Flood risk zones are shown on the FIRM or DFIRM for the 1-percent annual chance flood as Zone A, Zone AI-30 (on older FIRMs), Zone AE, Zone AO, Zone AH, Zone AR, Zone A99, Zone AR/A, Zone AR/AE, Zone AR/AI-30 (on older FIRMs), Zone AR/AH, Zone AR/AO, Zone V, Zone VI-30 (on older FIRMs), or Zone VE. Table 3-1 provides a general description of the most common flood zone designations for riverine flood areas and inland flood zones in coastal areas. Table 3-2 provides a general description of the most common flood zone designations for coastal flood areas. The zone designations presented on the FIRM or DFIRM depend on the type of flood hazard and type of study performed. The 0.2-percent annual chance floodplain is labeled as Zone B (on older FIRMs) or Zone X (shaded). Areas outside of the SFHA are labeled as Zone C or Zone X (unshaded). Definitions and descriptions of the flood insurance risk zones can be found at: [http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/flood\\_zones.shtm](http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/flood_zones.shtm).

**Table 1 - SUMMARY OF DISCHARGES**

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-YEAR	50-YEAR	100-YEAR	500-YEAR
<b>TENMILE RIVER</b>					
At the downstream corporate limits	210.0	7,500	13,660	16,850	26,280
At South Dover Bridge	194.5	6,930	12,410	15,260	23,470
Downstream from the confluence of the Swamp River	189.0	6,730	11,970	14,710	22,500
Upstream from the confluence of the Swamp River	141.0	4,980	8,300	10,070	14,590
At the upstream corporate limits	130.0	4,580	7,490	9,060	12,940
<b>WELLS BROOK</b>					
At its confluence with the Tenmile River	6.1	610	1,010	1,270	1,960
At a point approximately 0.8 mile upstream of its confluence with the Tenmile River	2.6	430	750	930	1,380

Figure 3-2(a). Sample FIS Summary of Discharges table.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
Tenmile River (continued)								
X	49,320 <sup>1</sup>	260	1,992	4.8	374.3			
Y	52,410 <sup>1</sup>	120	1,035	9.2	377.2			
Z	54,310 <sup>1</sup>	250	1,746	5.5	382.4			
AA	57,590 <sup>1</sup>	275	1,664	5.8	387.9			
AB	58,470 <sup>1</sup>	301	2,386	4.0	390.2			
Wells Brook								
A	725 <sup>2</sup>	115	270	4.1	375.6			
B	1,980 <sup>2</sup>	28	168	6.6	380.2			
C	4,280 <sup>2</sup>	69	270	4.1	391.3			

<sup>1</sup>Feet above corporate limits  
<sup>2</sup>Feet above confluence with Tenmile River  
<sup>3</sup>Elevation computed without consideration of backwater effects from Tenmile River

<b>TABLE 2</b>	FEDERAL EMERGENCY MANAGEMENT AGENCY	<b>FLOODWAY DATA</b>
	<b>TOWN OF DOVER, NY (DUTCHESS CO.)</b>	<b>TENMILE RIVER AND WELLS BROOK</b>

Figure 3-2(b). Sample FIS Floodway Data.



Figure 3-2(c). Sample FIS Flood Profile.

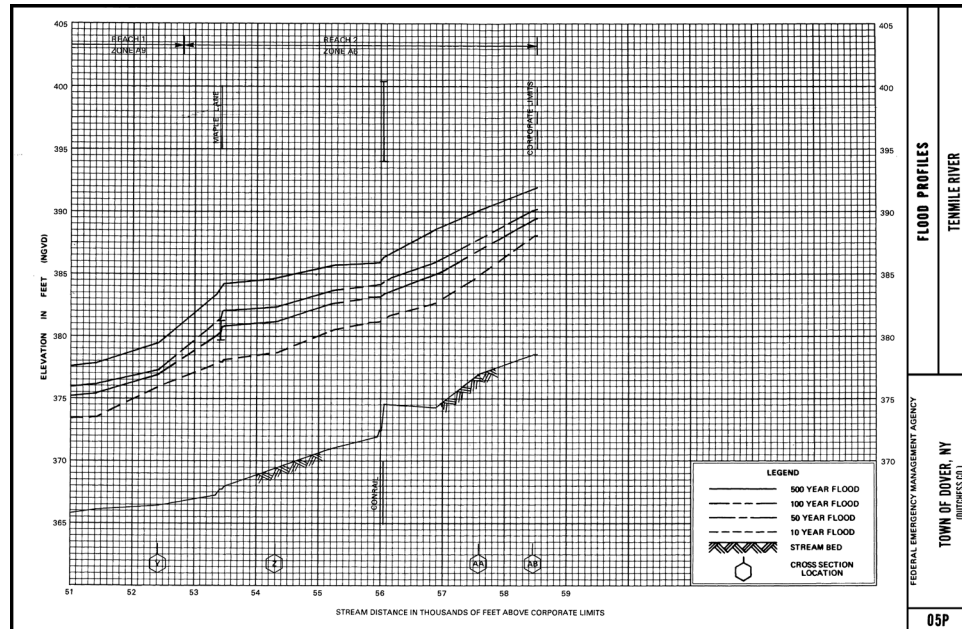


Table 3-1. Common SFHA Designations for Riverine or Inland Flood Zones

Zone	Description
<b>Flood Risk Zones</b>	
A	Areas subject to inundation by the 1-percent annual chance flood event. Because detailed hydraulic analyses are not used, no BFE or depths are shown.
AE and A1-30 <sup>1</sup>	Areas subject to inundation by the 1-percent annual chance flood event determined by detailed methods. BFEs are shown.
AH and AO	Areas subject to inundation from the 1-percent annual chance flood that have flood depths of between 1 and 3 feet. AO zones can be either ponding areas or sheet flow and are assigned a base flood depth measured in feet above the ground. AH zones are generally ponding areas and are assigned a BFE.

<sup>1</sup> Zone designations found on older FIRMS have been replaced by the designation listed in the same box above them.

Table 3-2. Common SFHA Designations for Coastal Flood Areas

Zone	Description
<b>Flood Risk Zones</b>	
V	Areas subject to inundation from the 1-percent annual chance flood in coastal areas where there is a velocity hazard due to wave action and, by definition, the entire Primary Frontal Dune. No BFEs have been determined.
VE V1-30 <sup>1</sup>	Areas subject to inundation from the 1-percent annual chance flood in coastal areas where there is a velocity hazard due to wave action. BFEs have been determined and are shown on the FIRM.

<sup>1</sup> Zone designations found on older FIRMS have been replaced by the designation listed in the same box above them.

In addition to the SFHAs labeled as V zones, there are some A zones, generally located landward of and contiguous to V zones, where flooding characteristics may include wave action, high velocity flows, and erosion or scour. These are referred to as Coastal A zones, and they are further described below and in Section 3.7.

Along rivers, streams, and lakes within the U.S., FEMA computes BFEs using computer models, statistical techniques, or both. These elevations are a function of the amount of water expected to enter a particular system by means of precipitation and runoff. The SFHAs along rivers, streams, and lakes are labeled as A zones.

Along the coast, FEMA determines SFHAs by an analysis of storm surge, wind direction, wind speed, wave heights, and other factors. FEMA designates these areas along the coast as both V and A zones on the FIRM or DFIRM.

FEMA applies the VE zone designation to those areas along the coast where water depth and other conditions would support at least a 3-foot wave height. FEMA also considers other factors in identifying VE zones, such as wave runup and the existence of a Primary Frontal Dune. FEMA usually designates AE zones in coastal areas landward of the VE zone. Coastal flood hazard areas mapped as AE zones can be subject to storm surge and damaging waves; however, the waves are less than 3 feet in height.

Currently, NFIP regulations make no distinction between the design and construction requirements for coastal AE zones and riverine AE zones. However, evidence suggests that design and construction requirements in some portions of coastal AE zones should be more like VE zone requirements. One of the hazard identification criteria for VE zone designation is where wave heights are estimated to be equal to or greater than 3 feet. Unfortunately, post-storm investigations have shown that typical AE zone construction techniques (e.g., wood frame, light gauge steel, or masonry walls on shallow footings or slabs, etc.) are subject to damage when exposed to waves less than 3 feet in height. Laboratory tests and post-disaster field investigations confirm that wave heights as small as 1.5 feet can cause failure of the above-listed wall types. Other flood hazards associated with coastal waves (e.g., floating debris, high velocity flow, erosion, and scour) also damage AE zone-type construction in these coastal areas.

As a result, for all new detailed coastal studies starting in 2009, FEMA will delineate the landward limit of waves 1.5 feet in height on the FIRMs and include this information in the DFIRM database as an informational layer. The landward limit of the area affected by waves greater than 1.5 feet is called the Limit of Moderate Wave Action (LiMWA). The LiMWA will be included on the preliminary FIRM; however, if a community does not want to delineate the limit on its final FIRMs, the community may provide a written request to FEMA with justification for such a request. There are no NFIP floodplain management requirements that communities must adopt or special insurance ratings associated with the designation of the LiMWA. However, communities are encouraged to adopt higher standards than the minimum NFIP requirements in these areas to address the increased risks associated with waves and velocity action.

### 3.3 The NFIP's Community Rating System (CRS)

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.

As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:

1. Reduce flood losses
2. Facilitate accurate insurance rating
3. Promote the awareness of flood insurance

For CRS participating communities, flood insurance premium rates are discounted in increments of 5 percent; a Class 1 community would receive a 45 percent premium discount, while a Class 9 community would receive a 5 percent discount (a Class 10 is not participating in the CRS and receives no discount). The CRS classes for local communities are based on 18 creditable activities, organized under four categories:

1. Public Information
2. Mapping and Regulations
3. Flood Damage Reduction
4. Flood Preparedness

### 3.4 NFIP Definitions Related to Manufactured Homes

In addressing the NFIP floodplain management requirements for manufactured homes, it is useful to define key terms. The following definitions are found in the NFIP floodplain management regulations at 44 CFR 59.1 unless noted otherwise. Several NFIP definitions can also be found in Appendix D. The definition for “manufactured home” does not include a recreational vehicle.

- “Manufactured home” means a structure, transportable in one or more sections built on a chassis and designed for use with/without a permanent foundation when attached to utilities.
- “Manufactured home park or subdivision” means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
- “Existing manufactured home park or subdivision” means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be

#### Permanent Foundations

A permanent foundation is a foundation constructed of durable materials that may include masonry, reinforced concrete, corrosion resistant steel, or pressure treated timber. The foundation designs provided in Appendix H are considered permanent foundations in accordance with this definition.



affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed before the effective date of the floodplain management regulations adopted by the community.

- “New manufactured home park or subdivision” means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) is completed on or after the effective date of the floodplain management regulations adopted by a community.
- “Expansion to an existing manufactured home park or subdivision” means the preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).
- “Substantial damage” means damage of any origin sustained by a structure whereby the cost of restoring the structure to the condition before damage would equal or exceed 50 percent of the market value of the structure before the damage occurred.
- “Substantial improvement” means any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the “start of construction” of the improvement. This term includes structures that have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either (1) any project for improvement of a structure to correct existing violations of State or local health, sanitary, or safety code specifications that have been identified by the local code enforcement official and that are the minimum necessary to ensure safe living conditions, or (2) any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.”

### 3.5 General NFIP Floodplain Management Requirements for Manufactured Homes

Under the NFIP, participating communities are required to regulate all development in SFHAs. “Development” is defined in the NFIP regulations as:

“Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.” [44 CFR 59.1]

Before a property owner can undertake any development in the SFHA, a permit must be obtained from the community. The community is responsible for reviewing all permit applications to determine whether development complies with the community’s floodplain management regulations. Communities are also required to review proposed development in SFHAs to

ensure that all necessary permits have been received from those government agencies from which approval is required by Federal or State law, such as 404 wetland permits from the U.S. Army Corps of Engineers (USACE) or permits under the Endangered Species Act.

The NFIP requires manufactured homes to meet the same basic regulatory requirements that are required for residential structures in the floodplain. The following general NFIP minimum standard applies to all residential structures in the floodplain in which communities are to:

“Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.” [44 CFR 60.3(a)]

The NFIP also requires that new manufactured home parks and subdivisions meet the same basic requirements as all other subdivision proposals in which communities are to:

"Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposal will be reasonably safe from flooding. If a subdivision proposal or other proposed development is in a flood-prone area, any such proposals shall be reviewed to assure that:

- (i) all such proposals are consistent with the need to minimize flood damages within the flood-prone area,
- (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and
- (iii) adequate drainage is provided to reduce exposure to flood hazards." [44 CFR 60.3(a)(4)]

## **3.6 NFIP Requirements for Manufactured Homes in Riverine and Inland Flood Zones**

Generally, manufactured homes must meet the same flood protection requirements as a “stick built” or typical housing. The general requirement for manufactured homes like typically built residential structures is that they must be elevated so that the lowest floor is above the BFE. This applies to new or substantially improved or substantially damaged manufactured homes.

**BFE and DFE**

**Base flood elevation (BFE)** – The water surface elevation resulting from the base, or 100-year (1 percent annual chance) flood.

**Design flood elevation (DFE)** – The elevation to which development in the regulatory floodplain is built. At a minimum, the DFE is equivalent to the BFE. However, in some areas, the DFE includes an additional freeboard height above the BFE as shown in the formula below.

$$\text{DFE} = \text{BFE} + \text{Freeboard}$$

**Freeboard** – An additional elevation requirement some height (1, 2, or more feet) above the BFE that provides a margin of safety above the estimated BFE.

As indicated above, the minimum DFE requirement for NFIP communities is the BFE. However, in communities where a higher degree of protection is promoted or required, the DFE includes a freeboard height above the BFE. This freeboard provides a margin of safety above the estimated BFE and against extraordinary or unknown risks. As in all natural hazard events, the design event can only be predicted in probabilistic terms and some uncertainties remain in any analysis. Freeboard is intended to allow for those uncertainties. The NFIP encourages participating communities to adopt and enforce freeboard requirements as part of their local floodplain management ordinance. This is shown in 44 CFR 60.1(d); which states, “Any floodplain management regulations adopted by a State or a community which are more restrictive than the criteria set forth in this part are encouraged and shall take precedence.”

**3.6.1 Approximate A Zones**

Approximate A zones are not studied using detailed methods; therefore, BFEs have not been developed. When a manufactured home is proposed on an approximate A zone site, the community must make every effort to obtain any BFE data and floodway data in order to achieve a reasonable measure of flood protection.

“Obtain, review, and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source....” [44 CFF 60.3(b) (4)]

BFE data may be available from a variety of sources such as local hydrologic and hydraulic (H&H) studies, State Departments of Natural Resources, or from Federal agencies such as the USACE. Several other sources of BFE data are identified in FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas, A Guide for Obtaining and Developing Base (100-year) Flood Elevations*.

If BFE or floodway data cannot be obtained from these sources, the community should consider conducting, or requiring the applicant to conduct, a site-specific engineering analysis to determine a BFE. Guidance for developing a BFE is available in FEMA 265.

If no BFE data are available, communities must ensure that building sites will be reasonably safe from flooding for proposed developments. A simplified method for estimating a BFE as well as other methods for ensuring a building site is reasonably safe from flooding can also be found in FEMA 265.

When a new manufactured home park or subdivision is being planned on a site that is greater than 50 lots or 5 acres (whichever is less), BFE data must be developed for approximate A zones through the use of detailed study methodologies similar to those used in creating the FIS. Under this requirement, the community must:

“Require that all new subdivision proposals and other proposed development (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data.” [44 CFR 60.3(b)(3)]

The community can perform a study to determine these elevations or require the developer to fund or complete the study. When the 50-lot, 5-acre threshold is surpassed and the development includes one or more lots that lie at least partially within the floodplain, BFE data must be developed through detailed study methodologies. If the developer completes the study, it is subject to approval by the community.

For manufactured home sites that are below the 50-lot/5-acre threshold and BFE data for those sites are not available from other sources, communities should consider conducting or requiring the permit applicant to develop a BFE in an approximate A zone. In addition to reducing flood damages, there are other advantages of developing a BFE. For example, flood insurance policies obtained in approximate A zones that are rated using a BFE developed using a detailed study methodology will often qualify for significantly lower insurance rates than policies that are rated without a BFE. The difference in flood insurance premiums could be substantial.

If a manufactured home is proposed in an approximate A zone where BFE data are not available from a Federal, State, or other source, the community must require that:

“...all manufactured homes to be placed within Zone A on a community FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purpose of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not limited to, the use of over-the-top frame ties to ground anchors. This requirement is in addition to applicable State and local anchoring requirements for resisting wind forces.” [44 CFR 60.3(b)(8)]

This minimum standard requires that manufactured homes be elevated and anchored to resist flood and wind forces. If elevation data are not available from a Federal, State, or other source, FEMA advises communities to require manufactured homes under this provision to be elevated at a minimum of 3 feet or higher from the highest adjacent grade to minimize flood damages. Guidance for anchoring is further addressed in Section 3.6.5 and in Chapter 7. The areas below the 3-foot elevation must be constructed with flood-resistant materials and utilities, and mechanical equipment must be elevated to the 3-foot elevation. Any utility and mechanical components that must be below the BFE must be made watertight to the 3-foot elevation as described in 3.6.7.

When BFEs or floodway data are obtained for manufactured home sites, the manufactured home must meet the elevation and floodway standards described in Sections 3.6.2 and 3.6.9.

### 3.6.2 Elevation in A, A1-30, AE, and AH Zones

Most manufactured home placements are subject to the same performance standards as typically built residential structures. The performance standard for the placement of these manufactured homes is addressed in this section. An exception has been made for the placement of manufactured homes in existing manufactured home parks or subdivisions which is addressed in Section 3.6.3.

The NFIP requires that manufactured homes placed or substantially improved in Zones A1-30, AH, or AE on the community's FIRM on sites:

- (i) “Outside of a manufactured home park or subdivision,
- (ii) In a new manufactured home park or subdivision,
- (iii) In an expansion to an existing manufactured home park or subdivision, or
- (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage as the result of a flood,

be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.” [44 CFR 60.3(c)(6)]

This requirement establishes the basic elevation and anchoring standards that apply to most manufactured home placements, including those outside of manufactured home parks and subdivisions and in new manufactured home parks and subdivisions. These manufactured homes must have their lowest floors elevated to or above the BFE. These requirements also apply to manufactured homes placed in expansions to existing manufactured home parks and on lots where manufactured homes are substantially damaged by flood. Once a manufactured home in an existing manufactured home park or subdivision is substantially damaged by flood, from that point on all manufactured homes placed on that lot must be elevated to or above the BFE.

The best way to meet the elevation requirement described above is to elevate the bottom of the manufactured home steel frame to the BFE. The manufactured home must be securely anchored to an adequately anchored foundation system to resist flotation, collapse, or lateral movement. Section 3.6.5 and Chapter 7 address anchoring in more detail.

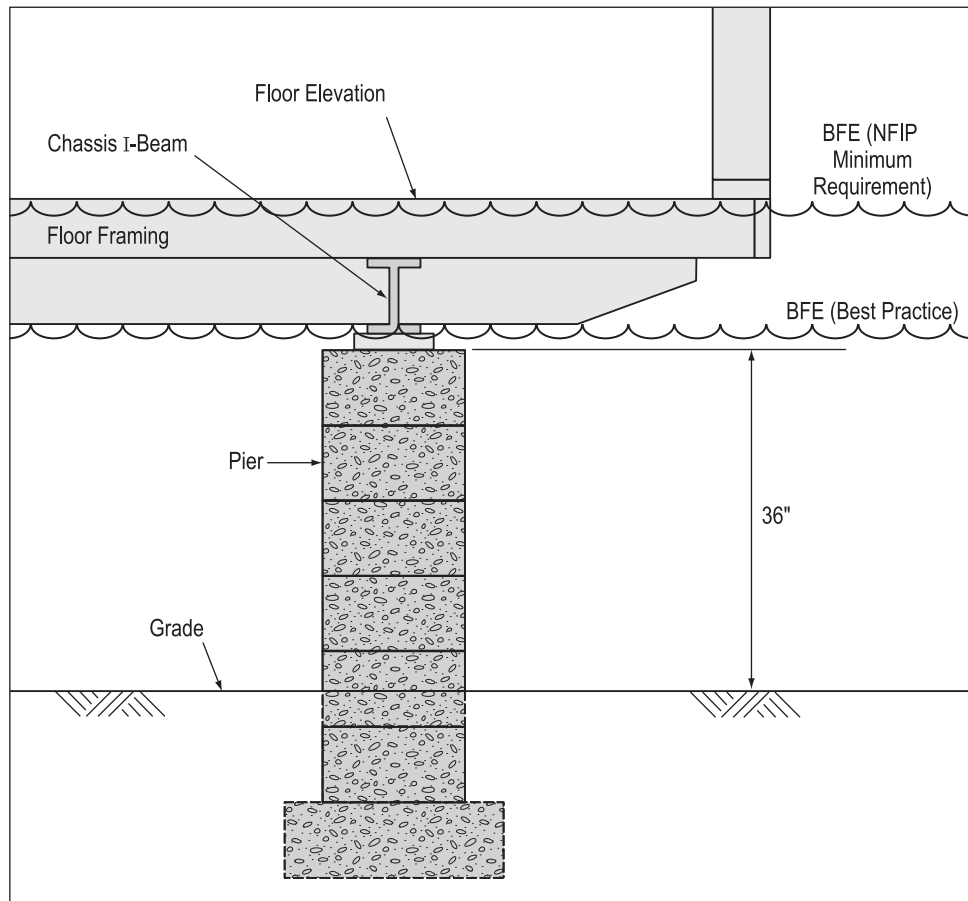
As with stick built housing, all parts of the manufactured home below the BFE must be constructed with

This guide recommends for A zones the best practice of placing the bottom of the manufactured home's steel frame at the BFE and not the lowest floor of the manufactured home in order to prevent flood damage to the floor and other interior finishes and contents (Figure 3-3).



flood damage-resistant materials and utility systems must either be elevated or made watertight to the BFE.

**Figure 3-3.**  
**Manufactured home with**  
**lowest floor elevated to**  
**the BFE.**



### 3.6.3 3-Foot Pier Foundation

The NFIP allows for a limited exemption to elevating to the BFE by allowing elevating to no less than 36 inches in height above grade for lots in existing manufactured home parks in Zones A1-30, AE, or AH on the community's FIRM. A manufactured home placed in an existing manufactured home park must meet either of the following requirements:

- "(1) The lowest floor of the manufactured home is at or above the base flood elevation;  
 or
- (2) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement." 44 CFR 60.3(c)(12).

The elevation requirements above apply in existing manufactured home parks or subdivisions established before the date of the community's initial floodplain management regulations when:

- 1) A manufactured home is being placed or replaced with a new model in an existing community or subdivision, or
- 2) A manufactured home is being replaced in an existing manufactured home park or subdivision when the previous home had sustained substantial damage due to reasons other than a flood.

The selection of the 36-inch pier foundation does not apply to the repair or replacement of a manufactured home on a site in an existing manufactured home park where a manufactured home has been substantially damaged by flood.

The option of allowing elevating 36 inches in height above grade is a compromise to balance the flood hazard against the economic impacts on some manufactured park owners that would result if elevation to the BFE were required. There are often practical difficulties in elevating manufactured homes to the BFE in many older parks due to small lot sizes and the split ownership of the manufactured home and the lot itself.

### **3-Foot Pier Foundation**

The 3-foot pier foundation is one option for manufactured homes installation in existing manufactured home parks or subdivisions. However, the NFIP strongly encourages elevating to the level of the BFE or higher for increased safety and property protection and reduced flood insurance premiums.

It is important to note that, when the 36-inch pier foundation is selected, the manufactured home may not be protected to the level of the BFE. For this reason, care must be exercised in using the 36-inch pier foundation option. This option may not be appropriate in communities where the flood hazard may be so severe, such as deep floodplains and high velocity areas, that it would place lives and property at too great a risk. Some communities may find placement of a manufactured home in an existing manufactured home park can accommodate elevation to the BFE.

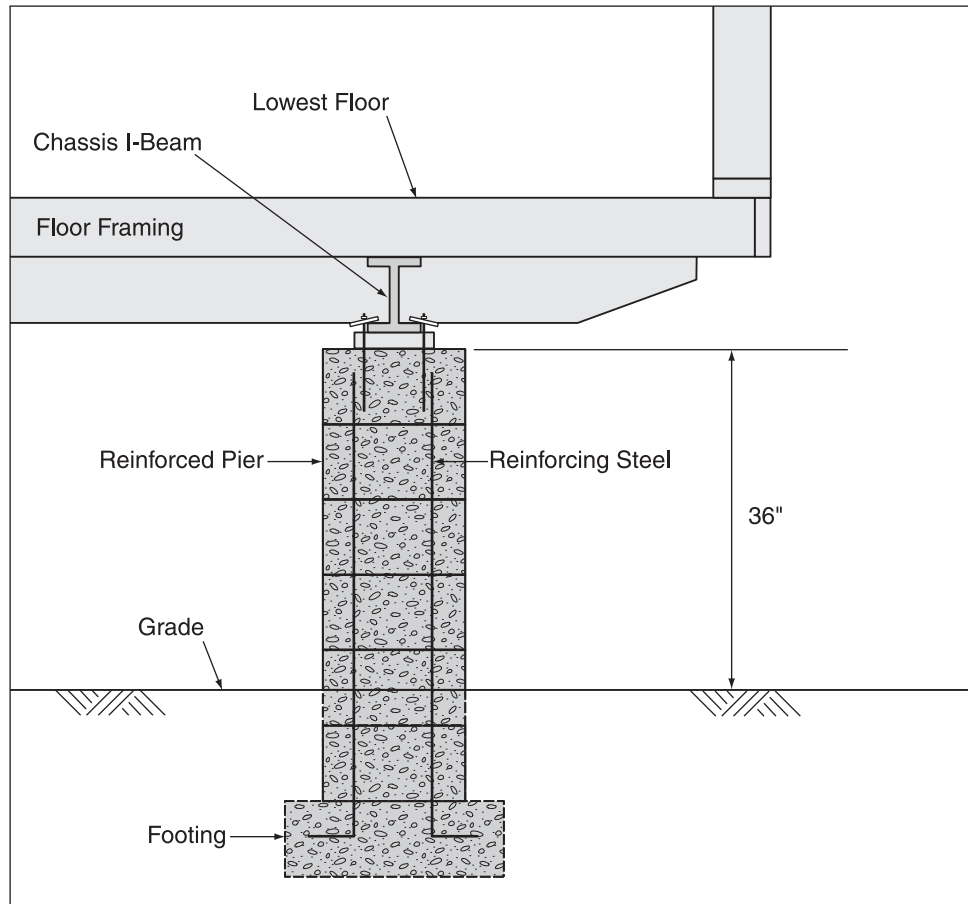
If the option of elevating the manufactured home to 36 inches above grade is chosen, the strength of the anchoring system must be increased in order to resist the additional flood forces that will be exerted upon the foundation since it is possible that water will reach or exceed the level of the home's floor. Therefore, under this scenario, the use of typical manufactured home installation methods such as foundations using dry-stack blocks and ground anchors would preclude the use of the other foundation designs in this guide.

No matter which option is chosen for elevating a manufactured home in an existing manufactured home park, the manufactured home must be securely anchored to an adequately anchored foundation system to resist flotation, collapse, or lateral movement.

As with stick built housing, all parts of the manufactured home below the BFE must be constructed with flood-resistant materials and utility systems must either be elevated or made watertight to the BFE. The best way to meet the requirement for flood resistance is to elevate the bottom of the manufactured home steel frame to the BFE.

Figure 3-4 shows a typical example of a foundation used on manufactured housing per the 36-inch pier foundation alternative. The pier, footing, and connection between the pier and the home must be designed to resist flotation, collapse, or lateral movement.

Figure 3-4.  
Manufactured home  
on reinforced pier  
foundation 36 inches  
high.



### 3.6.4 Elevation in Zone AO

A Zone AO is an area of shallow flooding with flood depths between 1 and 3 feet with no clearly defined channel. FIRMs indicate a flood height above grade that is based on an average depth to which structures must be raised for Zone AO.

Manufactured homes placed or substantially improved in Zone AO must meet the same standards as other residential structures and have their lowest floor elevated above the highest adjacent grade at least as high as the depth number specified on the FIRM.

HUD manufactured home standard 24 CFR 3285.305 requires a minimum clearance of 12 inches between the lowest member of the main frame and the ground surface, and the manufactured home main frame is typically 0.5 feet to 1 foot deep; therefore, the lowest floor level is typically 1.5 to 2 feet above grade. Under this scenario, meeting the NFIP elevation requirement for Zone AO may already be met or require a relatively small additional elevation of up to 1.5 feet. This additional elevation can be accomplished using installation techniques found in this guide, such as placing the home on piers and securing it with ground anchors.

Standard installation techniques provide a foundation that is typically elevated at least 3 feet above grade, and flood depths in Zone AO are typically 3 feet or less. Therefore, the placement or substantial improvement of manufactured homes in Zone AO are typically elevated to or above the base flood level, even if they are being placed in an existing manufactured home park or subdivision. However, the recommended best practice is to elevate the bottom of the steel frame to the BFE in Zone AO.

As in the other A zones, manufactured homes in Zone AO must be anchored to resist flotation, collapse, or lateral movement. The areas below the Zone AO flood depth must be made with flood damage-resistant materials, and utilities and mechanical equipment must be elevated to the flood depth specified on the FIRM. Any utility and mechanical components that must be below the BFE must be made watertight to the Zone AO flood depth. Refer to Sections 3.6.6 and 3.6.7 and Chapter 7 for additional details on these requirements.

### 3.6.5 Anchoring

In addition to the elevation requirement, manufactured homes are required to be securely attached to an adequately anchored foundation system to resist flotation, collapse, or lateral movement:

"[Manufactured homes must] ...and be securely anchored to an adequately anchored foundation to resist flotation, collapse and lateral movement." [44 CFR 60.3(c)(6) and (c)(12)]

“Adequately anchored” is considered to be a system of ties, anchors, and anchoring equipment that will withstand flood and wind forces.

#### **Anchor and Tie-down Systems**

Anchor and tie-down systems must meet load requirements stipulated in locally adopted installation ordinances. Many communities across the country have adopted or are in the process of adopting the International Code Council's (ICC's) model building codes, which include the International Residential Code® of 2009 (IRC® 2009). IRC 2009 stipulates working load requirements of 3,150 pounds with a 50 percent overload or 4,725 pounds for manufactured home anchoring systems.

Florida's manufactured home installation requirements, *Rules of Department of Highway Safety and Motor Vehicles Division of Motor Vehicles, Chapter 15C-1*, for homes manufactured before July 14, 1994, have the same loading standards for anchor systems as those found in the IRC 2009, a working load of 3,150 pounds with an ultimate load of 4,725 pounds. However, for homes manufactured after July 14, 1994, the system must be able to resist a working load of 4,000 pounds with an ultimate load of 6,000 pounds.

Additional guidance on anchoring manufactured homes can be found in Chapter 7.

### 3.6.6 Flood Damage-Resistant Materials

When a manufactured home is elevated, it is important that all parts exposed to floodwaters be made of flood damage-resistant materials. This includes all portions of the manufactured home such as foundation elements and any enclosures below the BFE.

“[Community must] Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a floodprone area, all new construction and substantial improvements shall...(ii) be constructed with materials resistant to flood damage...” [44 CFR 60.3(a)(3)]

“Flood [damage]-resistant material” is described in FEMA Technical Bulletin 2 as “any building product [material, component or system] capable of withstanding direct and prolonged contact with floodwaters without sustaining significant damage.” The term “prolonged contact” means at least 72 hours, and the term “significant damage” means any damage requiring more than cosmetic repair. “Cosmetic repair” includes cleaning, sanitizing, and resurfacing (e.g., sanding, repair of joints, repainting) of the material.

For further information on flood-resistant materials refer to FEMA Technical Bulletin 2, *Flood Damage-Resistant Material Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program*.

### 3.6.7 Utilities and Mechanical Equipment

The manufactured home’s utilities and mechanical equipment need to be protected. Their location below the BFE can make them susceptible to being inundated by floodwaters and damaged by floating debris. Utilities and mechanical equipment must:

“...be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.” [44 CFR 60.3(a)(3)(iii)]

Essentially, utility systems and mechanical equipment must be elevated to or above the BFE. Elevating utilities and mechanical equipment such as furnaces, hot water heaters, and heating, ventilation, and air conditioning equipment (HVAC) is the best protection. With most outdoor HVAC compressors, the main issues presented by floodwaters are inundation, velocity flow, and debris impact. The control and power circuits and mechanical parts in HVAC equipment, even when they are designed for outdoor installations, are not designed to withstand inundation by floodwaters. The most effective flood-resistant design for outdoor HVAC compressors is to strap or bolt the equipment onto a platform above the BFE.

Utility and mechanical components that must be below the BFE must be made watertight to the BFE. Examples of this include sealing on-site water well casings to prevent water intrusion or enclosing HVAC equipment in a flood-resistant enclosure so that it is protected to the BFE.



The NFIP does not recommend locating ductwork below the BFE for manufactured homes located in SFHAs. There is no known or cost-effective technique for designing air ducts to keep floodwaters from entering or accumulating within the systems components during inundation by floodwaters. If ductwork must be installed below the BFE, it should be minimized as much as possible. Placing the bottom of the steel frame at the BFE as recommended enhances protection of utility and mechanical equipment. The exception would be installation of cross-over duct work for manufactured housing that needs to pass under chassis frame members. If cross-over ducts are used, elevating the manufactured home 1 to 2 feet above the BFE will prevent them from being damaged during flood events.

Additional guidance for protecting utility and mechanical systems can be found in FEMA 348, *Protecting Building Utilities From Flood Damage, Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*.

### 3.6.8 Enclosed Areas

Generally, the space beneath the lowest floor of manufactured home is covered by some type of skirting or screening. Manufactured homes are also often installed on an enclosed foundation (see Chapter 8) when the BFE is several feet above grade.

When an enclosed area below the lowest floor of a manufactured home is created, special attention is needed for two reasons:

- The walls of enclosed areas are subject to flood damage from hydrostatic and hydrodynamic forces.
- People are tempted to convert enclosures that are intended to flood into areas that can sustain damage in a flood.

To protect enclosed areas below the lowest floor, the community must:

"Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters." [44 CFR 60.3(c)(5)]

The NFIP allows only certain uses of the enclosed area below the lowest floor of an elevated manufactured home. These spaces can only be used for parking of vehicles, building access, or storage.

Additionally, the enclosure must be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. To protect the enclosure, the NFIP minimum requirements are:

- A minimum of two openings in walls of the enclosure having a total net area of not less than 1 square inch for every square foot of enclosed area subject to flooding.
- The bottom of all openings must not be higher than 1.0 foot above the higher of the exterior or interior grade or floor immediately below the opening.
- Openings must permit the automatic entry and exit of floodwaters. The openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they meet this requirement.
- Alternative designs are allowed but must be certified by a registered professional engineer or architect as meeting the requirement to automatically equalize forces on exterior walls by allowing for the entry and exit of floodwaters.

To further minimize flood damages, mechanical, electrical, plumbing equipment, and other service facilities must be designed and/or located so as to prevent damage during conditions of flooding (see Section 3.6.7). Enclosures below the BFE must also be constructed with flood damage-resistant materials.

If the area below the manufactured home is enclosed with rigid skirting that is less likely to be dislodged by wind or flood loads, openings are required to equalize hydrostatic pressure in accordance with NFIP regulations.

For further information on enclosed areas refer to FEMA Technical Bulletin 1, *Openings in Foundation Walls and Walls of Enclosures Below Elevated Buildings in Special Flood Hazard Areas in Accordance with the National Flood Insurance Program*.

### **3.6.9 Floodways**

If a community receives a proposal for the development in the SFHA, the community must ensure that the proposal will not impose flood problems on other properties. To prevent this, communities must adopt floodways to designate those areas where flood flows are most sensitive to changes brought on by development. The NFIP defines the floodway as:

"...the channel of a river or other watercourse and adjacent land area that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height." [44 CFR 59.1]

A floodway is the central portion of a riverine floodplain needed to carry the deeper, faster moving water. A floodway is included with most riverine Flood Insurance Studies and will generally

be shown on the FIRM or DFIRM as indicated in Figure 3-5. A floodway schematic is provided in Section 4.4.1.1 (Figure 4-2). The area chosen for the regulatory floodway must be designed to carry the waters of the 1-percent annual chance flood without increasing the water surface elevation of that flood more than 1 foot at any point.



Figure 3-5. DFIRM showing the floodway (cross-hatched area in Zone AE).

Once a community has adopted a floodway, it must prohibit development in the floodway unless it has been demonstrated through H&H analyses performed using standard engineering practice that the development will not result in any increase in flood levels during the base flood. This “encroachment analysis” is required under the following NFIP provision:

"Prohibit encroachments in the floodway, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during occurrence of the base flood discharge." [44 CFR 60.3(d)(3)]

FEMA defines “any increase” as meaning a zero increase (greater than 0.00 feet). This analysis is usually called a “no-rise” or “zero-rise” analysis and results in a “no-rise” or “zero-rise” certification by a qualified registered professional engineer. Remember that considerable encroachment into the floodplain was already allowed when the floodway was designated by the community. Although some communities or States perform the H&H analyses themselves, most

require the permit applicant to obtain the services of a qualified registered professional engineer to perform the analysis and provide the certification. Generally, very little development or disturbance is permitted in the floodway because even minor encroachments in the floodway lead to increases in the BFE. Unless the engineering analysis demonstrates that there will not be an increase in the BFE as a result of the development, the permit must be denied.

For streams and other watercourses where FEMA has provided BFEs, but no floodway has been designated, the community must review developments on a case-by-case basis to ensure that these increases do not occur, as stated in 44 CFR 60.3(c)(10), in which communities must:

"Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community." [44 CFR 60.3(c)(10)]

### 3.7 NFIP Requirements for Manufactured Homes in Coastal Flood Areas

Flood hazard areas along coastlines that are subject to flooding from storm surge and wave impacts during coastal storms and hurricanes are designated on the FIRMs as Zones V1-30, VE, and V. In general, different standards than those in riverine floodplains apply in V zones to help manufactured homes withstand wave impacts. Many V zones are also subject to erosion and scour, which can undercut manufactured home foundations.

In addition, some A zones near the coast, generally located landward of and contiguous to V zones, experience V zone flooding characteristics, including wave action, high velocity flows, and erosion or scour. These are referred to as Coastal A zones. While the forces in Coastal A zones are not as severe as those in V zones, they can still cause damage to manufactured housing and foundations.

Although there are no distinct NFIP floodplain management regulations for Coastal A zones, this guide recommends that V zone regulations be followed within Coastal A zones where flood forces are generally stronger and more destructive than those in non-Coastal A zones.

**Coastal A Zones**  
NFIP regulations do not differentiate between Coastal and non-Coastal A zones. However, this guide recommends that manufactured housing in Coastal A zones be installed to be more resistant to flood forces found in coastal flood areas, including wave effects, velocity flows, erosion, and scour.

44 CFR 60.3(e) outlines the NFIP requirements for manufactured homes in coastal flood hazard areas in relation to elevation and anchoring, fill, enclosed areas and breakaway walls, and setbacks. Each of these requirements will be addressed in Sections 3.7.1 through 3.7.4, respectively.



In addition to these requirements, manufactured homes in coastal flood areas are required to meet many of the same requirements as manufactured homes constructed in riverine and inland flood areas, such as the use of flood damage-resistant materials below the BFE (Section 3.6.6) and protection of utilities and mechanical equipment (Section 3.6.7).

### 3.7.1 Elevation and Anchoring

Manufactured homes placed or substantially improved in V zones must be elevated so that the bottom of the lowest horizontal structural member of the lowest floor is elevated to or above the BFE in sites:

"(i) Outside of a manufactured home park or subdivision, (ii) In a new manufactured home park or subdivision, (iii) In an expansion to an existing manufactured home park or subdivision, or (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage as the result of a flood, meet the standards of paragraphs (e)(2) through (e)(7) of 44 CFR 60.3." [44 CFR 60.3(e)(8)]

Elevation requirements for structures in the V zones differ from those in the A zones. In A1-30, AE, A, and AO zones, the finished floor elevation (i.e., top of floor) must be elevated to or above the BFE. Structures in V zones must be elevated so that *"the bottom of the lowest horizontal structural member of the lowest floor is elevated to or above the BFE."* For manufactured homes, the lowest horizontal structural member would generally be the chassis main steel beams. Having the bottom of the lowest horizontal structural member to or above the BFE minimizes flood damages due to wave action. Figure 3-6 illustrates the reference level requirement.

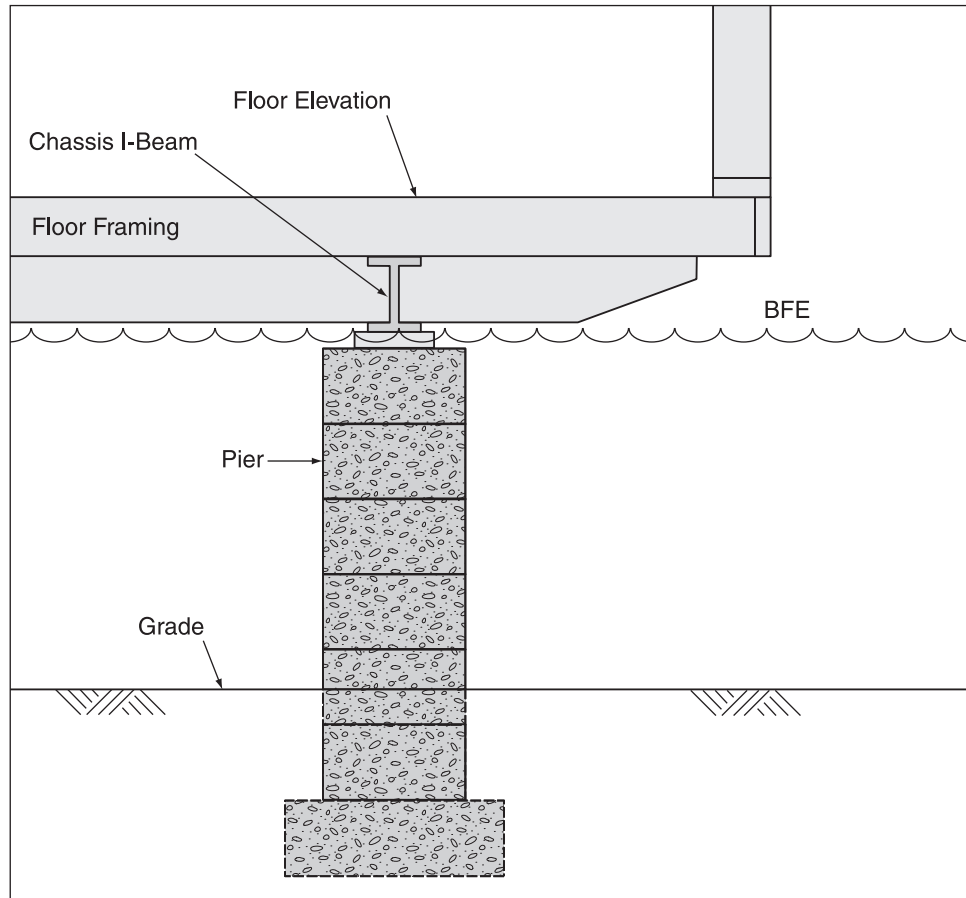
44 CFR 60.3 (e)(4) requires the community to:

"Provide that all new construction and substantial improvements in Zones V1-30, VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4)(i) and (ii) of this section."

Satisfying 44 CFR 60.3(e)(4)(ii) means that flood and wind loads are to be considered acting simultaneously in the design of elevated portions of the building, its foundation, and its attachment to the structure, so that the building will not be subject to flotation, collapse,



**Figure 3-6.**  
**Manufactured home with**  
**the bottom of the lowest**  
**horizontal structural**  
**member elevated to the**  
**BFE.**



displacement, or other structural damage. Design wind loads are to comply with State or local building standards.

Manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision in V zones must be elevated so that the bottom of the lowest horizontal structural member of the lowest floor is to or above the BFE or meet the 3-foot pier foundation addressed in Section 3.6.3. In the case of the 3-foot foundation, it is important to note that structures in V zones are subject to wave action, intense hydrodynamic pressures, and generally deeper flood depths than riverine areas. Foundations in V zones need to be designed to withstand flood forces from breaking waves and greater flood depths from storm surge. The 3-foot foundation should not be expected to withstand these forces. For these reasons, the NFIP recommends that all manufactured homes in V zones be elevated to or above the BFE. FEMA's *Coastal Construction Manual* (FEMA 55) recommends that the lowest horizontal structural members in coastal areas should be perpendicular to the expected wave crest.

As discussed in Section 3.2, post-storm investigations have indicated that typical AE Zone constructed buildings along the coast are subject to considerable damage when exposed to waves less than 3 feet and as small as 1.5 feet in height. Evidence from these post-storm investigations suggests that design and construction requirements in some portions of Coastal AE zones should be more like the VE zone requirements to minimize damages.

To help communities identify those Coastal AE zone areas subject to damaging wave heights, FEMA will delineate the landward limit of the area affected by waves greater than 1.5 feet in height on the FIRMs and include this information in the DFIRM database as an informational layer. As indicated in Section 3.2, FEMA refers to this limit as the LiMWA. Communities are encouraged but not required to adopt the coastal AE Zone area defined by the LiMWA and adopt and enforce higher building standards than the minimum NFIP requirements in these areas.

Furthermore, the 2009 International Building Code® (IBC®) references the American Society of Civil Engineers (ASCE) 24-05 *Flood Resistant Design and Construction* standard, which has specific design requirements, similar to Zone VE construction, that apply to areas that may be affected by waves greater than 1.5 feet (which ASCE 24 refers to as Coastal A zones). In addition, every FEMA coastal construction publication since the issuance of FEMA 55, *Coastal Construction Manual*, dated June 2000, has recommended the use of Zone VE construction practices in areas subject to wave heights greater than 1.5 feet. The NFIP's CRS provides credits for communities that adopt and enforce more stringent floodplain management requirements in these areas.

### **3.7.2 Fill**

Due to the wave action and more intense hydrodynamic forces experienced in coastal flood areas that lead to erosion and scour, elevating on structural fill is not permitted in V zones. Under the NFIP, the use of fill is prohibited for structural support.

“[The community must ] Prohibit the use of fill for structural support of buildings within Zones VI-30, VE, and V on the community’s FIRM.”[44 CFR 60.3(e) (6)]

While fill is not allowed for structural support, a limited amount of fill is allowed for landscaping, local drainage needs, and to smooth out a site for an unreinforced concrete pad. Fill must not divert floodwaters or deflect floodwaters and waves beneath elevated buildings. Fill must also not divert floodwaters or deflect waves such that increased flood damages is sustained by adjacent and nearby buildings.

For further information on fill in coastal flood areas refer to FEMA Technical Bulletin 5, *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas in accordance with the National Flood Insurance Program*.

### **3.7.3 Enclosed Areas and Breakaway Walls**

The preferred method of constructing a V zone building is to leave the area below the elevated floor free of obstruction or to enclose the area only with latticework or insect screening. That way waves can freely flow under the building without placing additional loads on the foundation. The only solid foundation walls allowed below the lowest floor of a manufactured home in a V zone area are breakaway walls that will give way under wind and water loads without causing collapse, displacement, or other damage to the elevated portion of the manufactured home or supporting to the piles. The NFIP requirements for enclosures below an elevated building are:

“[The community must] Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community’s FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purpose of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions.....”  
[44 CFR 60.3(e) (5)]

Just as in A zones, the space enclosed by walls is to be used solely for parking of vehicles, building access, or storage, and must be constructed with flood-resistant materials. Solid breakaway walls are allowed, as are garage doors that meet the same breakaway requirements. Solid breakaway walls are intended to collapse under the force of wave impacts without damaging the building's foundation or the elevated portion of the building. All solid breakaway walls should have their designs certified by a registered professional engineer or architect. The area enclosed by solid breakaway walls should be limited to less than 300 square feet because flood insurance rates increase dramatically for enclosures larger than 300 square feet.

For further information on enclosed areas and breakaway walls in coastal flood areas, refer to FEMA Technical Bulletin 5, *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas in accordance with the National Flood Insurance Program* and Technical Bulletin 9, *Design and Construction Guidance for Breakaway Walls Below Elevated Buildings Located in Coastal High Hazard Areas in accordance with the National Flood Insurance Program*.

### **3.7.4 Setbacks**

44 CFR 60.3 (e) (3) requires the community to “provide that all new construction within Zones V1-30, VE, and V on the community’s FIRM is located landward of the reach of mean high tide.”

In coastal areas, there is a mean high tide line used for regulatory purposes. This means that the high tide line is physically shifting over time as beach and coastal areas are dynamic. However, the community, region, or State will have a regulatory line defined. The NFIP does not allow any development or construction to occur seaward of this line. Figure 3-7 illustrates how the mean high tide line defines the area of no development in coastal regions. Figure 3-8 shows coastal development in an area where setback requirements are enforced.

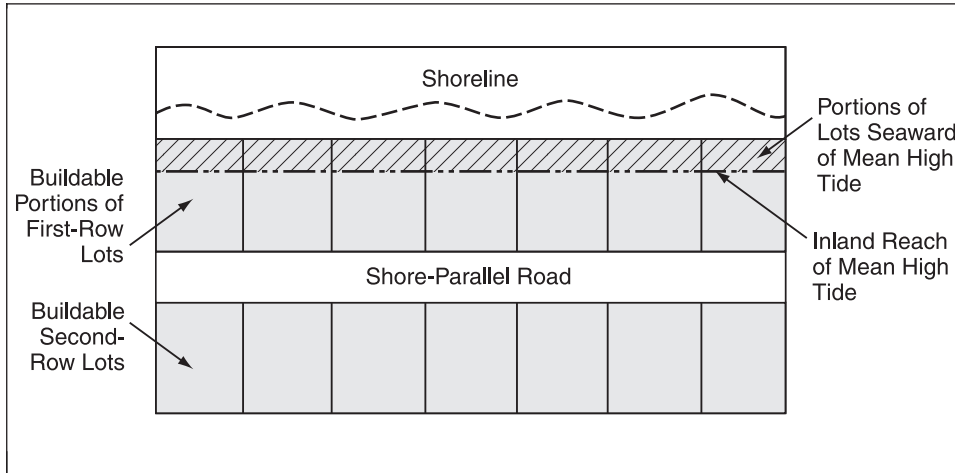


Figure 3-7. Mean high tide line development restriction.



Figure 3-8. Coastal development well-suited to the land: generous setbacks, in combination with deep lots and avoidance of dune areas, should afford protection from erosion and flooding for years to come.

## 3.8 Existing Manufactured Homes in Flood Hazard Areas

### 3.8.1 Relocation

The best way to prevent damage to manufactured homes and to prevent loss of life and injury during a flood is to install manufactured homes outside of flood-prone areas. For existing manufactured homes, relocation of the manufactured home out of the floodplain may be a viable option to minimize damages.

Manufactured homes are relatively easy to transport and can be moved from areas prone to flooding to sites located outside of the flood hazard area. This not only allows the homeowner to prevent damage to the manufactured home, but also provides peace of mind concerning safety risks and property damages due to flooding.

Some issues to consider when evaluating relocation as a mitigation option include:

- Will it be cost-effective (cost of incurring damages versus cost of preventing damages)?
- Is the home in good enough condition for transporting?
- Is the removal of existing utility connections easily done prior to transportation?
- Is there a suitable new site for relocation?
- Are utilities with similar connections available at the new site?
- Is there a route that will provide adequate clearance for transporting the manufactured home?

The relocation process consists of nine steps that are fairly clear, but include many design considerations:

**Step 1.** Select a manufactured home moving contractor

**Step 2.** Analyze the existing site and manufactured home conditions

**Step 3.** Select, analyze, and design foundation for the relocated home at the new site

**Step 4.** Prepare the existing site

**Step 5.** Evaluate and plan the moving route

**Step 6.** Prepare the manufactured home for relocation

**Step 7.** Move the manufactured home

**Step 8.** Prepare the new site

**Step 9.** Restore the old site

More information on relocation as a retrofitting technique can be found in Chapter 7 of FEMA 312, *Homeowner's Guide to Retrofitting* (2nd Edition, 2009), and FEMA 259, *Engineering Principles and Practices of Retrofitting Flood-Prone Residential Structures* (2nd Edition, 2001).

### **3.8.2 Evacuation**

Evacuation of a manufactured home from a site when there is a flood threat can result in extensive flood damages being avoided to the home. Communities may have procedures in place for evacuating homes when there is a flood threat and may provide assistance to the occupant of the manufactured home to remove the manufactured home to a protected site. The NFIP will pay up to \$1,000 for the reasonable expenses incurred to move an insured manufactured home to a place other than the described location that contains the manufactured home in order to protect it from flood or the imminent danger of flood. Any insured manufactured home moved



to a place other than the described location must be placed outside of the Special Flood Hazard Area or above ground level.

Communities may allow the evacuation of manufactured homes in Zones A1-30, AH, and AE only in the following cases:

- Evacuation of a manufactured home from an existing manufacture home park or subdivision; or
- Evacuation of a manufactured outside of a manufactured home park or subdivision.

After the threat of flooding from a specific event has passed, these manufactured homes can be returned to their original site without being elevated in accordance with the requirements at either 44 CFR 60.3(c)(6) or (c)(12) provided the manufactured home was not subject to the elevation requirements in these two paragraphs when first installed on the site.

Communities that allow existing manufactured homes to be removed to avoid flooding should have some type of permitting and tracking system in place to ensure that the same home is being returned to the original permanent site or pad. Communities may require a permit to ensure that utility reconnections meet local codes. If a community has developed a plan that pre-identifies manufactured homes that would be removed in the event of a flood, the plan should include procedures for determining which manufactured homes are to be removed and which ones are to be returned to their original site or pad. If a community has not developed a plan or individual manufactured homeowners initiate removal of their home on their own, the community is still responsible for determining whether the same home is being returned to the original site or pad. Since much can go wrong in trying to evacuate a manufactured home, evacuation is not a substitute for permanently protecting the manufactured home by elevating it to or above the BFE.

The community should issue some type of re-occupancy permit for owners who want to return the home to the original site or pad as a record to distinguish these from new or substantially improved manufactured homes that must meet the community's floodplain management regulations. A variance under the NFIP floodplain management regulations at 44 CFR 60.6(a) is not required for returning a manufactured home that was evacuated to the original site or pad because it is not a new placement, a replacement of, or substantial improvement.

### **3.8.2.1 Manufactured Home Substantially Improved or Returned to a Different Site or Pad in an Existing Manufactured Home Park**

If the manufactured home that was evacuated due to the threat of flooding is placed on a different site or pad in the existing manufactured home park or subdivision or is substantially improved on the original site or pad, it would have to meet the requirements at 44 CFR 60.3(c)(12) in all A zones (the manufactured home would have to be elevated to the BFE or be elevated at 36 inches in height above grade).

### **3.8.2.2 Manufactured Home Placed in a New Manufactured Home Park or Subdivision**

If the manufactured home that was evacuated due to the threat of flooding is placed in a new manufactured home park or subdivision or in the expanded part of an existing manufactured home park or subdivision, or is placed on a different site outside a manufactured home park or subdivision, it would have to meet the elevation requirements of 44 CFR 60.3(c) (6) in Zones A1-30, AE, and AH and elevate to the BFE or 44 CFR 60.3(e) (8) in Zones VI-30, VE, and V and elevate to the BFE.

## **3.9 HUD Manufactured Home Construction and Safety Standards**

Prior to 1975, there were no Federal mandatory regulations or standards governing the design and construction of manufactured homes. Since 1976, HUD's Manufactured Home Construction and Safety Standards (MCHSS), or "HUD codes," have regulated the design and construction of factory-built manufactured housing.

After Hurricane Andrew in 1992, the HUD codes underwent many improvements regarding design and construction of manufactured homes. The lateral (wind) load provisions were updated to a modified American National Standards Institute/American Society of Civil Engineers (ANSI/ASCE) 7-88 design standard.

The HUD codes were revised to include three wind zones (Figure 1-1). Zone II homes are designed to resist a 100-mph (fastest mile) wind event; Zone III homes are designed for 110 mph. The design wind speed for Zone I homes is not specified. Rather, HUD I homes are designed to resist specified lateral and uplift wind pressures. Also, as point of interest, the HUD codes' energy design requirements were updated around this time frame. HUD codes program standards are found in 24 CFR 3280.

HUD's MCHSS include provisions for support and anchoring systems based on HUD Wind Zones I, II, and III. HUD's standards specify design requirements for the body and frame of the manufactured home. However, the HUD standards do not take seismic loading into account for the design of foundations and attachments.

The program has been in effect since 1976, and all manufactured homes built on or after June 15, 1976, are subject to HUD requirements. Although building codes are usually regulated at a local level, an exception is made with manufactured housing because it is most often built outside of the locality where it is eventually sited for use. Prior to the MCHSS, the quality of manufactured housing was unreliable, which resulted in the severe restriction or banning of the housing within several localities.

Under the program, manufacturers who build manufactured homes for sale in the U.S. are required to follow HUD-mandated design and construction standards. The standards are enforced either through HUD or approved Primary Inspection Agencies (either private firms or State administrative agencies) that perform reviews of manufacturers' designs and inspect the homes during construction to ensure compliance with the standards.

According to 24 CFR 3280, the purpose of the MHCSS is to establish standards for “all equipment and installations in the design, construction, transportation, fire safety, plumbing, heat-producing and electrical systems of manufactured homes which are designed to be used as dwelling units.”

A manufactured home designed and constructed in accordance with the MHCSS standards will have a data plate and a certification label attached to it. The data plate will be affixed in a permanent manner near the main electrical panel or other readily accessible and visible location. The data plate contains the following information:

- The name and address of the home’s manufacturing plant
- The serial number and model designation of the unit
- The date it was manufactured
- A list of the certification label numbers that are affixed to each transportable section
- A list of factory-installed equipment, including the manufacturer’s name and the model number for each appliance
- Reference to the roof and wind load zones for which the home is designed

The certification label will be a 2-inch by 4-inch aluminum plate. The plate will be permanently attached to the home on the tail light end of the home, approximately 1 foot from the floor and 1 foot in from the road side. Figure 3-9 is a certification plate for homes built after June 15, 1976.



Figure 3-9. Certification plate for manufactured homes built after June 15, 1976.

Siting and installation requirements for manufactured homes are generally a State or local regulatory responsibility, where such regulatory authority exists. Some State and local regulations require licensed or registered installers, and/or require permits to be obtained prior to installation. Inspections are often required in conjunction with the permits, to ensure correct

installation. The new installation standards in Part 3285 dictate that manufacturers' installation instructions be approved by a Design Approval Primary Inspection Agency (DAPIA) and the protections contained therein meet or exceed all requirements of HUD's model installation standards. This requirement is to ensure that the purchaser has the correct procedures available for installing the manufactured home.

As part of the 1994 changes, the provisions for "Windstorm protection" in 24 CFR 3280.306 that address anchoring systems were also modified to be consistent with the revisions made for wind design requirements for manufactured housing in high-wind areas. This section of the standard requires that the manufacturer provide instructions, including drawings and specifications, detailing at least one acceptable system of anchoring the manufactured home that has been approved by a registered professional engineer or architect (24 CFR 3280.306(b)). Requirements are detailed in 24 CFR 3280.306 for the instructions and stipulate wind loading requirements for design. At this time, the standards do not instruct the designer to consider the forces of floodwaters or seismic loads when designing the foundation system.

### 3.10 HUD Model Manufactured Home Installation Standards

Siting and installation requirements for manufactured homes are generally a State or local regulatory responsibility, where such regulatory authority exists. Some State and local regulations require licensed or registered installers, and/or require permits to be obtained prior to installation. Inspections are often required in conjunction with the permits, to ensure correct installation. The new installation standards in Part 3285 dictate that manufacturers' installation instructions be approved by a Design Approval Primary Inspection Agency (DAPIA) and the protections contained therein meet or exceed all requirements of HUD's model installation standards. This requirement is to ensure that the purchaser has the correct procedures available for installing the manufactured home.

#### **State Manufactured Home Installation Programs**

As of January 2009, according to HUD's Office of Manufactured Housing Programs, the following States have Approved or Conditionally Approved Manufactured Home Installation Programs: Alabama, Arizona, Arkansas, California, Kentucky, Ohio, Pennsylvania, South Carolina, Tennessee, Washington, and West Virginia.

The following States have submitted applications for Manufactured Home Installation Programs: Georgia, Idaho, Indiana, Kansas, Maine, Michigan, Minnesota, Mississippi, Nevada, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Texas, and Virginia.

The Manufactured Housing Improvement Act of 2000 required that HUD establish minimum National Model Installation Standards (which were published in 24 CFR 3285 in October 2007). The Act also set out requirements that States must meet in order to continue to regulate manufactured home installation in their State. To be eligible, States must meet certain requirements as indicated in HUD's Installation Program published in June 2008, including a requirement that State Standards meet or exceed HUD's Model Installation Standards.

The installation standards in 24 CFR 3285 include requirements for pre-installation and installation considerations, site preparation, foundations, and home installation procedures. Additionally, standards on installation, preparation, and/or testing of optional features, appliances, utility system connections, and life safety features have been incorporated. The standard is designed for adoption and use by authorities who are responsible for the safety and health of manufactured home users. The standards address natural hazards (wind, flooding, and freezing) by incorporating the following requirements:

- A section on Installation of Manufactured Homes in Flood Hazard Areas states that FIRMs must be consulted prior to installation to determine a property's flood risk and identify whether floodplain development permits may be necessary.
- In areas prone to flooding, elevation and anchoring techniques are required, as well as consultation with a registered professional engineer and local authorities to ensure installation conforms to all applicable codes and regulations.
- Piers, anchoring, and support systems of the foundation in flood hazard areas must be capable of resisting loads associated with design flood and wind events.
- Oil storage tanks in flood hazards areas must be protected from damage by anchoring and elevation or other design.
- Appliances located on the outside of the manufactured home and air inlets must be elevated to or above the design flood elevation (DFE), which is defined in Appendix D.
- Special requirements for footings and foundations for manufactured home placement in freezing climates apply.
- The installer is required to secure the manufactured home against the wind according to the HUD codes.
- Anchor type requirements (longitudinal) for manufactured homes subject to higher winds (Wind Zones II and III) apply.
- Provisions for maximum diagonal tie-down strap spacing, dependent on the wind zone in which the property is located, apply.

The standard can be viewed online at <http://www.nfpa.org/assets/files/PDF/CodesStandards/MHCCHUD/MHCCInstallationStandardsFinalRule.pdf>.

In October 2007, HUD issued 24 CFR 3285 *Model Manufactured Home Installation Standards*, which regulates manufactured home installations.

The new standard creates a baseline standard for manufactured housing installation; it presents the minimum requirements for installation that must be equaled or exceeded by States and are also a minimum requirement for manufacturers' installation instructions.

### **Manufactured Home Installation Standards for Flood Hazard Areas**

24 CFR 3285.302 also requires manufacturers to indicate in the installation instructions if the foundation specifications have been designed for flood-resistant considerations and, if so, the conditions of applicability for velocities, depths, or wave action; or to indicate if the foundations are not designed to address flood loads.



Model Manufactured Home Installation Standards 24 CFR 3285.302 – Flood Hazard Areas requires:

“...foundations, anchoring and support systems must be capable of resisting loads associated with design flood and wind events, or combined wind and flood wind events, and homes must be installed on foundation supports that are designed and anchored to prevent flotation, collapse, or lateral movement of the structure”

## **3.11 Model Building Code Requirements**

Model building codes can be adopted and enforced by localities and States to specifically address manufactured housing installation. Two major building codes within the U.S. are the ICC’s International Code Series, and NFPA 5000, Building Construction and Safety Code (2006). The International Code Series includes the IRC for 2006 (IRC 2006), which applies to one- and two-family dwellings. In addition, the IRC for 2009 (IRC 2009) is now available.

### **3.11.1 IRC 2006**

The IRC 2006 is a comprehensive residential building code that includes provisions for development in the SFHAs that meet the minimum requirements of the NFIP. Appendix E of the IRC 2006 contains a section dedicated to “Manufactured Housing Used as Dwellings.” Section 502 of this appendix describes requirements for foundation systems, which, in part, refer to the general provisions of the code. Under the IRC Appendix E, all footings for manufactured housing shall be as follows:

- Extend below the frost line
- Be constructed of materials specified by the code, including masonry and concrete
- Be made of solid material (concrete and masonry footings)
- Be designed in accordance with seismic specifications, including minimum reinforcements near the bottom of the footing, and specifications on joints between footings and stem walls if located in a Seismic Design Category D1 or D2 area
- Be elevated to the DFE for new and replacement manufactured homes

Appendix E, Section AE604.1 of the IRC 2006 also details requirements for anchorage installation. The code ground anchor requirements are:

- The load carrying portion of the ground anchors shall be installed to the full design depth and shall extend below the established frost line into undisturbed soil.
- The manufacturer’s installation directions should provide preload requirements and load capacities for various soil types.
- Approved ground anchors must be capable of resisting an allowable working load 3,150 pounds in the direction of the tie plus a 50 percent overload or 4,725 pounds without

failure. Failure is considered to have occurred when the anchor moves more than 2 inches at a load of 4,725 pounds.

- Ground anchors designed to be installed so that loads on the anchors are other than direct withdrawal must be designed and installed to resist an applied design load of 3,150 pounds at 40 to 50 degrees from vertical without displacing the end of the anchor more than 4 inches horizontally.

Appendix E, Section AE605 of the IRC 2006 establishes performance requirements for ties, materials, and installation. The requirements include:

- Ties must be attached to ground anchors with turnbuckles or other adjustable tensioning devices, and
- Ties must be capable of resisting a working load of 3,150 pounds with less than a 2 percent elongation, and a 50 percent overload of 4,725 pounds.

FEMA has evaluated the IRC 2006 and has determined that it is consistent with NFIP regulations. The IRC 2009 has also been determined to be consistent with NFIP regulations.

### **3.11.2 NFPA 5000**

NFPA 5000's Chapter 39 (Flood-Resistant Design and Construction) includes many of the minimum NFIP requirements. According to the code, manufactured housing located in the flood hazard area must adhere to the following requirements:

- Foundations must be designed and constructed as required by Structural Engineering Institute (SEI)/ASCE 24, *Flood Resistant Design and Construction*.
- In flood areas subject to high velocity wave action, structural fill, slabs-on-ground, and foundation walls are prohibited.
- The lowest floor of the structure must be elevated to or above the DFE (see Appendix D for DFE description).
- Manufactured homes must be installed using methods that minimize flood damage and shall be securely anchored to a foundation (meeting the requirements of SEI/ASCE 24). These requirements are in addition to the manufacturer's specifications and State and local anchoring requirements for resistance to wind.
- Where temporary structures are proposed, the authority having jurisdiction must consider flood warning time as well as the location of the structure in relation to any floodways, alluvial fan areas, or high velocity wave action areas before granting a permit.

NFPA 5000 also dictates that ASCE 7 is to be used to determine the design loads associated with environmental loads, including wind, seismic, snow, and ice events. The code states that all buildings and other structures shall be designed to resist these design loads.

### **3.11.3 NFPA 501**

NFPA 501, *Standard on Manufactured Housing*, addresses the design, manufacture, and transportation of manufactured homes and adopts, by reference, ASCE 7-2002. NFPA 501 also added some seismic provisions by requiring all homes placed in seismic areas to have their water heaters braced to prevent falling or horizontal movement.

### **3.11.4 NFPA 225**

NFPA 225, *Model Manufactured Home Installation Standard*, is the first multi-hazard installation standard for manufactured homes. NFPA specifies wind provisions (ASCE 7-02), includes provisions for homes sited in SFHAs, and contains the latest National Earthquake Hazards Reduction Program (NEHRP) criteria for homes susceptible to earthquake damages.

FEMA has evaluated the 2005 edition of NFPA 225 and has determined it is consistent with NFIP regulations. In addition, the 2009 edition of NFPA 225 is now available and has also been determined to be consistent with NFIP regulations.