

# Reducing Flood Losses Through the International Codes<sup>®</sup>

Coordinating Building Codes and  
Floodplain Management Regulations

5<sup>th</sup> Edition, October 2019



in cooperation with



**FEMA**

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## Acronyms and Abbreviations

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ASCE	American Society of Civil Engineers
ASFPM	Association of State Floodplain Managers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base flood elevation
CFR	Code of Federal Regulations
CRS	Community Rating System
DFE	Design flood elevation
DRRA	Disaster Recovery Reform Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
HUD	U.S. Department of Housing and Urban Development
HVAC	Heating, ventilation, air conditioning
IAPMO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code®
ICCPC	International Code Council Performance Code®
I-Codes	International Codes®
IEBC	International Existing Building Code®
IFGC	International Fuel Gas Code®
IMC	International Mechanical Code®
IPC	International Plumbing Code®
IPSDC	International Private Sewage Disposal Code®
IRC	International Residential Code®
ISPSC	International Swimming Pool and Spa Code®
LiMWA	Limit of Moderate Wave Action
LOMR-F	Letter of Map Revision based on Fill
NAI	No Adverse Impact
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
PA	Public Assistance
SDE	Substantial Damage Estimator
SFHA	Special Flood Hazard Area

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## Chapter 1 Introduction

The International Codes® (I-Codes®), a family of codes developed and maintained by the International Code Council, shares common goals with the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP): protection of public safety and reduced property damage.

Many states adopt building codes at the state level and mandate enforcement by communities. In other states, communities may elect to adopt codes. The International Code Council records indicate one or more of the I-Codes is adopted or used in all 50 states, the District of Columbia, and four of the five U.S. territories. In a late 2018 internal analysis, FEMA determined that 23 states adopt the codes at the state level and require local enforcement. The District of Columbia, Guam, Northern Marianas, Puerto Rico, and the U.S. Virgin Islands adopt and enforce codes based on the I-Codes and many communities in the other states have elected to adopt and enforce the I-Codes.

Community participation in the NFIP is voluntary. Of the more than 22,700 communities identified by FEMA as having some degree of flood risk, more than 21,000 elect to participate (as of mid-2019). More than 1,700 communities without identified areas prone to flooding also participate. To participate in the NFIP, communities must have enforceable floodplain management regulations that are consistent with the requirements in Title 44 Code of Federal Regulations (CFR) Parts 59 and 60 for land management and use.

### 1.1 Purpose of Guide

This guide is intended to help state and local officials integrate the I-Codes into their current floodplain management regulatory processes related to structures, buildings, and other development to satisfy the requirements to participate in the NFIP. Benefits of coordinating building codes and floodplain management regulations include reduced duplication and conflict between requirements and improved, consistent, and thorough review, permitting, and enforcement processes.

This guide may also be useful to state and local officials when applying the flood provisions of the I-Codes to mitigation and recovery projects approved for FEMA grant funding. It is not intended as an endorsement of any specific approach for effectively managing flood hazards, nor does it explain all of the NFIP and building code requirements and how to administer them. FEMA and others have produced numerous documents and publications related to the NFIP and the regulation of flood hazard areas.

#### I-Code Edition

This guide focuses on the 2018 edition of the I-Codes with reference to the 2015 and 2012 editions where there are differences between editions.

#### Community

For the purposes of the NFIP and this guide, community means "any State or area or political subdivision thereof, any Indian tribe or authorized tribal organization, or Alaska Native Village or authorized native organization, which has the authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction." Counties, cities, towns, villages, and parishes are communities. In some states, flood control districts or planning districts that exercise land use authority may meet the definition.

#### State

For the purpose of this guide, the term state includes states, territories, and tribal governments.

# Introduction

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Careful attention is required to ensure that all requirements of the NFIP are addressed through a combination of building codes and other regulations. The remainder of this guide is organized as follows:

- [Chapter 2](#) describes three approaches for coordinating the I-Codes and local floodplain management regulations and identifies a number of advantages and considerations when relying on the flood provisions of the codes to meet the NFIP requirements for buildings and structures.
- [Chapter 3](#) explains several differences between the NFIP regulations and the I-Code requirements related to specific terminology and provisions. Many requirements in the codes are more restrictive than the NFIP requirements, and some provisions are more specific than the NFIP, especially in the American Society of Civil Engineers' (ASCE's) standard ASCE 24, *Flood Resistant Design and Construction*, that is referenced by the International Building Code (IBC).
- [Chapter 4](#) contains a series of questions that states and communities should answer to know whether and how to modify existing floodplain management regulations to coordinate with building codes.
- [Chapter 5](#) describes modifications that can be adopted to incorporate higher standards in state and local building codes that are based on the I-Codes to further increase building and community resilience to flood damage.
- [Chapter 6](#) introduces the model code-coordinated ordinances prepared by FEMA.
- [Appendix A](#) lists cited references and other resources that are useful for understanding and interpreting the requirements of the NFIP.
- [Appendix B](#) provides sample plan review and inspection checklists.

## Referenced Standards

As used in building codes, "referenced standard" refers to a technical specification that has been developed through a consensus process by a standards-setting organization.

The I-Codes include statements that "standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference." Further, the codes state that "where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply."

## 1.2 The I-Codes and the NFIP

This guide covers the I-Codes, a family of codes developed by the International Code Council. The flood provisions in each code in the series (2012 edition and later) either meet or exceed the NFIP requirements for the purpose of NFIP participation. Therefore, communities that participate in the NFIP can rely on the I-Codes to form the basis of their floodplain management practices related to buildings and structures.

## Earlier Editions of the I-Codes

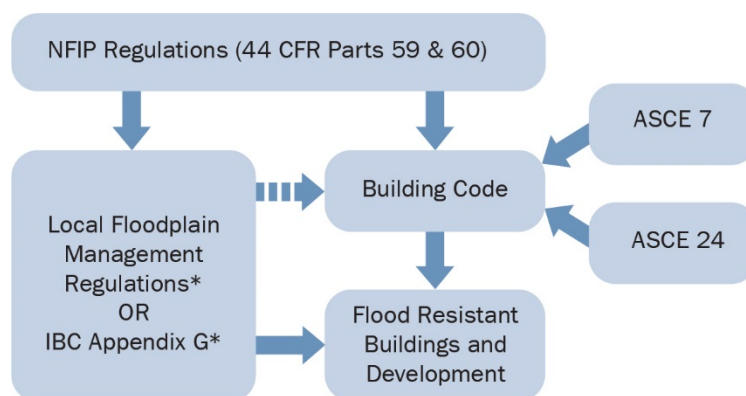
The I-Codes have included flood provisions since the first edition was published in 2000. While most flood provisions in the early editions are consistent with the NFIP requirements for buildings, the changes between the 2006 and 2012 editions addressed a small number of gaps and inconsistencies.

FEMA supports the adoption and use of the latest published editions of the I-Codes as a minimum standard for hazard resistance, including flood hazards, high winds, and earthquake hazards. FEMA encourages states and communities to adopt the most recent edition of the I-Codes to ensure enforcement of the latest hazard-resistant provisions. This will increase safety and reduce financial losses for individuals, supporting more rapid recovery after disasters. For the purposes of evaluating whether a community is deemed hazard-resistant, FEMA considers the two latest published editions of the I-Codes to be adequate. Additionally, new federal law and emerging policies tie some pre- and post-disaster federal assistance to the latest editions of codes and standards.

The I-Codes, including flood provisions, are continually updated based on best practices and post-disaster investigations, and improve the standards with each edition. The NFIP requirements for buildings and structures have remained largely unchanged since 1971 and no longer meet the minimum industry standards.

To help states and communities identify and understand the flood provisions in the I-Codes and the relationship with the NFIP regulations (see [Figure 1-1](#)), FEMA posts the following resources at [www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources):

- Excerpts of the flood provisions in each code in the I-Codes (2012 and later editions)
- Checklists that demonstrate how the flood provisions of the I-Codes meet or exceed the requirements of the NFIP (2012 and later editions)
- “Highlights of ASCE 24, *Flood Resistant Design and Construction*” (2014 and 2005 editions)



\* NFIP-consistent administrative provisions, community-specific adoption of Flood Insurance Studies and maps, and technical requirements for development outside the scope of the building code (and higher standards, in some communities).

**Figure 1-1: Relationship of NFIP regulations to building code flood provisions**

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The I-Codes that contain flood provisions include:

- **International Building Code® (IBC):** The IBC, largely by reference to ASCE 24, ASCE’s standard, *Flood Resistant Design and Construction*, meets or exceeds the design and construction requirements of the NFIP for all buildings and structures. While primarily used for buildings and structures other than one- and two-family dwellings within the scope of the IRC, the IBC may be used to design dwellings. IBC Appendix G addresses other NFIP requirements, such as duties and powers of the official enforcing the appendix; map-related duties; variances; and development other than buildings, including subdivisions, site improvement work, manufactured homes, recreational vehicles, underground and above-ground storage tanks, other building work, temporary storage and temporary structures, and utility and miscellaneous structures (which the IBC calls “Utility and Miscellaneous Group U structures”).
- **International Residential Code® (IRC):** The IRC meets or exceeds the NFIP requirements for flood-resistant design and construction of one- and two-family dwellings and townhomes. For dwellings in floodways, the IRC references ASCE 24.
- **International Existing Building Code® (IEBC):** The IEBC meets or exceeds the NFIP requirements for flood-resistant design and construction of existing buildings by requiring compliance with the requirements of the IBC and IRC under certain circumstances (Substantial Improvement and Substantial Damage).
- **International Plumbing Code® (IPC), International Mechanical Code® (IMC), International Fuel Gas Code® (IFGC), International Private Sewage Disposal Code® (IPSDC), and International Swimming Pool and Spa Code® (ISPSC):** Each of these codes has flood provisions.
- **International Code Council Performance Code® (ICCPC):** The ICCPC contains performance-based standards to provide for resistance to flood loads and damage.

### 1.3 Intended Audience

This guide is intended for floodplain management and building officials at all levels of government who have a role in regulating construction of buildings and land development. At the local level, these responsibilities may be under the jurisdiction of a single department or office, or may be distributed among several offices. Regardless of how a state or community is organized, FEMA recommends that this guide be reviewed by every office that has a role in land development (including subdivisions) and construction regulation.

### 1.4 Where to Get Help

Each state has an office designated as the State Coordinating Agency for the NFIP, commonly referred to as the NFIP State Coordinator and sometimes called State Floodplain Managers. Contact information for the NFIP State Coordinators is online at [www.floods.org](http://www.floods.org), and a list of the 10 FEMA Regional Offices (see [Figure 1-2](#)) is available at [www.fema.gov/fema-regional-contacts](http://www.fema.gov/fema-regional-contacts). Contact information for state code agencies can be accessed at [codes.iccsafe.org/search/map](http://codes.iccsafe.org/search/map) (click on state map, then click “Key Contacts”).

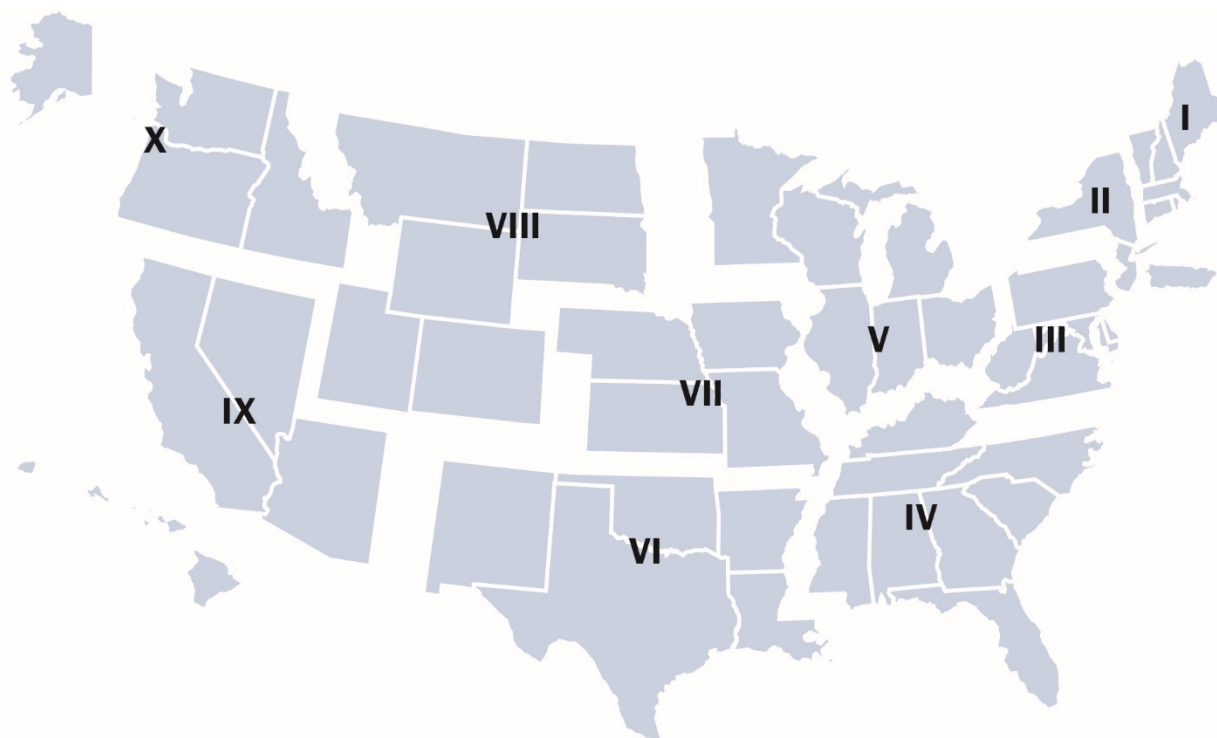


Figure 1-2: FEMA Regions

## 1.5 Purpose and Overview of the NFIP

**NFIP Purpose.** The authorizing legislation for the NFIP is the National Flood Insurance Act of 1968, as amended (42 U.S. Code § 4001 et seq.). In the act, the U.S. Congress found that “a program of flood insurance can promote the public interest by encouraging sound land use by minimizing exposure of property to flood losses.” The act has been amended several times since 1968.

The NFIP regulations for development in special flood hazard areas (SFHAs) delineated on Flood Insurance Rate Maps (FIRMs) are the basis for local floodplain management ordinances adopted by communities to participate in the NFIP. In addition, the NFIP requirements are the starting point for flood-resistant design and construction requirements in model building codes and standards.

When land use and development decisions lead to development in SFHAs, application of NFIP requirements will minimize exposure to floods and flood-related damage. Enforcing building codes and NFIP-consistent requirements helps achieve the long-term objective of building disaster-resistant communities.

## Introduction

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### Some NFIP Terms Used in this Guide

**Base Flood:** The flood having a 1 percent chance of being equaled or exceeded in any given year (also known as “base flood” and “100-year flood”).

**Base Flood Elevation (BFE):** Elevation to which floodwater is anticipated to rise during the base flood, including wave height, relative to the datum specified on FIRMs.

**Flood Insurance Rate Map (FIRM):** A map produced by FEMA to delineate both SFHAs and risk premium zones. SFHAs and BFEs are shown on FIRMs.

**Special Flood Hazard Area (SFHA):** Land areas subject to a 1 percent or greater chance of flooding in any given year, indicated on FIRMs as Zone A, AE, A1–A30, A99, AR, AO, AH (collectively referred to as Zone A in this guide), and Zone V, VO, VE, or V1–30 (collectively referred to as Zone V in this guide). Mapped zones outside of the SFHA are Zone X (shaded or unshaded) or Zone B/Zone C on older FIRMs.

**Zone A:** Flood zones shown on FIRMs as Zone A, AE, A1–30, AH, AO, A99, and AR.

**Zone V:** Flood zones shown on FIRMs as Zone V, VE, V1–30, and VO.

**Overview of the NFIP.** The three main elements of the NFIP are managed by FEMA:

1. **Hazard identification and mapping**, in which engineering and other studies are conducted and flood maps are prepared to delineate areas subject to flooding under certain conditions
2. **Floodplain management criteria**, which establish the minimum requirements for communities to adopt and enforce to regulate development in mapped flood hazard areas, with the expectation that communities will recognize hazards throughout the land development processes
3. **Flood insurance**, which provides some financial protection for property owners and tenants to cover flood-related damage to buildings and contents

Federal flood insurance provides financial relief for flood-damaged buildings beyond what is available through disaster assistance and disaster loans for homeowners and business owners. Disaster assistance rarely covers most of the costs to cleanup and repair after floods, and disaster loans do not significantly ease the financial burden because of repayment terms. Disaster assistance is available only after events are declared major disasters by the President of the United States. Disaster loans are only available after major disasters and when the U.S. Small Business Administration determines that events have affected a certain number of uninsured homes and businesses. In contrast, NFIP flood insurance claims are paid any time an NFIP policyholder’s insured property sustains damage from a qualifying flood event.

More information about NFIP flood insurance is available online at [www.floodsmart.gov](http://www.floodsmart.gov).

An important objective of the NFIP is to break the cycle of flood damage. Before communities joined the NFIP, many buildings were flooded, repaired or rebuilt sometimes using the same construction techniques that did not adequately resist flood damage in the first place, and flooded again.

By encouraging communities to guide development to lower-risk areas, and requiring that new buildings in flood-prone areas (and nonconforming buildings that are improved beyond a certain threshold or that incur a certain level of damage) be elevated, one of the long-term objectives of the NFIP can be achieved: reduce flood damage and losses. Older buildings may be removed or replaced, or they may be upgraded or modified using materials and techniques that reduce vulnerability to flood damage.



### 1.6 Overview of State and Community Responsibilities under the NFIP

**Overview of State Responsibilities.** At the state level, each governor designates an agency or office to function as the NFIP State Coordinating Agency. The NFIP State Coordinator's office is specifically charged with linking FEMA and communities and advising communities on how to comply with the NFIP requirements, as well as applicable state laws and regulations. The NFIP State Coordinator stays current on NFIP issues and can advise communities and citizens on how specific provisions should be interpreted in many situations.

The duties and responsibilities of the NFIP State Coordinator's office are found in the NFIP regulations (44 CFR § 60.25). Common functions include:

- Enact, when necessary, legislation to enable communities to regulate development in flood hazard areas
- Ensure coordination with other state, area-wide, and local agencies
- Encourage and assist communities to qualify for participation in the NFIP
- Guide and assist communities to develop, implement, and maintain floodplain management regulations
- Provide technical assistance to communities and the general public
- Assist with disseminating information on flood hazards and regulatory requirements
- Participate in and provide training opportunities
- Help FEMA and communities to identify flood-prone areas
- Notify FEMA of problems with community programs if such problems cannot be resolved through technical assistance

An important responsibility of the NFIP State Coordinator's office is to work with state agencies that undertake development in SFHAs. The NFIP includes states in the definition for "community" (44 CFR § 59.1). NFIP flood insurance policies on state-owned buildings cannot be written or renewed unless the state either:

- Requires state agencies to comply with the floodplain management requirements of all communities participating in the NFIP in which state-owned properties are located; or
- Establishes and enforces floodplain management regulations that apply to state agencies and that, at a minimum, satisfy the criteria at 44 CFR § 60.3.

Other functions that NFIP State Coordinators may provide to support communities vary from state to state, but may include:

- Coordinate with the state building code agency
- Participate in planning processes and recommend priorities for federal floodplain management activities relative to community needs
- Provide advice on improvements to local administrative procedures for issuing permits, inspecting construction, remedying violations, and handling variances

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- Produce a floodplain management newsletter for local officials and others
- Review proposed code and ordinance amendments to ensure NFIP compliance
- Provide assistance to communities and others on using flood hazard maps, including how to seek revisions
- Assist communities with applications to participate in the NFIP's Community Rating System (CRS) (refer to Section 5.2 of this guide for additional information)
- Review applications for flood hazard mitigation grants
- Provide communities with FEMA flood insurance data, including Repetitive Loss, Severe Repetitive Loss, and flood insurance claims data

***Overview of Community Responsibilities.*** The NFIP regulations (44 CFR § 59.22) outline actions communities must take to become and remain eligible to participate in the program, including:

- Adopt and enforce floodplain management regulations that meet or exceed the NFIP requirements
- Apply the regulations to all designated SFHAs throughout their jurisdictions
- Submit to FEMA the regulations adopted to reduce or prevent flood-related damage (and subsequent amendments to those regulations), including copies of related zoning, building, and subdivision regulations; health codes; special purpose ordinances; and other corrective and preventive measures to minimize flood damage
- Identify the location where flood hazard maps will be maintained and made available for public inspection
- Appoint or designate an agency or individual official with the responsibility for implementing the floodplain management program
- If another jurisdiction will enforce the requirements, execute a memorandum of agreement (such an agreement does not change a community's ultimate responsibility to the NFIP)
- Maintain a file with specific information on all development within mapped SFHAs, including documentation of building elevations, certification of designs for buildings in coastal high hazard areas (Zone V), and certification of designs for floodproofed buildings, and make this information available for public inspection
- Conduct periodic field inspections to ensure that ongoing development complies with issued permits and to check for unpermitted development
- Include objectives in the community's comprehensive plan that are consistent with floodplain management goals
- Notify FEMA when revisions to flood hazard maps are necessary and provide available data to support those revisions
- Cooperate with federal, state, local, and private entities that undertake projects to study, survey, identify, and map flood hazard areas

- Notify FEMA, the state, and adjacent communities of any alteration or relocation of a watercourse
- Notify FEMA when the community's boundaries have been modified by legal actions such as annexation or dissolution

### **1.7 Benefits of Participating in the NFIP**

Although there is no federal requirement that communities participate in the NFIP, most communities with identified flood hazards choose to do so to make federal flood insurance available to their citizens. The implications of not participating are described in Section [1.8](#).

Significant benefits of participation in the NFIP include:

- Development and buildings that comply with the NFIP performance criteria are less likely to incur major damage. NFIP aggregate insurance claims data indicate that buildings designed and constructed to meet the requirements of the NFIP sustain 80 percent less flood damage than buildings that pre-date the NFIP. Ample evidence indicates that buildings designed to standards that exceed the NFIP requirements are even less likely to sustain damage.
- Most forms of federal disaster assistance for repair of buildings damaged by flooding, including grants and loans, are only available in communities that participate in the NFIP.
- Federally insured or regulated lenders must require buildings in mapped SFHAs to be insured for flood damage. People who have flood insurance have a significant advantage over those who have no financial support or those who have to get loans to help repair and rebuild after flood events. Most homeowners' property insurance explicitly excludes damage from floods, and flood insurance from private insurance companies may be hard to find and may not be accepted by some lenders. However, it is easy for most home and business owners to get NFIP flood insurance policies because many private companies write and sell policies on behalf of the NFIP.

In participating communities, NFIP flood insurance is available for both residential and nonresidential buildings, and coverage can be added for contents. Policies on buildings in SFHAs include coverage to help defray certain costs when flood-damaged buildings are required to be brought into compliance with community floodplain management requirements. This additional coverage, called "Increased Cost of Compliance," is described in Section [5.3.8](#) of this guide.

### **1.8 Implications of Not Participating in the NFIP**

Communities may elect not to participate in the NFIP, unless required to do so by state law. Officials in communities that do not currently participate in the NFIP are strongly urged to learn more about the benefits of the program. For assistance, contact the NFIP State Coordinator's office or the FEMA Regional Office (see Section [1.4](#)). When communities choose not to participate, the following apply:

- NFIP flood insurance is not available to property owners in that community.
- Federally regulated private mortgage lenders may make loans for properties in flood hazard areas, but they are required to notify borrowers that federal disaster assistance grants and loans will not be provided in the event of a flood disaster. Some lenders may decline to provide mortgages.

## Introduction

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- Direct federal mortgage loans for properties in the SFHA are not available from U.S. Government programs such as the Department of Veterans Affairs and the Federal Housing Administration.
- Federal agencies, including the U.S. Department of Housing and Urban Development (HUD), the U.S. Environmental Protection Agency, the U.S. Small Business Administration, and the U.S. Department of Health and Human Services, cannot provide grants and loans for construction, reconstruction, repair, rehabilitation, or additions to buildings in the community's mapped SFHAs.
- Federal disaster assistance will not be provided for permanent restorative construction of public buildings located in the community's mapped SFHA.
- Individuals and families in the community will receive only limited federal disaster housing assistance when a major disaster is declared for flooding, and other federal grants and assistance for repairs are not available.

Communities that decline to participate in the NFIP when FEMA prepares the first flood map for their area may subsequently decide to join the program. To do so, communities should contact the NFIP State Coordinator's office.

### 1.9 FEMA's Involvement in Development of Model Codes and Standards

FEMA has long recognized the advantages of enforcing requirements for buildings in flood hazard areas through building codes and has contributed to the development of flood provisions in building codes and standards since the mid-1980s. FEMA contributed to the development of the I-Codes starting with the first edition published in 2000. The history of FEMA's early and ongoing efforts in the code development process is summarized in a paper published in the proceedings of the 2012 Conference on Advances in Hurricane Engineering: *Flood Provisions in the International Code Series and 2010 Florida Building Code* (Ingargiola and Quinn 2012).

**FEMA Training**  
FEMA develops and delivers training on the flood provisions of the I-Codes. Contact FEMA Regional Offices for more information.

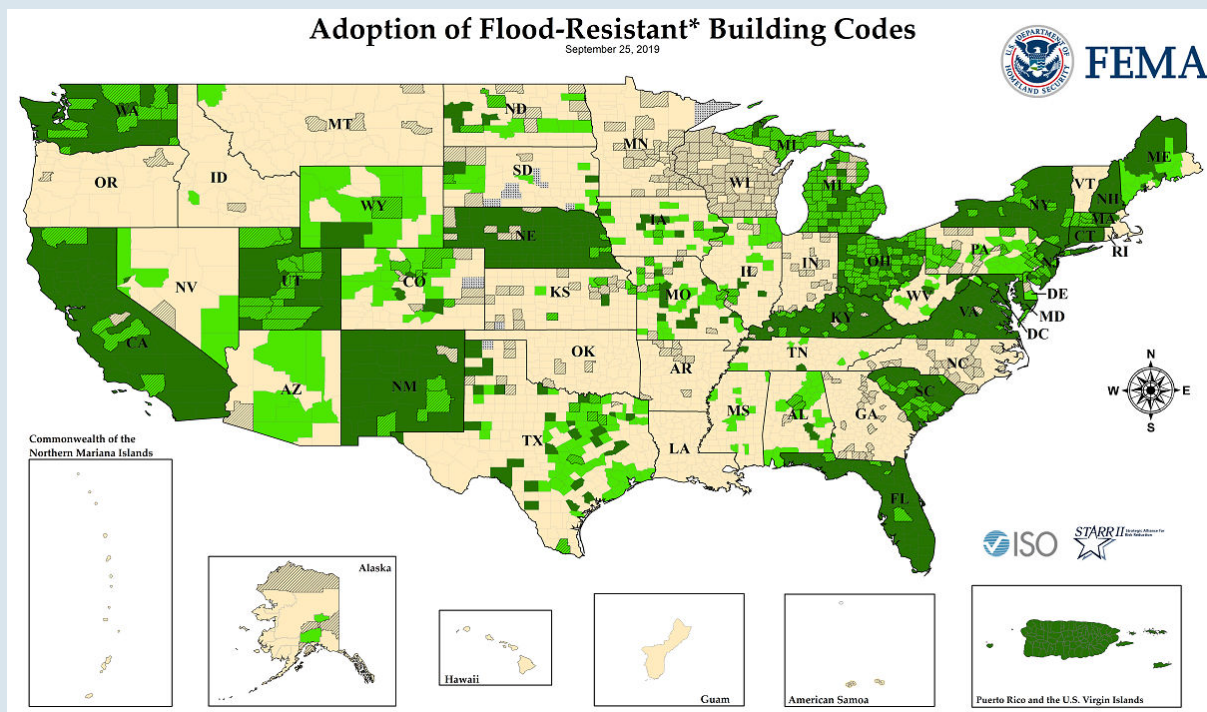
FEMA also participates in the development of ASCE 24, having served on committees that prepared the first edition in 1998, the second edition in 2005, and the third edition in 2014. The history of ASCE 24 up to 2012 is summarized in an article published in the proceedings of the 2012 Conference on Advances in Hurricane Engineering: *ASCE 24: Improving the Performance of Buildings and Structures in Flood Hazard Areas* (Ingargiola et al. 2012).

FEMA also contributes to the flood provisions included in codes and standards developed by other model code and standards developing organizations such as the International Association of Plumbing and Mechanical Officials (IAPMO) and the National Fire Protection Association (NFPA).

### National Snapshot: Flood-Resistant Building Code Adoption

As of September 2019, 47% of flood-prone jurisdictions in the United States are flood-resistant based on their adoption of one of the latest two editions of the International Codes (IBC & IRC).

FEMA’s Building Science Branch regularly monitors the adoption of the hazard-resistant provisions of the International Codes using data reported by local jurisdictions to ISO, Inc. The map below displays flood risk and resistance, by county, based on reporting jurisdictions within each county. A county is identified as flood-resistant if any reporting jurisdiction within that county has adopted either the 2015 or 2018 International Building Code (IBC) and International Residential Code (IRC) without weakening any of the provisions related to flood hazards, and that jurisdiction participates in the NFIP. More than 22,700 communities participate in the NFIP, including counties, cities, towns, villages, parishes, and tribal governments.



#### Map Legend: Flood Resistance for At-Risk Counties using the 2015 or later IBC/IRC

- 100% of reporting jurisdictions within the county have adopted flood-resistant building codes and all jurisdictions with high flood risk participate in the NFIP
- 0.1% to 99.9% of reporting jurisdictions within the county have adopted flood-resistant building codes and all reporting jurisdictions with high flood risk participate in the NFIP
- 0.1% to 99.9% of reporting jurisdictions within the county have adopted flood-resistant building codes and at least one reporting jurisdiction with high flood risk does not participate in the NFIP
- 0% of reporting jurisdictions within the county have adopted flood-resistant building codes and all reporting jurisdictions with high flood risk participate in the NFIP
- 0% of reporting jurisdictions within the county have adopted flood-resistant building codes and/or at least one reporting jurisdiction with high flood risk does not participate in the NFIP
- Counties which are not a High Risk for Flood based upon reporting jurisdictions

(continued on next page)

### National Snapshot: Flood-Resistant Building Code Adoption (concluded)

**Map Notes:**

\* A jurisdiction is considered flood-resistant if: (1) it or its State has adopted, as mandatory, any combination of the 2015 or 2018 IBC and IRC, without weakening any of the provisions related to floods for which the jurisdiction is at high risk, and (2) the jurisdiction participates in the NFIP when having high risk to flood.

Jurisdictions are known locations which may have participated in the BCEGS survey done by ISO or provided by Building Code Adoption Tracking Research. Jurisdiction is the common name for the area, with defined political boundaries, served by the building department. Jurisdictions include, but are not limited to, cities, towns, townships, boroughs, villages, counties, and parishes. Many small crossroad communities are counted as jurisdictions.

A county may contain other jurisdictions which do not report building code adoption information through ongoing survey responses. The flood-resistant status of such jurisdictions is unknown, and therefore not reflected in this map. Contact your local jurisdiction to determine the particular building code and latest amendments to the building code.

*Based on BCEGS data provided by Insurance Services Office (ISO), September 25, 2019 or other research groups*

## Chapter 2 Approaches to Floodplain Management

From the inception of the NFIP, it was anticipated that communities may want to use various tools to regulate development. The definition of “floodplain management regulations” in 44 CFR § 59.1 is broad:

*Flood plain management regulations’ means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as a flood plain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction. (Italics added.)*

States and communities throughout the United States use different approaches to manage development in flood-prone areas. In some states, communities may be required to adopt floodplain management regulations to satisfy state laws. Similarly, in some states, communities may be required to enforce building codes that include provisions for flood-resistant design and construction of buildings and structures. Each state, and where applicable each community, should determine which state requirements and enabling legislation will govern how they integrate floodplain management regulations and building codes.

State and local officials should consider the value of integrating (or coordinating) building codes and floodplain management regulations described in this chapter and then examine their current regulations and programs. Engaging all departments and agencies that have roles in floodplain management in this examination will result in the best decisions and ensure consistent and thorough review, permitting, and enforcement processes. This chapter focuses on the value of undertaking that examination.

### **Including Building Codes in the NFIP**

In response to the Biggert-Waters Flood Insurance Reform Act of 2012, FEMA prepared a report titled *Including Building Codes in the National Flood Insurance Program* in 2013. The report presents findings of the impact, effectiveness, and feasibility of including the I-Codes as part of NFIP floodplain management criteria. It outlines the regulatory, financial, and economic impacts of such a decision, as well as the feasibility and effectiveness in reducing future flood damage.

The report concludes that the net effect would be positive, helping to reduce physical flood losses, which would in turn positively affect the land use planning and regulatory climate. The long-term benefits include generally increased property values, reduced losses during flood and other hazard events (which reduce insurance rates over a 5- to 10-year period), and a more actuarially sound NFIP and insurance industry.

# Approaches to Floodplain Management

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## 2.1 Importance of Coordinating Building Codes and Local Floodplain Management Regulations

Section 1.6 of this guide explains that communities that participate in the NFIP must adopt and enforce minimum requirements for development in mapped SFHAs. Now that FEMA considers the provisions of the latest published editions of the I-Codes to meet or exceed the NFIP requirements for buildings (see Section 1.2), the concept of coordinating floodplain management regulations with the flood provisions of the I-Codes gains importance. The primary objective of this coordination is to eliminate duplication and inconsistencies. As a rule, having multiple regulatory instruments govern the same thing is problematic and can lead to at least two distinct problems with interpretation and enforcement:

- **Wording differences.** If regulations use different, although similar, words to describe similar requirements, the differences may be interpreted to be meaningful, which can complicate resolution of the differences on a case-by-case basis.
- **Differences in requirements.** Although the concept that the more restrictive of conflicting provisions prevails is common, allowing known conflicts to remain can cause confusion. Having such differences places an undue burden on property owners, design professionals, builders, and local officials who have to determine which regulation or code contains the more restrictive provisions. This step adds to the cost of preparing, reviewing, and revising designs and construction documents. Importantly, local officials may be liable for failing to enforce the more restrictive provisions, especially if that failure is shown to have contributed to damage after a flood event.

Another aspect of coordination, addressed in more detail in Chapter 4, has to do with state requirements. Some states explicitly authorize the state building code as the only rule that governs the design and construction of buildings and structures. In those states, it is possible that locally adopted provisions for buildings in SFHAs may not withstand legal challenge, especially local provisions that exceed or are more restrictive than the minimum requirements of the state building code. This demonstrates the importance of examining the questions outlined in Chapter 4 to allow states and communities to resolve those differences in a manner that allows communities to retain locally adopted higher standards.

## 2.2 Considerations for Relying on the I-Codes as Part of a Community's Floodplain Management Program

Communities that enforce building codes should consider the following advantages and considerations when examining how best to integrate and coordinate those codes with their local

### Ensuring all NFIP Requirements are Met

If a community's floodplain management regulations and building codes, taken together, do not meet all of the NFIP requirements, the community could be found noncompliant, which may lead to sanctions by the NFIP.

### Freeboard: The Most Common Higher Standard

Additional elevation of the lowest floor above the minimum required elevation is the most common locally adopted higher standard. The 2018 and 2015 I-Codes specify minimum elevations of BFE + 1 foot. Thus, communities that have enforced BFE + 1 foot through floodplain management regulations do not have to modify their building codes to retain that requirement. Local amendments are necessary to adopt more than one foot of freeboard. Also see Sections 3.4.3 and 5.3.1.



floodplain management regulations. There are advantages to relying on the flood provisions of the I-Codes:

- **Fewer conflicts.** Communities that have coordinated building codes and floodplain management regulations to resolve conflicts and remove duplication do not have to resolve differences on a case-by-case basis during review of permit applications and supporting documents. The potential for conflicts increases when building codes and floodplain management regulations are administered by different offices within a community. Another way conflicts can arise is when amendments are made to one code or regulation and other requirements are not amended at the same time to maintain consistency.
- **All hazard-related building construction requirements in one place.** The I-Codes address seismic, high winds, severe winter storms, and flood hazards on a consistent and rational basis. Thus, when communities enforce the codes, buildings are designed to resist the effects of all hazards that are prevalent within their jurisdictional boundaries.
- **Improved construction quality.** In the absence of building codes, communities have less assurance that buildings will be “designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement,” considered an NFIP performance standard for buildings (44 CFR § 60.3(a)(3)(i)). Improperly constructed buildings are likely to sustain significantly more damage than those built to code.
- **Exceed or are more specific than NFIP requirements.** The minimum NFIP requirements have not changed for several decades, while the I-Codes are modified to incorporate best practices and industry standards. [Chapter 3](#) describes some provisions of the I-Codes that exceed the NFIP requirements and some code provisions that are more specific than the NFIP’s broad performance statements (44 CFR § 60.3(a)(3)). The provisions in the referenced standard ASCE 24, *Flood Resistant Design and Construction*, are, in large part, the basis for the more restrictive and more specific provisions. Many of the code provisions were supported by the results of FEMA’s evaluation of buildings that performed well after flood events.
- **Aligned with FEMA’s goals and emerging policies.** FEMA considers hazard resilience to start with building codes and urges adoption and use of the latest published editions of the I-Codes for buildings and structures. Through emerging policies and programs, FEMA encourages adoption of up-to-date building codes. For example, implementation of the DRRA will require FEMA-funded Public Assistance (PA) projects to meet the latest published editions of codes and standards, regardless of a state or community’s adopted edition. States and communities that adopt the latest edition of the I-Codes will not have to learn the requirements to ensure FEMA-funded projects comply. The *National Mitigation Investment Strategy* (DHS 2019), which aims to reduce natural hazard risk and increase the nation’s resilience to disasters, acknowledges FEMA’s past and recent efforts to encourage building code adoption through grant programs,

### Disaster Recovery Reform Act (DRRA)

*Section 1206:* Effective late 2018, FEMA is authorized to provide disaster assistance to state and local governments for building codes and floodplain management ordinance administration and enforcement.

*Section 1234:* Additional pre-disaster funds are available for communities to facilitate the adoption of the latest published editions of the I-Codes.

For more information, go to [www.iccsafe.org/wp-content/uploads/DRRA-Statement-FINAL.pdf](http://www.iccsafe.org/wp-content/uploads/DRRA-Statement-FINAL.pdf).

## Approaches to Floodplain Management

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and recommends that the federal government and non-federal partners use up-to-date building codes and commit to supporting communities with developing and implementing up-to-date building codes.

- **Consistent permit conditions and requirements.**

Regulating the design and construction of buildings and structures with the flood provisions of the I-Codes can eliminate problems that arise when separate floodplain permits are issued, which may mean separate building permits, construction plans and specifications, and inspection forms do not explicitly state the elements required for compliance with floodplain management regulations. Building inspectors may lack the information needed to perform effective inspections. For example, it would be difficult to verify that a building footprint is located outside of the floodway if the floodway boundary is not shown on the site plan submitted with the building permit application. Similarly, if flood opening specifications for an enclosed area beneath an elevated building are described in writing as a condition of a floodplain permit, but are not shown on the construction drawings used by the building department, the requirement may be overlooked by both the contractor and the building inspector.

### Sample Plan Review Checklists

Two sample plan review checklists are included in [Appendix B](#), one for development in Zone A and one for development in Zone V.

- **Permits issued for all buildings and structures.** When communities issue building permits, most property owners, design professionals, and contractors are familiar with the requirement to obtain permits before starting new construction and before starting work on existing buildings. However, there are specific work items that the I-Codes exempt from the requirement to obtain permits (see [Section 4.8](#)). Communities that enforce the I-Codes must ensure that all buildings and structures and other development in flood hazard areas are regulated. When communities do not enforce building codes, the public may not be as aware of other types of permit requirements because only a portion of the community is regulated (i.e., only the mapped SFHA).
- **Strengthened enforcement.** Regulating buildings in SFHAs through the building department allows for stronger enforcement because all provisions for plan review, inspection, and enforcement are administered through a single department. Building departments routinely conduct plan reviews, inspect construction, and have clear authority and responsibility to require compliance and enforce building permit conditions. Stand-alone floodplain management regulations also include administrative provisions, including enforcement. However, typically those regulations do not parallel the building department's enforcement procedures, especially if a model floodplain management ordinance was the basis for local regulations and was adopted without tailoring it to cite local enforcement authority. Having separate and perhaps differing provisions for inspection and enforcement may lead to problems, such as if a permittee claims inconsistent treatment by different departments. In terms of enforcement, some building officials suggest that building codes have more weight—are more enforceable—than provisions in stand-alone floodplain management regulations.

- **Effective, routine inspections.** Compliance inspections are more effective and efficient when both building inspections and inspection for compliance with floodplain management requirements are administered by a single department under a single set of regulations. Building departments typically conduct multiple inspections at specific times during the construction process, and builders are accustomed to the procedures for initiating those inspections. In communities where floodplain management regulations are enforced by a department other than the building department, inspections for floodplain management compliance may not be conducted with the same regularity or may not be coordinated with building inspections. In addition, when building inspectors familiar with floodplain management requirements are in the field on a regular basis, unpermitted buildings and other activities are more likely to be identified.
- **Improved compliance with requirements for existing buildings.** Building departments routinely handle applications for permits to work on existing buildings, including additions, alterations, repairs, and other improvements. In contrast, planning, zoning, engineering, and public works departments rarely deal with proposals to physically modify buildings on sites that are already developed. This has led to gaps in enforcement of the requirements related to Substantial Improvement and Substantial Damage.
- **Saves money.** The National Institute of Building Sciences studied the benefits of meeting common requirements of the 2018 I-Codes, specifically comparing the costs and benefits of meeting the 2018 IRC and IBC elevation requirements versus the NFIP requirements, which do not include additional elevation above the BFE. The study found a benefit of \$6 for every \$1 spent for meeting the I-Code elevation requirements (NIBS 2019).

### Sample Inspection Checklists

Two sample inspection checklists are included in [Appendix B](#), one for development in Zone A and one for development in Zone V.

There are several things to take into consideration when relying on the flood provisions of the I-Codes. The following considerations and others are addressed in more detail in [Chapter 4](#):

- **Building codes apply only to buildings and structures.** To participate in the NFIP, communities must regulate all development in SFHAs. The term “development” is much broader than just buildings and structures. Because building codes only govern the design and construction of buildings, communities must have other rules that apply to development in SFHAs other than buildings and structures. The scope of the I-Codes is described in more detail in [Section 3.1.1](#).
- **States may limit local adoption of higher standards.** Many states adopt building codes at the state level and either have certain requirements for local amendments or do not allow local amendments. Although the I-Codes already exceed the NFIP requirements in certain ways, state limitations could affect the ability of communities to adopt additional, more restrictive requirements for buildings. Information on this topic is provided in [Section 4.14](#) and [Chapter 5](#) of this guide.
- **Certain structures may be exempt or not required to obtain permits.** Some states modify the I-Codes to explicitly exempt certain buildings from the codes, which means communities are not authorized to regulate those buildings *under the codes*. Moreover, the I-Codes specify that certain minor structures are required to comply with the code, but are not required to

## Approaches to Floodplain Management

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have permits prior to construction. Communities must consider both of these situations when relying on the I-Codes for participation in the NFIP, because the program requires communities to regulate all development in SFHAs. This issue is discussed further in Sections 4.8 and 4.9 of this guide.

- **Potential for codes to be inconsistent with the NFIP.** Because the I-Codes and ASCE 24 are developed through consensus processes (see Chapter 3), amendments to future editions could propose provisions that do not meet NFIP requirements. Similarly, states and communities may modify the requirements such that their codes no longer meet the NFIP requirements. Questions related to modifying the codes are addressed in Sections 4.5, 4.6, 4.8, 4.9, 4.12, and 4.14 of this guide.

### 2.3 Examining Approaches

Examining how states and communities handle enforcement of building codes and administration of floodplain management regulations is an important step to undertake before considering changes in approaches. Worksheets A and B can be used to help state and local officials understand their current approaches to floodplain management. Although the following discussion is focused on communities, NFIP State Coordinators may want to have a similar discussion with state agencies responsible for building codes in those states that adopt building codes at the state level.

[Worksheet A](#) lists NFIP regulatory requirements and community responsibilities. The I-Codes in which those requirements and functions are found are listed across the top.

[Worksheet B](#) is set up for use in the following manner:

- Across the top, users should list all departments involved in regulating development in flood hazard areas. The typical departments are listed and space is provided to add others, if appropriate.
- Users should consider the functions and regulatory requirements of the NFIP that are listed on the right. Use the worksheet to denote which department is currently responsible for each function or requirement, keeping in mind that more than one department may share some responsibilities. Representatives from each of these departments should be invited to participate in the discussion.

After this examination and discussion of how a community currently coordinates reviews for compliance with building codes and floodplain management regulations, and after identifying differences between those regulatory tools, communities should consider how best to improve their approaches to fulfill their responsibilities for participating in the NFIP. Three approaches are described in sections later in this chapter:

- **Building codes approach.** This approach, described in Section 2.6, is used by communities that rely on building codes to regulate buildings and either IBC Appendix G or companion regulations written to ensure that all other requirements of the NFIP are adopted. Communities that do not use other regulatory tools and those that assign all development review functions to the building department should consider this approach.
- **Comprehensive approach.** Many communities use a variety of planning, zoning, building codes, and other regulatory tools to achieve multiple goals, including floodplain management. It is common for those other regulatory functions—which generally focus on

land use, zoning, location, setbacks, and environmental impacts—to be assigned to a department other than the building department. Although this approach is described in Section 2.7 as a separate approach, in fact it relies in large part on enforcement of building codes separate from floodplain management regulations for all other requirements of the NFIP. Consequently, communities that use several regulatory tools should examine the description of the “building codes approach” and undertake the same evaluation and coordination process.

- **Stand-alone floodplain management regulations plus building codes approach.** Regulations that incorporate all requirements necessary for participation in the NFIP, including requirements for buildings, are referred to in this guide as “stand-alone” regulations (see Section 2.8). Communities that adopt separate regulations for floodplain management and *also* enforce building codes should undertake the evaluation and coordination process described in this guide for the “building codes approach” to understand how the two regulatory instruments overlap or may conflict.

# Approaches to Floodplain Management

## Worksheet A. The NFIP and the I-Codes (2018/2015/2012)

National Flood Insurance Program Provisions and Processes	2018/2015/2012 International Codes							
	IBC	IBC App. G*	IRC	IEBC	IPC	IMC	IFGC	IPSDC
<b>Development Review</b>								
1. Subdivision of land.		Yes						
2. Changes to land (filling, grading, paving, excavation, mining, dredging, drilling, channel modifications, alteration of sand dunes and/or mangrove stands).		Yes						
3. One- and two-family dwellings, townhomes (except in floodways).			Yes					
4. Buildings and structures (including tanks, towers, and one- and two-family dwellings in floodways).	Yes	Yes						
5. Temporary structures and temporary storage.	Yes	Yes						
6. Buildings that are accessory in character and miscellaneous structures (see IBC Utility and Miscellaneous Group U) and structures that are not buildings (fences, retaining walls).		Yes						
7. Site-related public/private utilities (sewage disposal, water supply).		Yes	Yes		Yes			Yes
8. Building utilities (electrical, plumbing, HVAC, fuel).	Yes		Yes	Yes	Yes	Yes	Yes	
9. Existing buildings and structures (additions, alterations, repairs, rehabilitations).	Yes		Yes	Yes				
10. Site development (water, sewer, drainage, on-site waste disposal systems).		Yes						Yes
11. Transportation infrastructure (roads, bridges, culverts).		Yes						
12. Other water resources infrastructure (dams, ponds, levees, floodwalls).		Yes						
13. Placement/replacement of manufactured homes.		Yes	Yes					
14. Recreational vehicles.		Yes						
15. Refer to other federal, state, and local agencies and require appropriate permits.		Yes						
16. Review and grant variances/modifications.	Yes	Yes	Yes					
<b>Records</b>								
17. Maintain record of permits, certifications, required analyses, and variances; make available for public inspection.	Yes	Yes	Yes	Yes				
<b>Inspection and Enforcement</b>								
18. Subdivision lot layout.		Yes						
19. Location of building/structure footprints on lot.	Yes	Yes	Yes					
20. Foundations.	Yes		Yes					
21. Lowest floor elevation (buildings and structures).	Yes		Yes	Yes				
22. Lowest floor elevation (manufactured homes).		Yes	Yes					
23. Enclosures below lowest floor (flood openings or breakaway).	Yes		Yes					
24. Collect/review documentation (elevation, dry floodproofing, flood openings, breakaway wall).	Yes	Yes	Yes	Yes				
25. Damaged buildings (to determine if building is substantially damaged).	Yes		Yes	Yes				

\* Or companion ordinance

# Approaches to Floodplain Management

## Worksheet B. Examining Community Approaches

Community Organization										Provisions and Processes (Check which department handles each code provision or function)
Planning	Zoning	Sub-division	Health	Flood Control or Storm-water	Engineering or Public Works	Building Dept.	Other	Other	Other	
										<b>Development Review</b>
										1. Subdivision of land.
										2. Changes to land (filling, grading, paving, excavation, mining, dredging, drilling, channel modifications, alteration of sand dunes, and/or mangrove stands).
										3. One- and two-family dwellings, townhomes (except in floodways).
										4. Buildings and structures (including tanks, towers, and one- and two-family dwellings in floodways).
										5. Temporary structures and temporary storage.
										6. Buildings that are accessory in character and miscellaneous structures (see IBC Utility and Miscellaneous Group U) and structures that are not buildings (fences, retaining walls).
										7. Site-related public/private utilities (sewage disposal, water supply).
										8. Building utilities (electrical, plumbing, HVAC, fuel).
										9. Existing buildings and structures (additions, alterations, repairs, rehabilitations).
										10. Site development (water, sewer, drainage, on-site waste disposal systems).
										11. Transportation infrastructure (roads, bridges, culverts).
										12. Other water resources infrastructure (dams, ponds, levees, floodwalls).
										13. Placement/replacement of manufactured homes.
										14. Recreational vehicles.
										15. Refer to other federal, state, and local agencies and require appropriate permits.
										16. Review and grant variances/modifications.
										<b>Records</b>
										17. Maintain record of permits, certifications, required analyses, and variances; make available for public inspection.
										<b>Inspection and Enforcement</b>
										18. Subdivision lot layout.
										19. Location of building/structure footprints on lot.
										20. Foundations.
										21. Lowest floor elevation (buildings and structures).
										22. Lowest floor elevation (manufactured homes).
										23. Enclosures below lowest floor (flood openings or breakaway).
										24. Collect/review documentation (elevation, dry floodproofing, flood openings, breakaway wall).
										25. Damaged buildings (to determine if building is substantially damaged).

## Approaches to Floodplain Management

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### 2.4 Modifying a State or Community's Approach

After a state or community has examined its current approach and considered the advantages of coordinating building codes and floodplain management regulations, the next step is to determine whether changes are appropriate.

Community representatives from the same departments identified on [Worksheet B](#) should be involved. If building codes are adopted at the state level, the NFIP State Coordinator should have a similar discussion with the state agency responsible for the building code. To prepare for these discussions:

- Review [Chapter 3](#) of this guide to understand some of the differences between the NFIP regulations and the flood provisions of the I-Codes.
- Review [Chapter 4](#) to see the questions that should be answered to know whether and how to modify floodplain regulations or building codes.
- Review [Chapter 5](#) to understand how the codes (and IBC Appendix G) may be modified to incorporate higher standards.
- Review [Chapter 6](#) to access three versions of a code-coordinated model ordinance prepared by FEMA.

Throughout the review process, it will be helpful to keep the following objectives in mind:

- All NFIP requirements must be met for communities to participate and maintain good standing in the NFIP.
- If flood-related provisions are addressed in multiple codes or regulations, then coordination is critical to minimize overlap, conflicting provisions, and duplication.
- A department or local official must be designated to be responsible for each code or regulation related to floodplain management.
- If more than one department in a community handles elements of the floodplain management program, then coordination and communication between the departments need to be established to facilitate review of permit applications and supporting plans and documentation, as well as to ensure inspection of both buildings and other development.

### 2.5 Implementing the Selected Approach

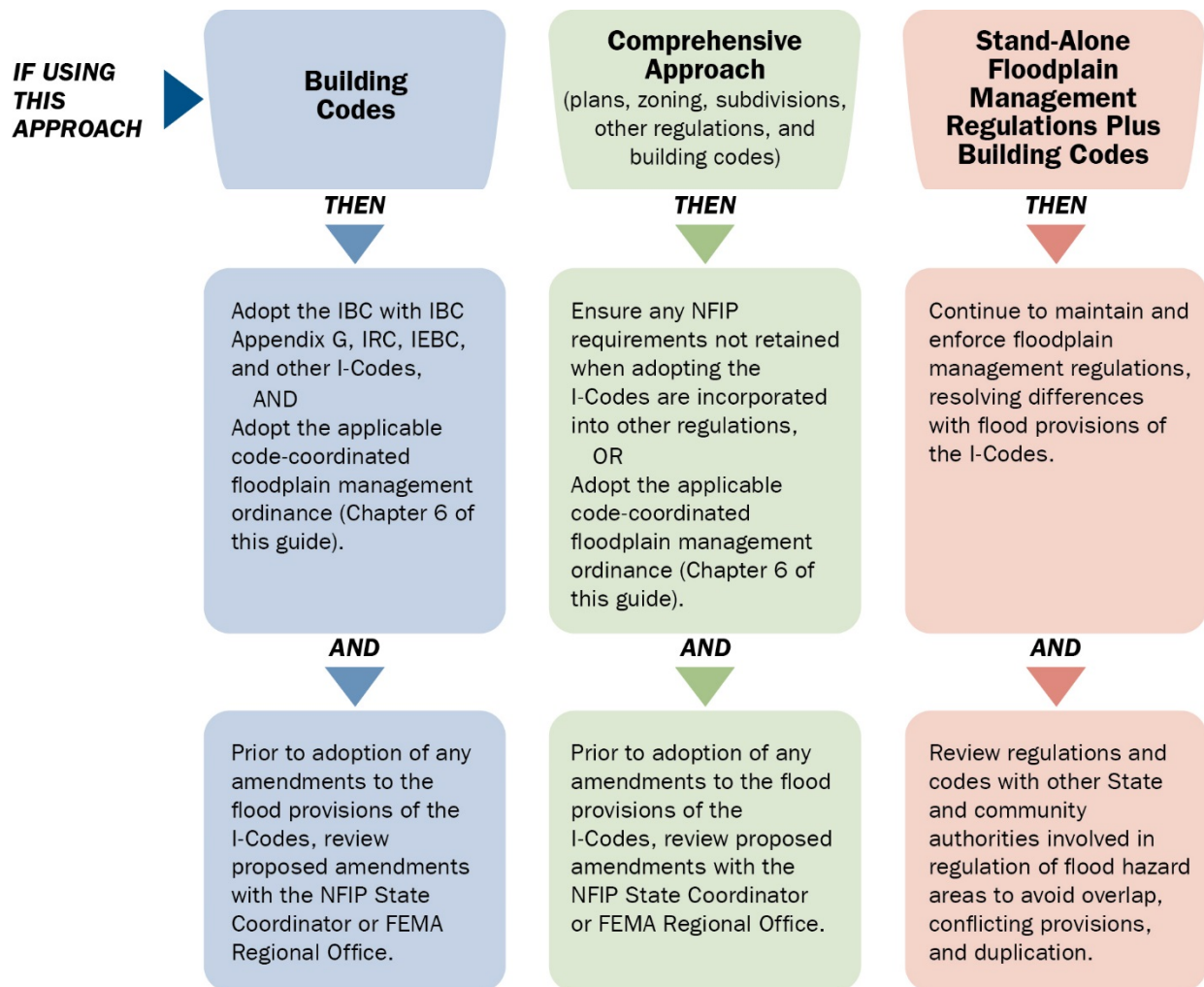
If the examination of a community's existing approach and discussion about modifying that approach results in a decision to implement the building codes approach or the coordinated approach that includes building codes, the next step is to determine actions needed to bring about the desired outcome. [Figure 2-1](#) illustrates the primary point—the end result should be coordinated regulatory tools.

[Chapter 6](#) introduces three versions of a model ordinance written to accomplish the described approaches. Different versions are provided because some states and communities do not adopt IBC Appendix G, while others do. Similarly, while many states and communities adopt the administrative provisions of the I-Codes (in [Chapter 1](#)), some do not. Thus, it is necessary to have different versions of the model ordinance to complement the codes for each of these scenarios.



## Approaches to Floodplain Management

Communities that participate in the NFIP should ask the NFIP State Coordinator (or the FEMA Regional Office) to review and comment on proposed changes to floodplain management regulations, even if the decision is to use one of the model code-coordinated ordinances prepared by FEMA. Because floodplain management regulations were adopted to qualify for participation in the NFIP, communities should take care to ensure that all of the current requirements of the NFIP are satisfactorily incorporated—otherwise participation or good standing in the NFIP could be jeopardized.



**NOTE:** Take extra care if amendments to the flood provisions of the IBC, IBC Appendix G, IRC, IEBC, or other I-Codes are proposed. Amendments should be carefully reviewed to ensure the NFIP minimum requirements are maintained. Consult with the NFIP State Coordinator or FEMA Regional Office prior to adoption of amendments.

**Figure 2-1: Approaches to fulfilling the requirements of the NFIP**

# Approaches to Floodplain Management

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## 2.6 The Building Codes Approach

Communities electing to use the “building codes approach,” whether as part of a more comprehensive program or to satisfy the NFIP requirements for participation, may rely on the flood provisions in the I-Codes, provided the community enforces all of the following:

- The IBC with IBC Appendix G and Model Ordinance Version One (see [Chapter 6](#) of this guide)
- The IRC
- The IEBC (or IBC Chapter 34, Existing Structures, 2012 and earlier editions)

### Limitations on the Building Codes Approach

The “building codes approach” cannot be used in the following circumstances:

- If any flood provisions are removed from the codes
- If any flood provisions are weakened to less than the minimum NFIP requirements (modifications to strengthen the flood provisions, often called “higher standards,” are acceptable)
- If only the IBC or only the IRC is adopted, or if existing buildings are not addressed by the adopted codes, in which case the building codes do not govern all buildings and structures, and communities would have to have complete floodplain management regulations to regulate buildings that are not governed by the adopted code

Alternatively, if the I-Codes are adopted but IBC Appendix G is not, or if the administrative provisions (Chapter 1) of the I-Codes are not adopted, then the community must adopt companion regulations that include flood-related administrative provisions and that contain, at a minimum, all of the administrative and technical requirements of IBC Appendix G (Model Ordinance Version One and Version Three, see [Chapter 6](#)). See [Chapter 4](#) for discussions of several questions related to these topics.

## 2.7 The Comprehensive Approach

Under the broad concept of “floodplain management” many communities coordinate several planning, zoning, stormwater, environmental, and other regulatory functions assigned to different offices to achieve multiple land use, growth management, environmental, risk reduction, and public safety goals. Floodplain management goals often include avoiding development in flood hazard areas when buildable, non-flood-prone land is available. Communities may also minimize development in flood hazard areas by such measures as low-density zoning, cluster development, waterway buffers or setbacks, transfer of development rights, evacuation access requirements, and others.

While specific programs or functional organizations may vary considerably from community to community, a “comprehensive approach” to floodplain management is generally considered to include:

- **Floodplain management regulations.** Floodplain management regulations establish a community’s administrative processes and general and specific requirements for development in identified flood hazard areas. These regulations are enforced through issuance of permits. Many communities, even those enforcing building codes, adopt “stand-alone” floodplain regulations that include all NFIP requirements, including requirements for buildings. To minimize conflicts and achieve the other benefits described in [Section 2.2](#),

floodplain management regulations should be explicitly coordinated with the building codes, described in this guide under the “building codes approach.”

- **A plan.** The plan may be called a comprehensive plan, general plan, land use plan, or master plan, or it may be a combination of several plans. The plan is usually a collection of policies and guidance on how a community expects to grow, change, and look in the future. With respect to flood hazard areas, the plan may recognize existing and future risks and establish a goal of reducing future exposure through various planning, zoning, and development control mechanisms.
- **A zoning ordinance.** The zoning ordinance is a tool to help achieve the goals set forth in the plan. A zoning ordinance typically divides a community into districts and establishes use and development criteria within each zone or district. Typical zoning districts are residential, commercial, industrial, agriculture, and various permutations and combinations of these uses. Development criteria for each zone or district type typically specify such parameters as density (units per acre), size, bulk, height, setbacks, and appearance. Some communities categorize flood hazard areas as separate conservation zones, allowing only development that is compatible with open space, recreational uses, and public infrastructure and drainage. Other communities define flood hazard areas as an “overlay zone” to the other zones, in which case the underlying zoning specifications are modified to achieve flood-damage reduction goals. Communities may specify setbacks or buffer zones to protect stream banks and shorelines or to preserve the natural functions of channels and adjacent areas.
- **A subdivision ordinance.** A subdivision ordinance is another tool communities use to achieve planning goals. These ordinances typically address lot size, shape, and setbacks; curbs, sidewalks, and gutters; open space; and public improvements such as street layout and dimensions, drainage and stormwater management, and utility installation. Many subdivision ordinances are designed to avoid development in mapped SFHAs through open space conservation requirements and setbacks from bodies of water. Where development in SFHAs is unavoidable, subdivision ordinances may guide development to less hazard-prone areas by specifying lot layouts and requiring buildings to be sited on higher ground or requiring buildings to be elevated by means other than use of fill. At a minimum, whether by subdivision ordinances or floodplain management regulations, communities must adopt specific NFIP requirements for subdivisions proposed in SFHAs (44 CFR §§ 60.3(a)(4) and (b)(3)).
- **Building codes and other health and safety codes.** Codes that govern design and construction of buildings and structures are applied after making decisions on zoning, land use, and subdivision designs that affect what and where to build. The primary purpose of building codes and other health and safety codes is to provide minimum requirements for buildings and structures to safeguard the public safety, health, and general welfare.

### Subdivision Design and Flood Hazard Areas (PAS 584)

Published by the American Planning Association in 2016 to complement the 1997 PAS 473, this planning report expands and updates the material in the first report. It reflects an “evolved way of thinking about planning and hazards that allows for a more comprehensive approach to saving lives, protecting property, and building a future that is free from, or has a reduced risk to, flooding hazards.”

## Approaches to Floodplain Management

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- **Sanitation regulations.** Sanitation regulations typically set the standards for the location, design, and installation of water and sewer systems. Sanitation regulations may place limitations on the location of these systems in flood-prone areas to minimize contamination of potable water and discharge of sewage into floodwaters. Some states have specific health department rules that apply in flood hazard areas. Most communities include these provisions in their floodplain management regulations.

For a discussion and an examination of a variety of tools to achieve flood damage reduction goals through the subdivision process, refer to *Subdivision Design and Flood Hazard Areas* (American Planning Association 2016), which complements the 1997 edition, *Subdivision Design in Flood Hazard Areas*.



### No Adverse Impact Floodplain Management

The Association of State Floodplain Managers (ASFPM) developed the “No Adverse Impact” (NAI) approach to floodplain management. NAI is founded on the concept that communities should prevent worsening flooding and other negative impacts on public health, safety, and welfare. In essence, the actions of one property owner should not be allowed to adversely affect the rights of other property owners. NAI publications are available online ([www.floods.org](http://www.floods.org)), including a toolkit and how-to guides for regulations and development standards, hazard identification and mapping, education and outreach, planning, infrastructure, and mitigation. The *NAI How-To Guide for Regulations and Development* describes many more restrictive regulatory standards, illustrating successful implementation through case studies.

## 2.8 The Stand-Alone Floodplain Management Regulations Plus Building Codes Approach

As used in this guide, “stand-alone” floodplain management regulations are regulations that incorporate all requirements needed to fulfill a community’s responsibility for participation in the NFIP. Such regulations adopt Flood Insurance Studies (FISs) and FIRMs, establish administrative procedures, and specify land management criteria, subdivision requirements, and design and construction requirements for buildings and structures. Many NFIP communities enforce building codes and also enforce stand-alone regulations. The local official or office charged with administering stand-alone regulations should coordinate with all other offices that regulate land development and building construction, including the building department. The extent to which stand-alone regulations are coordinated with the building code and other health and safety codes, whether on paper or through coordinated review procedures, varies significantly from state to state and community to community.

## Chapter 3 Differences Between NFIP Requirements and the I-Codes

FEMA states that the flood provisions of the latest published editions of the I-Codes meet or exceed the NFIP requirements for buildings and structures in flood hazard areas. While NFIP requirements for buildings and structures have not changed for several decades, the flood provisions of the I-Codes have improved each cycle to incorporate best practices based on post-flood observations and changes to ASCE 24.

This chapter summarizes differences between the NFIP requirements and the flood provisions of the I-Codes. Some differences are only in terminology (including colloquial use of terms), while others are clear differences in technical provisions. Provisions of the I-Codes that are not described in this chapter are essentially the same as the equivalent NFIP requirements. Excerpts of all the flood provisions of the 2012 and later editions of the I-Codes are accessible at [www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources).

The International Code Council manages a public consensus process to develop and maintain the I-Codes. Over the past several code development cycles, code changes for requirements that exceed the NFIP requirements have been approved. Reason statements submitted by FEMA to support those code changes characterize the merits of the proposals in terms of providing increased resistance to flood damage and being cost effective. Similarly, FEMA proposes code changes to clarify the flood provisions to facilitate interpretation and enforcement. Approval by consensus means a majority of International Code Council members with voting privileges concur with proposals and supporting justifications.

The IRC contains detailed flood provisions that trace their origins to the NFIP regulations and, especially in the 2018 and 2015 editions, to the standard, ASCE 24, *Flood Resistant Design and Construction*. The IBC achieves consistency with the NFIP largely through reference to ASCE 24. The IBC and ASCE 24 both reference ASCE 7,<sup>1</sup> *Minimum Design Loads for Buildings and Other Structures*, for determination of flood loads. Referenced standards are considered part of the requirements of the code.

ASCE also uses a consensus process to develop and maintain standards. Committees with balanced representation by design professionals, building industry representatives, manufacturers, government officials, and academic representatives propose and vote on changes, with the consensus prevailing. The ASCE 24 committee is not required to mimic the NFIP requirements, although FEMA is a member of the committee and advises the committee if proposed changes would result in a requirement that would not at least meet the NFIP requirements. Over time, the committee has incorporated a number of provisions that exceed the NFIP requirements to improve building resistance to flood damage. Similarly, some ASCE 24 provisions are written to be more specific than the NFIP requirements, which helps both the designer and the building official ensure that buildings and structures resist flood conditions.

### Comparing NFIP & I-Codes

*Quick Reference Guide: Comparison of Select NFIP & 2018 I-Code Requirements for Special Flood Hazard Areas* can be used to readily visualize some of the key similarities and differences between requirements of the NFIP and I-Codes.

The document is available at [www.fema.gov/media-library/assets/documents/25986](http://www.fema.gov/media-library/assets/documents/25986).

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<sup>1</sup> The 2016 edition of ASCE 7 is titled *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. ASCE 7-16 is referenced by the 2018 I-Codes.

## Differences Between NFIP Requirements and the I-Codes

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Table 3-1 lists the differences described in this chapter, which are grouped by topic.

**Table 3-1: Contents of this Chapter: Differences Between NFIP Requirements and the I-Codes**

<b>Click on a section to go directly to that topic.</b>	
<b>3.1</b>	<b>Scope and Administration</b>
3.1.1	Scope: Buildings, Structures, and Development
3.1.2	Occupancy: Residential, Nonresidential, and Mixed-Use Buildings
3.1.3	Adoption of Flood Insurance Studies and Flood Insurance Rate Maps
3.1.4	Building Official and Floodplain Administrator
3.1.5	Substantial Improvement and Substantial Damage Determinations
3.1.6	Certifications by Registered Design Professionals
3.1.7	Inspections
3.1.8	Variances
3.1.9	Keeping Permit Records
<b>3.2</b>	<b>Definitions</b>
3.2.1	Base Flood Elevation and Design Flood Elevation
3.2.2	Basement
3.2.3	Crawlspace and Under-Floor Space
3.2.4	Existing Building/Existing Structure
3.2.5	Livable and Habitable
3.2.6	Special Flood Hazard Area and Flood Hazard Area
<b>3.3</b>	<b>Planning, Location, and Site Development</b>
3.3.1	Buildings in More than One Flood Zone
3.3.2	Floodway Requirements
3.3.3	Floodways and Subdivisions
3.3.4	Landward of the Reach of Mean High Tide
3.3.5	Use of Fill
3.3.6	Swimming Pools
3.3.7	Private Sewage Systems
<b>3.4</b>	<b>Building Design</b>
3.4.1	Flood Loads and Flood Resistance
3.4.2	Flood Design Class and Risk/Occupancy Category
3.4.3	Building Elevations
3.4.4	Requirements in Coastal A Zones
3.4.5	Equipment and Utility Elevations
3.4.6	Dry Floodproofing
3.4.7	Flood Openings
3.4.8	Building Envelope Protection
3.4.9	Tanks
3.4.10	Stairways and Ramps
3.4.11	Concrete Slabs
3.4.12	Decks and Porches
3.4.13	Manufactured Homes
<b>3.5</b>	<b>Existing Buildings/Existing Structures</b>
3.5.1	Existing Building Requirements
3.5.2	Additions
3.5.3	Historic Structures

### 3.1 Scope and Administration

#### 3.1.1 Scope: Buildings, Structures, and Development

**NFIP.** The NFIP regulations apply to all development, including building and structures and development other than buildings and structures. Development is defined 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.”

**IRC.** The IRC limits the definition of the term “building” to one- and two-family dwellings and townhouses (including their accessory structures) that fall under the scope of the code. Buildings and structures other than dwellings are outside the scope of the IRC.

**IBC.** The IBC defines a building as “any structure used or intended for supporting or sheltering any use or occupancy” and structure is “that which is built or constructed.” The IBC governs buildings and structures other than one- and two-family dwellings and townhouses within the scope of the IRC. Floodplain management requirements for development other than buildings and structures are included in IBC Appendix G. This appendix, applicable only if explicitly adopted, defines “development” the same as the NFIP, with the addition of temporary structures and temporary storage: “any manmade change to improved or unimproved real estate, including but not limited to, buildings or other structures, temporary structures, temporary or permanent storage of materials, mining, dredging, filling, grading, paving, excavations, operations and other land-disturbing activities.”

#### 3.1.2 Occupancy: Residential, Nonresidential, and Mixed-Use Buildings

**NFIP.** The NFIP regulations have different requirements that apply to “residential” and “nonresidential” buildings, but those terms are not explicitly defined. All residential buildings in the SFHA must be elevated regardless of flood zone, while nonresidential buildings must be elevated or, if located in Zone A, may be dry floodproofed.

Although the *NFIP Flood Insurance Manual* has definitions for the terms residential, nonresidential, and mixed-use buildings, those definitions are for insurance purposes and are based in part on the primary use of a building. The insurance definitions must not be used to determine which nonresidential buildings may be dry floodproofed.

**IRC.** The IRC is scoped to apply to buildings that are “detached one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures.” Dwelling is defined as “any building that contains one or two dwelling units used, intended, or designed to be built, used, rented, leased, let or hired out to be occupied, or that are occupied for living purposes.”

**IBC/ASCE 24.** The IBC is scoped to apply to all buildings and structures that are not within the scope of the IRC. The IBC requires each building to be assigned an occupancy classification and use, which includes a series of “groups,” such as Assembly, Business, Educational, Factory, High-Hazard, Institutional, Mercantile, Residential, Storage, and Utility and Miscellaneous. Residential Group R and many Institutional Group I buildings are residential.

## Differences Between NFIP Requirements and the I-Codes

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ASCE 24-14 and ASCE 24-05 define nonresidential to be “any building or structure or portion thereof that is not classified residential” (see text box). ASCE 24 refers to mixed use buildings as buildings that have portions that are classified nonresidential and portions that are classified residential (see Section 3.4.6 for the definition of “mixed use”).

### ASCE 24-14 Definitions

**Nonresidential** – Any building or structure or portion thereof that is not classified residential.

**Residential** – (1) Buildings and structures and portions thereof where people live or that are used for sleeping purposes on a transient or non-transient basis; (2) structures including but not limited to one- and two-family dwellings, townhouses, condominiums, multifamily dwellings, apartments, congregate residences, boarding houses, lodging houses, rooming houses, hotels, motels, apartment buildings, convents, monasteries, dormitories, fraternity houses, sorority houses, vacation time-share properties; and (3) institutional facilities where people are cared for or live on a 24-h basis in a supervised environment, including but not limited to board and care facilities, assisted living facilities, halfway houses, group homes, congregate care facilities, social rehabilitation facilities, alcohol and drug centers, convalescent facilities, hospitals, nursing homes, mental hospitals, detoxification facilities, prisons, jails, reformatories, detention centers, correctional centers, and prerelease centers.

### 3.1.3 Adoption of Flood Insurance Studies and Flood Insurance Rate Maps

**NFIP.** The NFIP requires communities to adopt and enforce floodplain management regulations based on flood hazard data provided by FEMA. The data take the form of FISs, which include the corresponding FIRMs. Communities adopt the FISs and FIRMs in local floodplain management regulations to define the areas in which the regulations apply. Communities may adopt a different or additional flood hazard map and still meet the requirements for participation in the NFIP, provided the map shows the same or larger flood hazard areas as the SFHAs and has the same or higher BFEs shown on FIRMs. Local studies and maps may be prepared to identify and regulate areas subject to inadequate drainage, along waterways above where FEMA studies terminate, or to incorporate anticipated changes such as upland development and increased runoff.

**I-Codes.** The I-Codes provide for the adoption of FISs and FIRMs in different ways:

- *IBC Section 1612.3* assumes individual communities will adopt flood hazard maps and supporting data, which show, at a minimum, SFHAs identified on FIRMs. Communities should insert the community name and the date of issuance for the FIS “as amended or revised,” and the accompanying FIRMs and related supporting data “along with any revisions thereto.” When the IBC is adopted at the state level for local enforcement, the expectation is communities will locally adopt the FIS and FIRMs rather than complete the blanks in this section.
- *IRC Table R301.2(1)* assumes individual communities will insert values for a number of locally applicable climatic and geographic design criteria. Under “Flood Hazards,” communities are to identify the date of the community’s entry into the NFIP (date of adoption of the first floodplain management regulations), the date of the effective FIS, and FIRM panel numbers and dates “as amended.” When the IBC is adopted at the state level for local enforcement, the expectation is communities will locally adopt the FIS and FIRMs rather than input the data in this table.

FEMA periodically updates its studies and releases revised FISs and FIRMs. However, although the I-Codes are written to automatically adopt these subsequent amendments or revisions, some states



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## Differences Between NFIP Requirements and the I-Codes

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do not allow communities to automatically adopt amendments or revisions. The presence of this provision in the I-Codes does not supersede those state-specific limitations. See Section 4.15.

### 3.1.4 Building Official and Floodplain Administrator

**NFIP.** Communities that choose to participate in the NFIP initially pass resolutions making several commitments to qualify for the program. Among the commitments are adoption of FISs and FIRMs and adoption and enforcement of regulations. Communities must legislatively designate a single official or agency (commonly called the “floodplain administrator”) with the responsibility, authority, and means to implement the community’s floodplain management regulations.

It is common that more than one office is charged with administration of various elements of the regulations. Many communities designate the building official to be responsible for their floodplain management regulations. In those communities, the building official (or designee) performs the floodplain management duties and responsibilities under the authority of the floodplain management regulations, as opposed to the authority of the building code, which is limited to enforcement of the building code.

Small communities typically designate the town manager or town clerk, while larger communities usually designate the head of an agency or office. Some small communities develop agreements with other jurisdictions, typically counties. Importantly, while a community may delegate some or all of its floodplain administrator duties to another community (or private contractor), the delegating community must still adopt regulations and designate a floodplain administrator and is still accountable to FEMA for ensuring that the floodplain management regulations are enforced.

**I-Codes.** Building officials are charged with the administration and enforcement of building codes. They perform their duties and responsibilities under the authority of the building code. Building officials have the authority to appoint deputies and other personnel. States that adopt building codes at the state level usually have licensing requirements for building officials, plans examiners, inspectors, and related personnel.

**IBC Appendix G.** IBC Appendix G commentary states that many communities designate an official other than the building official to administer and enforce the requirements of the appendix. Those communities may elect to modify the appendix to replace references to the building official with the title of the appropriate designated official (see Section 5.4.1).

### 3.1.5 Substantial Improvement and Substantial Damage Determinations

**NFIP.** A requirement of the NFIP is for buildings that meet the definitions for Substantial Improvement and Substantial Damage to be brought into compliance with the requirements for new construction. Local officials are expected to determine whether proposed work meets the definitions. The requirement to comply applies to buildings in all flood hazard areas except historic structures that meet the definition in the NFIP regulations (see Section 3.5.3).

FEMA P-758, *Substantial Improvement / Substantial Damage Desk Reference*, provides guidance for state and local officials and others. FEMA 213, *Answers to Questions About Substantially Improved / Substantially Damaged Buildings*, is based on the Desk Reference, but intended to answer common questions from property owners, designers, and others.

## Differences Between NFIP Requirements and the I-Codes

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Damage of any origin may meet the definition of Substantial Damage. Therefore, after an event that damages buildings, whether from flood, fire, tornado, earthquake, vandalism, deterioration and neglect, or any other cause, local officials should inspect damaged buildings to evaluate safety and the severity of damage. Quick action is important when damage that may meet the definition for Substantial Damage is discovered because most owners want to repair or rebuild immediately.

FEMA developed the *Substantial Damage Estimator (SDE) Tool* (FEMA P-784) to assist state and local officials in determining Substantial Damage. The tool can be used to assess flood, wind, wildfire, seismic, and other damage from other causes. It helps communities collect data to provide timely Substantial Damage determinations. The companion *Substantial Damage Estimator (SDE) User Manual and Field Workbook* explains the purpose of the SDE, the data required to produce valid assessments, and report options. It offers guidance on preparing for field work and performing determinations. After major natural hazard events that damage a large number of buildings, some communities and states seek technical support from FEMA to use the SDE Tool to collect data to evaluate flood damage.

**IRC.** Beginning with the 2015 edition, the IRC includes the requirement to make Substantial Improvement and Substantial Damage determinations in the building official's responsibilities for action on permits. Section R105.3.1.1 includes the definition for Substantial Improvements, which includes Substantial Damage.

The 2012 IRC and earlier editions contain requirements related to making Substantial Improvement and Substantial Damage determinations in two sections:

- *Section R105.3.1.1*, in the section that specifies the building official's action on permits, calls for the building official to examine construction documents submitted for work on existing buildings and make a finding regarding the value of the proposed work. If the value of the proposed work equals or exceeds 50 percent of the market value of the building, then the finding is provided to the board of appeals.
- *Section R112.2.1*, in the section that creates a board of appeals, specifies that when the building official provides a finding, the board is to determine whether the value of the proposed work constitutes a Substantial Improvement. As with several terms used in the flood provisions of the IRC, the term Substantial Improvement is defined in this section, rather than in the separate chapter that contains definitions.

**IBC and IEBC.** Beginning with the 2015 editions, the IBC and IEBC have Section 104.2.1 to require the building official to determine when proposed work on existing buildings in flood hazard areas constitutes Substantial Improvement or repair of Substantial Damage.

The 2012 IBC and earlier editions, and the 2012 IEBC and earlier editions, define the terms Substantial Improvement and Substantial Damage, but do not have explicit administrative provisions

### Substantial Damage

Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

### Substantial Improvement

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.

## Differences Between NFIP Requirements and the I-Codes

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or procedures for making determinations as to whether improvements or repairs constitute Substantial Improvement or Substantial Damage. Instead, building officials are expected to determine whether proposed work does or does not meet the definitions.

### 3.1.6 Certifications by Registered Design Professionals

**NFIP.** The NFIP regulations specify that designs for buildings in coastal high hazard areas (Zone V) and designs for dry-floodproofed nonresidential buildings must be certified by registered professional engineers or architects. FEMA Form 086-0-34, *Floodproofing Certificate for Non-Residential Structures*, requires the certification statement to be certified by a registered professional engineer or architect. FEMA does not have an official form for certification of designs of buildings in Zone V.

The NFIP regulations also require analyses for floodway encroachments to be performed in accordance with standard engineering practice. In addition, building elevations and ground elevations, relative to datums on FIRMs, must be documented. The FEMA Elevation Certificate (FEMA Form 086-0-33) requires surveyed elevations to be certified by “a land surveyor, engineer, or architect authorized by law to certify elevation information.”

States establish limits for the professional practices of engineering, architecture, and land surveying, and each state has licensing requirements for each profession. Although the NFIP regulations state that engineers and architects may certify designs, state limitations on those professionals govern. Some states specifically limit whether architects can prepare structural engineering designs and specifications. Similarly, while the NFIP regulations and the Elevation Certificate indicate engineers, architects, and land surveyors may certify elevations, state limitations govern whether engineers and architects may perform and certify land surveys.

**I-Codes.** The I-Codes define registered design professional as “an individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.” The flood provisions of the I-Codes refer to design certifications and elevation documentation that are prepared and sealed by registered design professionals. The use of “registered design professional” when referring to elevation documentation does not supersede laws of states where engineers or architects are not authorized to perform elevation and land surveys.

### 3.1.7 Inspections

**NFIP.** Communities that participate in the NFIP are required to ensure that all development activities in SFHAs meet or exceed minimum floodplain management requirements. Although the NFIP regulations do not explicitly call for inspections, the most effective way to verify compliance is to conduct inspections during construction.

**I-Codes.** The I-Codes specify required inspections, including “lowest floor inspections” (IBC) and “floodplain inspections” (IRC) conducted upon placement of the lowest floor and prior to further vertical construction. At that time, permittees are to submit elevation documentation.

#### Value of Obtaining Building Elevations during Construction

Unlike many aspects of a building under construction that can be checked visually, it is not feasible to visually verify whether a building’s lowest floor is correctly elevated above a datum. Obtaining the elevation information upon placement of the lowest floor allows both the builder and the building official to determine that the lowest floor elevation is correct. It is easier and less expensive to correct an elevation error during construction than to discover it when the as-built FEMA Elevation Certificate is completed.

## Differences Between NFIP Requirements and the I-Codes

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Beginning with the 2012 I-Codes, documentation of the elevation of the lowest floor is required to be submitted prior to the final inspection. Although use of the FEMA Elevation Certificate is not explicitly required, it is recommended in part because owners are required to have FEMA Elevation Certificates when they obtain NFIP flood insurance policies for new construction and Substantial Improvements. Completed FEMA Elevation Certificates provide more than just the surveyed elevations of lowest floors—they document lowest equipment elevations and information about openings in walls of enclosures and foundation walls. Having FEMA Elevation Certificates completed before final inspections helps inspectors verify compliance with floodplain management requirements of the I-Codes.

### 3.1.8 Variances

**NFIP.** For the purposes of the NFIP, a variance is a grant of relief from the application of one or more of the NFIP minimum requirements. Variances allow construction in a manner that is otherwise not permitted. While communities may grant variances, such variances are for floodplain management purposes only. A community may issue a variance to allow a building to be constructed in a manner that varies from the minimum NFIP provisions, but the NFIP flood insurance policy for that building will still be rated according to risk, primarily the elevation of the lowest floor relative to the BFE. As a consequence, the costs of policies may be significantly higher than if buildings met all of the minimum requirements. The NFIP regulations do not provide communities the authority to waive requirements related to floodway encroachments that increase flood levels during the base discharge.

#### Variances

Communities should consult with NFIP State Coordinators prior to issuing variances.

Even if a building is allowed by a properly issued variance to have its lowest floor below the BFE, NFIP flood insurance policies will be more expensive than if the lowest floor was at or above the BFE.

The primary goals of the flood resistant provisions of the NFIP and the I-Codes are to reduce damage and protect public health and safety for the entire community. Achieving these goals also results in disaster-resistant and livable communities. Very few variances to the floodplain management provisions can be justified. A variance should not be granted if a proposed activity increases risks to people.

As a guiding principle, a variance should pertain to the unique characteristics of the land itself. A properly issued variance may be granted for a parcel of land with physical characteristics so unusual that complying with the code or regulations would create an exceptional hardship for the applicant. A variance should not be granted based on the personal circumstances of an individual. For additional guidance, see FEMA P-993, *Variances and the National Flood Insurance Program*.

**IRC.** Beginning with the 2015 IRC, the criteria for issuance of variances in flood hazard areas are located under Section R104.10 to parallel the organization of these provisions in the IBC (below). This change was made because many states and communities remove the IRC section creating a board of appeals, which has the effect of removing the provisions relating to variances in flood hazard areas.

The 2012 IRC and earlier editions contain specific criteria for issuance of variances in two sections:

- *Section R104.10*, similar to the IBC, limits the authority of the building official to grant modifications without the granting of a variance by the board of appeals.

## Differences Between NFIP Requirements and the I-Codes

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- *Section R112.2.2*, in the section that creates a board of appeals, specifies that variances may be issued only after certain criteria are satisfied.

***IBC/Appendix G.*** Beginning with the 2012 edition, the IBC has provisions for variances in Chapter 1 and in Appendix G:

- *Section 104.10* specifies that the building official has the authority to “grant modifications for individual cases ... [if the building official] shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, accessibility, life and fire safety, or structural requirements.” This authority is narrowed in *Section 104.10.1*, which specifies that modifications shall not be granted to any provision required in flood hazard areas unless the building official makes a determination that requires consideration of certain provisions equivalent to those specified by the NFIP.
- *Appendix G, Section G105* requires the board of appeals to hear and decide on requests for variances. The specific provisions of G105 are equivalent to the variance considerations and conditions of the NFIP.

### **3.1.9 Keeping Permit Records**

***NFIP.*** The NFIP regulations explicitly require participating communities to “maintain for public inspection and furnish upon request ... any certificates of floodproofing, and information on the elevation ... of the lowest floor (including basement) of all new or substantially improved structures.” The NFIP regulations do not specify a period of time for retention. The implication is that records must be maintained permanently, even if state rules specify a minimum retention period.

Although the NFIP only specifies maintenance of documentation of elevations and floodproofing designs, communities should maintain additional records to demonstrate that all structures and other development comply with floodplain management requirements. FEMA and NFIP State Coordinators periodically conduct Community Assistance Visits and Community Assistance Contacts, during which compliance and community enforcement and documentation are reviewed. Communities should maintain the following: all editions of FISs and FIRMs, Letters of Map Change, records of permits issued or denied, and determinations of whether proposed work constitutes Substantial Improvement or repair of Substantial Damage. In addition, FEMA or the NFIP State Coordinator will check for required design certifications and documentation of elevations, notifications related to alterations of watercourses, assurances that the flood-carrying capacity of altered watercourses will be maintained, documentation related to appeals and variances, including justification for issuance or denial, and records of enforcement actions.

***I-Codes/Appendix G.*** An administrative requirement of the I-Codes is retention of all official records “for the period required for retention of public records.” States may specify minimum periods of retention of public records. However, community commitments to the NFIP are in addition to any specific state records retention requirements and supersede such requirements. IBC Appendix G requires retention of records of permits issued pursuant to the scope of the appendix, including design certifications and inspection reports.

## Differences Between NFIP Requirements and the I-Codes

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### 3.2 Definitions

#### 3.2.1 Base Flood Elevation and Design Flood Elevation

**NFIP.** The NFIP regulations define and use the base flood as the regulatory flood and the base flood elevation (BFE) as the reference point for determining minimum required elevation of the lowest floor or level of protection for dry floodproofing. FIRMs depict SFHAs, which are areas subject to flooding by the base flood. When detailed engineering methods are used to delineate SFHAs, BFEs are identified on FIRMs. Many SFHAs are delineated using estimation methods that do not produce BFEs.

In areas where BFEs are not specified in an FIS and on a FIRM, communities must require applicants to include BFEs in proposals for subdivisions and other developments that are greater than 50 lots or 5 acres, whichever is less. For other applications, communities must determine whether flood hazard information is available from other sources. Otherwise, communities may use a number of techniques to develop BFEs, or applicants can have engineers develop BFEs using standard engineering methods.

**I-Codes/ASCE 24.** The I-Codes and ASCE 24 use the term “design flood elevation” (DFE). The DFE is the elevation of the design flood—it is not the elevation to which buildings are designed. Most NFIP communities adopt the FIRM for regulatory purposes, and in those communities the DFE is the BFE (see text box). If a community adopts a different flood hazard map, then the elevations shown on that map are DFEs. The DFE will always be equal to or higher than the BFE. The origin of the term traces to the 1998 edition of ASCE 7 and the first edition of ASCE 24, also published in 1998.

In areas where DFEs are not specified on the adopted map, IBC Section 1612.3.1 and IRC Section R322.1.4.1 authorize building officials to require applicants to obtain DFE data from a reliable source or to have a registered design professional determine the DFE using accepted engineering practices.

#### 3.2.2 Basement

**NFIP.** The NFIP regulations define a basement as “any area of the building having its floor subgrade (below ground level) on all sides.” New construction and Substantial Improvement of buildings and structures in SFHAs are not permitted to have basements. Nonresidential buildings that are permitted to be dry floodproofed may have basements, provided the design for the dry floodproofing measures takes into account the hydrostatic loads and buoyancy on below-grade areas and other design criteria.

##### Base Flood

The flood that has a 1 percent chance of being equaled or exceeded in any given year (commonly called the “100-year” flood).

##### Design Flood

The greater of the base flood or the flood corresponding to the area designated on the community’s flood hazard map, whichever is higher. The design flood is always equal to or greater than the base flood.

##### Zone AO and Depth Numbers

On FIRMs, Zone AO identifies areas of shallow flooding, usually sheet flow on sloping terrain. Rather than BFEs, most Zone AO show depth numbers indicating average base flood depths between 1 and 3 feet are expected. Where a depth number is not specified, the depth number must be at least 2 feet.

## Differences Between NFIP Requirements and the I-Codes

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FEMA issued interim guidance in NFIP Technical Bulletin 11, *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*. This bulletin provides guidance to communities that wish to allow perimeter wall foundations forming crawlspaces that are below grade on all sides to be considered subgrade crawlspaces (not basements), but only if the crawlspaces meet certain very specific criteria that limit depth below grade and total foundation wall height. To allow subgrade crawlspaces that comply with the specific criteria in NFIP Technical Bulletin 11, communities must adopt specific language in their floodplain management regulations.<sup>2</sup>

### NFIP Insurance Rates for Subgrade Crawlspaces

To reflect the increased risk associated with below-grade crawlspace foundations, NFIP flood insurance rates for buildings with subgrade (below ground level) crawlspaces are higher than for buildings with crawlspaces that have the interior grade at or above the exterior grade on at least one entire side.

**IRC.** The IRC defines a basement as “a story that is not a story above grade plane,” a term that has no specific meaning in terms of requirements for dwellings in SFHAs. This is important because the flood provisions in Section R322 use the term “basement” and, where used, it is clearly described to be other than the IRC-defined term. Specifically:

- *R322.2.1 (Zone A).* “Basement floors that are below grade on all sides shall be elevated to or above the design flood elevation.”
- *R322.3.2 (Zone V and Coastal A Zone).* “Basement floors that are below grade on all sides are prohibited.”

**IBC.** The IBC has two definitions for basement. One matches the definition in the IRC with respect to “stories above grade plane” and does not apply to requirements of Section 1612 for flood hazard areas. The other definition, specifically applicable to flood loads, is the same as the NFIP definition.

### 3.2.3 Crawlspace and Under-Floor Space

**NFIP.** The NFIP regulations do not use the term “crawlspace,” although it is used in various guidance documents to refer to a type of foundation in which solid, load-bearing perimeter walls support a building. The space enclosed by perimeter walls and between the ground and the floor system above is the crawlspace. In SFHAs identified as Zone A, the area under elevated buildings is allowed to be enclosed by walls, including perimeter walls, provided the enclosures are used only for parking of vehicles, storage, and building access. Walls of enclosures must have flood openings and be constructed of flood-damage resistant materials.

**I-Codes.** The 2018 IRC defines the term “crawl space” as “an underfloor space that is not a basement.” Earlier editions of the IRC and all editions of the IBC use, but do not define, the terms “crawl space” and “under-floor space” which are used interchangeably. Both codes include under-floor space requirements for ventilation, access, debris removal, and finished grade. The IRC flood provisions for Zone A specifically include crawl spaces as allowable enclosed areas. The term “under-floor space” is useful to refer to areas enclosed by masonry or concrete perimeter walls that are taller than what are commonly considered to be crawl space walls; examples include load-bearing

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<sup>2</sup> Technical Bulletin 11 is interim guidance. Communities that choose to amend ordinances to allow below-grade crawlspaces may be required to make further amendments if FEMA modifies that guidance or adopts revised regulations that differ from the interim guidance.

## Differences Between NFIP Requirements and the I-Codes

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walls that support buildings elevated more than a few feet above grade and walls that are tall enough to enclose areas used for parking, building access, and storage.

### 3.2.4 Existing Building/Existing Structure

**NFIP.** Section 4.10 of this manual describes the NFIP definitions for “existing construction” and “new construction” and cautions against using insurance terms (pre-FIRM and post-FIRM) for compliance purposes.

**IBC/IEBC.** The 2018 IBC and International Existing Building Code (IEBC) define existing building and existing structure as those “erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.” Earlier editions include sentences that refer to the effective date of a community’s first floodplain management code, ordinance, or standard.

With the revised definitions, the Substantial Improvement and Substantial Damage requirements apply to existing buildings and structures in flood hazard areas, regardless of the date of construction. FEMA supported this change, noting changes in flood zone and BFEs over time warrant examination of improvements and repairs of all buildings to determine whether the work constitutes Substantial Improvement or repair of Substantial Damage.

#### Post-FIRM and Pre-FIRM

The terms “post-FIRM” and “pre-FIRM” are insurance terms that are tied to a community’s initial FIRM and used by the NFIP to determine flood insurance rates.

It is common—but misleading—for these terms to be used to distinguish between new construction and buildings that predate when a community adopted its first floodplain management requirements. Because FEMA periodically revises FIRMs, which sometimes changes flood zones and BFEs, reliance on post-FIRM and pre-FIRM for compliance can lead to incorrect interpretations of the Substantial Improvement and Substantial Damage requirements.

### 3.2.5 Livable and Habitable

**NFIP.** The NFIP regulations do not use the terms “livable” or “habitable.” Limitations on uses of enclosed areas below elevated buildings are explicitly stated: only enclosures that are used for parking of vehicles, storage, and building access are allowed. In describing the NFIP elevation requirements, it is commonly understood that all livable or habitable spaces must be elevated. However, this characterization is not precise because it could be misinterpreted to include buildings and areas of buildings that are used for occupancies other than residential.

**I-Codes.** The I-Codes do not define “livable,” although the IRC defines “living space.” “Habitable space” is defined as “a space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered habitable spaces.” Clearly, bathrooms, toilet rooms, and utility spaces are not among the allowed uses specified for enclosures below elevated buildings in flood hazard areas because they are not parking, storage, or building access. Notably left out of the habitable space definition are spaces used for occupancies that do not involve habitation, such as commercial, educational, mercantile, and industrial.



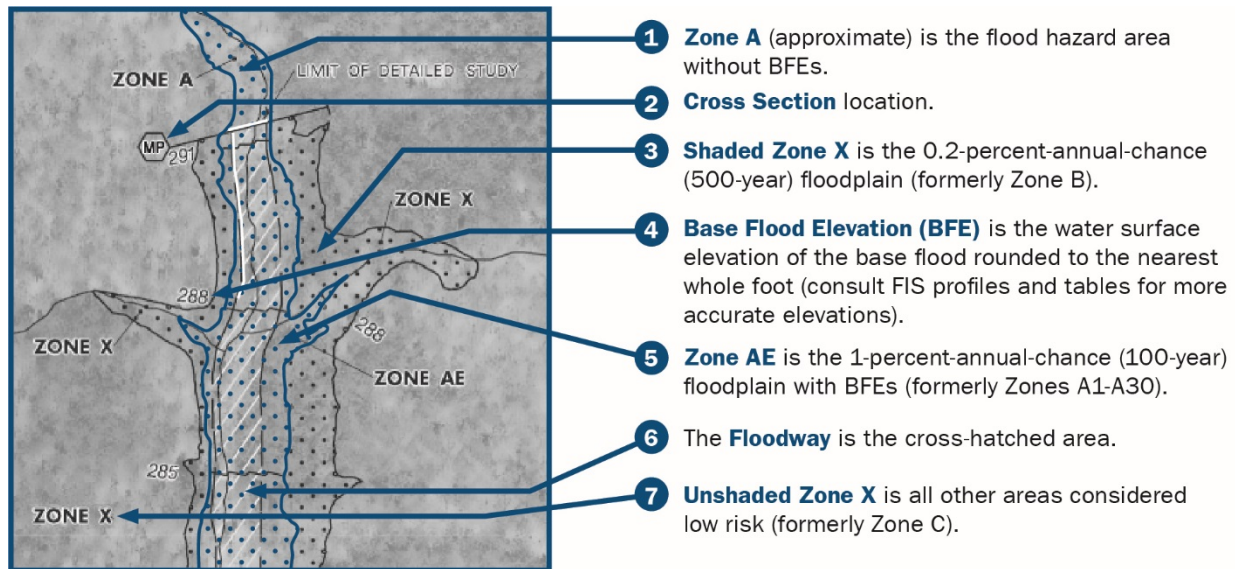
### 3.2.6 Special Flood Hazard Area and Flood Hazard Area

**NFIP.** The NFIP regulations define and use the term “special flood hazard area” to refer to land in a floodplain that is subject to a 1 percent or greater chance of flooding in any given year, which is the base flood. FIRMs show SFHAs, which are identified as flood zones (Zone A, AO, AH, A1-30, AE, A99, V, V1-30, VO, and VE). Mapped zones outside of the SFHA are Zone X (shaded or unshaded) or Zone B/Zone C on older FIRMs. See [Figure 3-1](#) and [Figure 3-2](#).

#### I-Code/ASCE 24: Flood Hazard Area

Flood hazard area is defined as the greater of the SFHA or the area designated on a community’s flood hazard map or otherwise legally designated. The flood hazard area is always equal to or larger than the SFHA.

**I-Codes/ASCE 24.** The I-Codes and ASCE 24 use the term “flood hazard area” to accommodate communities that elect to adopt flood hazard maps that either augment or replace the FIRMs. Most NFIP communities adopt the FIRM for regulatory purposes, and in those communities the flood hazard area is the SFHA. The flood hazard area will always be equal to or larger than the SFHA. As with DFE, the origin of the term traces to the 1998 edition of ASCE 7 and the first edition of ASCE 24, also published in 1998. ASCE 24 Chapter 3 contains additional requirements applicable in High Risk Flood Hazard Areas subject to alluvial fan flooding, flash floods, mudslides, erosion, high-velocity flows, high-velocity wave action, and damage-causing ice or debris.



**Figure 3-1: FEMA FIRMs and riverine flood zone terminology**

## Differences Between NFIP Requirements and the I-Codes

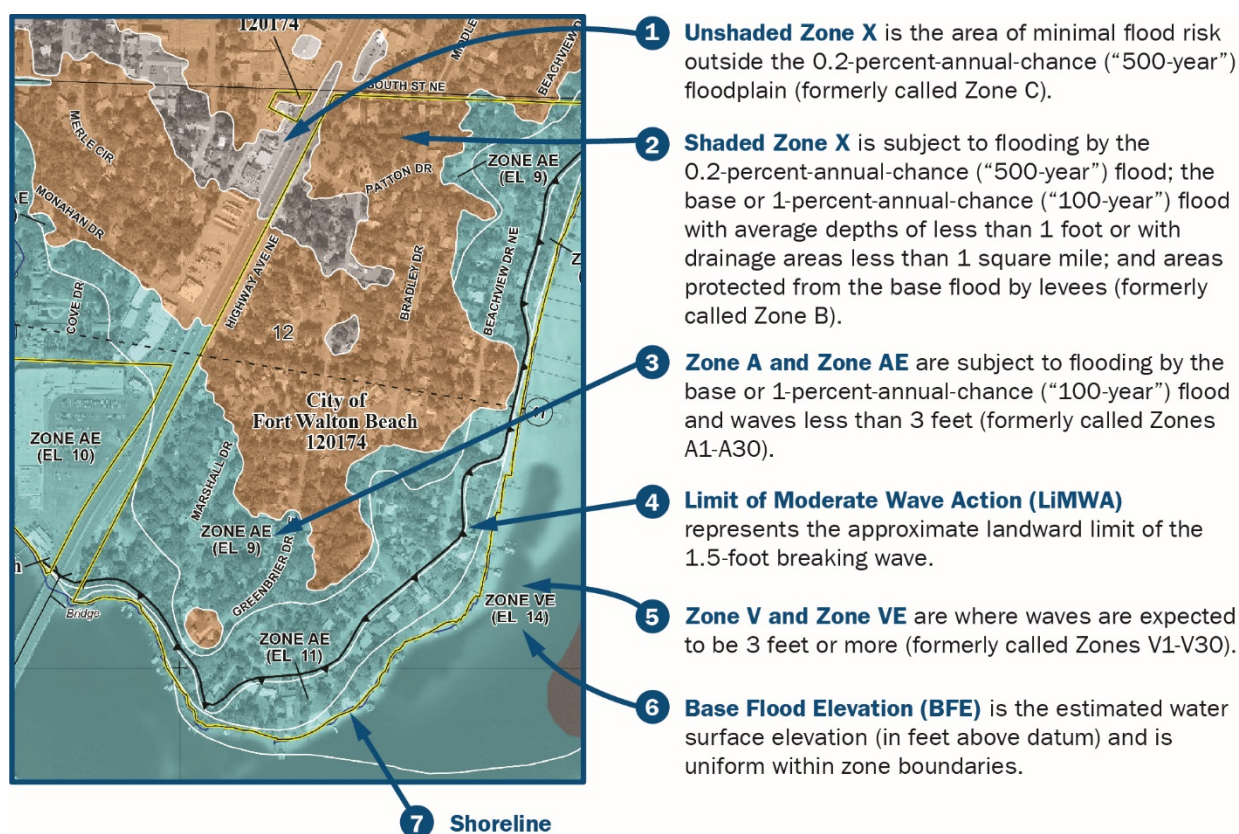


Figure 3-2: FEMA FIRMs and coastal flood zone terminology

### 3.3 Planning, Location, and Site Development

#### 3.3.1 Buildings in More than One Flood Zone

**NFIP.** The NFIP regulations do not specifically address situations where more than one flood zone affects a building; for example, if a portion of a building is in Zone V and a portion is in Zone A, or part is in Zone A and part in Zone X. However, the performance statement is satisfied only when buildings in more than one zone are designed to comply with the more restrictive requirements. The statement requires buildings to 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.”

**I-Codes/ASCE 24.** The IRC and IBC both require that where buildings are located in more than one flood hazard area, the provisions of the more restrictive flood hazard area (flood zone) apply. ASCE 24-14 Commentary Section C1.4.1 describes the intent that “[a] structure that “straddles” a line between flood hazard areas, or between a flood hazard area and an area not designated as subject to flooding, must meet the most restrictive requirements for either area.”

#### 3.3.2 Floodway Requirements

**NFIP.** Floodways are the channels and adjacent areas of riverine watercourses that must be reserved to convey the base flood without increasing the water surface elevation by more than a certain

## Differences Between NFIP Requirements and the I-Codes

amount. In general, floodwater is deeper and faster in floodways than in adjacent floodway fringe areas.

Floodways are not designated along all riverine watercourses. Floodways are shown on FIRMs when detailed study methods are used to determine the amount of encroachment that would result in no more than 1 foot of increased elevation of the base flood (see Figure 3-3). Some states negotiate with FEMA to establish smaller increases, which are then used to determine and map floodway boundaries.

NFIP regulations specify:

- Where floodways *are designated* on FIRMs, communities must “prohibit encroachments, 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 the occurrence of the base flood discharge.”
- Where floodways *are not designated* on FIRMs, communities must not permit “new construction, substantial improvement, or other development (including fill) ... 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.”
- The floodway fringe is the SFHA outside of designated floodways. Because the analyses used to designate floodways has already estimated allowable encroachment, site-specific analyses of the effects of development in the floodway fringe are not required.

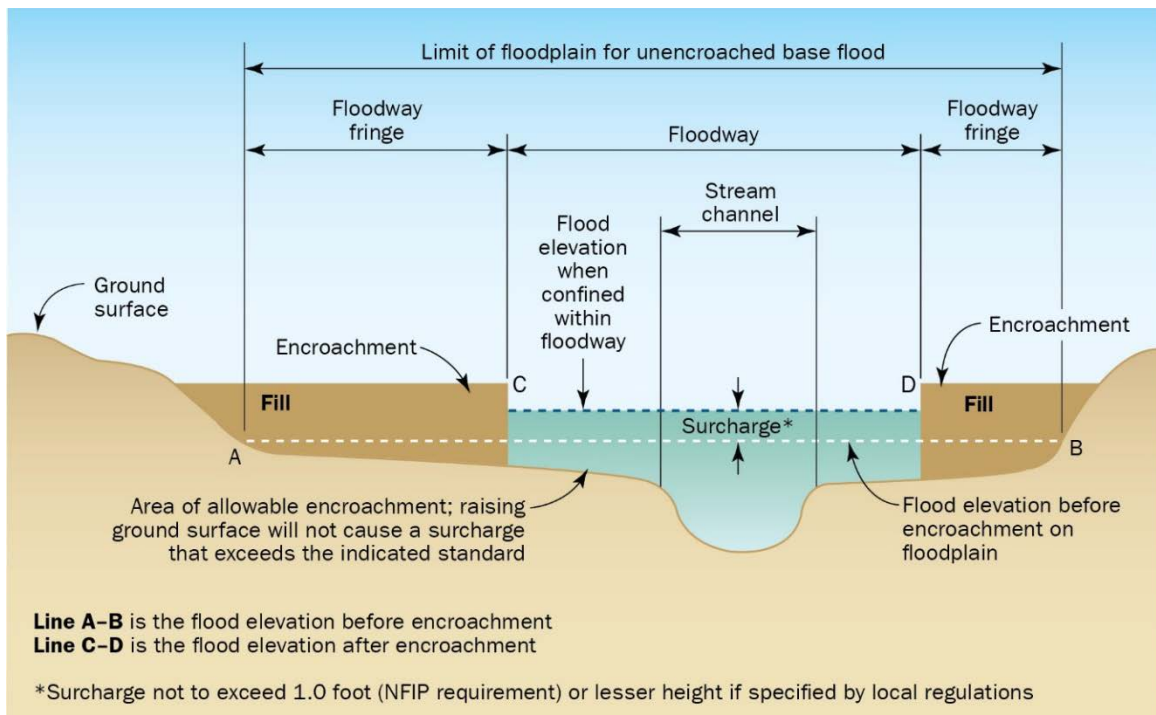


Figure 3-3: Illustration of floodway concept

## Differences Between NFIP Requirements and the I-Codes

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**IRC.** The IRC specifies that dwellings in floodways must be designed and constructed in accordance with ASCE 24. Section R322.1.4.2 requires a determination of impacts in riverine flood hazard areas where DFEs are specified but floodways have not been designated. The determination is equivalent to the NFIP requirement to demonstrate the cumulative effect of proposed development and anticipated development on water surface elevations of the base flood.

**IBC/ASCE 24.** The IBC/ASCE 24 specify that structures and fill must not be allowed in floodways unless applicants demonstrate that there will be no increase in the flood level and no reduction in the conveyance of floodwater within the floodway. Section 1612.3.2 requires the same determination of impacts specified in R322.1.4.2.

Dwellings in floodways and dwellings that would otherwise be within the scope of the IRC but are designed in accordance with the IBC/ASCE 24 are assigned Flood Design Class (2015 IBC and later editions) or Risk/Occupancy Category II (2012 IBC and earlier editions). As used in ASCE 24, the assigned class and category determine elevation requirements (see Section 3.4.3).

### 3.3.3 Floodways and Subdivisions

**NFIP.** The NFIP requirements for floodways apply to proposed encroachments, including filling, grading, and buildings. Development in floodways must be evaluated to determine whether the encroachments increase base flood levels. The NFIP regulations have no requirements that govern how subdivisions are laid out and whether any portion of a subdivision is in a floodway.

**IBC Appendix G.** IBC Appendix G requires subdivision plats to show flood hazard areas and floodways, and requires residential building lots to have buildable areas outside of floodways. IBC Appendix G applies only if explicitly adopted.

### 3.3.4 Landward of the Reach of Mean High Tide

**NFIP.** The NFIP regulations require new construction on sites in coastal high hazard areas (Zone V) to be located landward of the reach of the mean high tide. Buildings that are Substantially Improved or repaired after incurring Substantial Damage are not required to be moved landward of the reach of mean high tide, but must be brought into compliance with all of the other requirements for new construction in Zone V. FEMA guidance states the “reach of mean high tide” is the “mean high water line” (sidebar).

#### Reach of Mean High Tide

The “mean high water line” is the line that delineates where the water surface at the elevation of mean high water intersects with the land. “Mean high water” is a tidal datum defined as the average of all the high water heights observed over a specified period of time.

Source: National Oceanic and Atmospheric Administration, [shoreline.noaa.gov/glossary.html](http://shoreline.noaa.gov/glossary.html)

**IRC.** IRC Section R322.3.1 requires “new buildings and buildings determined to be substantially improved” to be located landward of the reach of the mean high tide. The requirement applies to structures that are located in whole or part in coastal high hazard areas (Zone V) and within designated Coastal A Zones.

**IBC.** The IBC, by reference to ASCE 24 requirements for coastal high hazard areas (Zone V) and Coastal A Zones, requires new construction—but *not* Substantial Improvements—to be located landward of the reach of mean high tide. In the 2005 edition of ASCE 24 the location requirement was applied to new construction and Substantial Improvements.

### 3.3.5 Use of Fill

**NFIP.** The NFIP regulations for development in SFHAs are silent on the use and compaction of earthen fill to elevate buildings in Zone A, although the general performance expectation that building sites will be reasonably safe from flooding applies. To properly support a building, earthen fill must be free of organic material, construction debris, cobbles, and boulders. Fill must be placed in layers and compacted and protected from scour and erosion to provide sufficient strength and stability to carry the weight of the building, when subject to loads, without shifting or loss of support. In flood hazard areas, flowing water may cause erosion and fill may become saturated, altering the bearing capacity of the fill material.

NFIP Technical Bulletin 10, *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding*, explains what is required to ensure buildings on fill are “reasonably safe from flooding” for the purposes of revising FIRMs. When applications, including documentation on the placement of fill, are submitted, FEMA may revise FIRMs and remove property or structures from SFHAs by issuing Letters of Map Revision based on Fill (LOMR-F).

**IRC.** The IRC requires dwellings to be constructed on foundations that are capable of accommodating all loads, and fill soils that support footings and foundations must be designed, installed, and tested in accordance with accepted engineering practice (Section R401.2). Section R506 requires fill material used to support concrete slab-on-ground floors to be free of vegetation and foreign material. Fill is to be “compacted to ensure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches (610 mm) for clean sand or gravel and 8 inches (203 mm) for earth.” Given those fill depth limitations, approval by the building official is required except in areas with very shallow flood depths. Building officials should require builders to obtain a report or design from a qualified design professional. In Zone V and Coastal A Zones, Section R322.3.2 states the use of fill for structural support to achieve elevation is prohibited. See Section 3.3.2 for limitations on use of fill in floodways.

**IBC/ASCE 24.** IBC Chapter 18 covers soils and foundations in general. In addition to the other requirements of this chapter, Section 1804.5 addresses grading and fill in flood hazard areas and states that fill must be “placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of floodwater and, as applicable, wave action.” To meet the required performance objective, a qualified design professional is required to design the fill.

ASCE 24 Section 2.4 includes requirements for use of structural fill. If a soils engineering report is not required by the community, then certain lift thickness and compaction specifications must be met. ASCE 24 specifies that side slopes must be no steeper than 1 vertical to 1.5 horizontal and must be protected from scour and erosion during flooding up to and including the design flood.

#### Fill in Floodways and Zone V

The NFIP regulations require evaluation of the impact of fill proposed in floodways.

The NFIP regulations specify that the use of fill for structural support of buildings in Zone V is prohibited.

#### Fill and FIRM Revisions

For the purpose of FIRM revisions based on fill, the NFIP defines “reasonably safe from flooding” to mean “base flood waters will not inundate the land or damage structures to be removed from the SFHA and that any subsurface waters related to the base flood will not damage existing or proposed buildings.” [44 CFR § 65.2]

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### 3.3.6 Swimming Pools

**NFIP.** The NFIP regulations do not have explicit requirements for swimming pools in SFHAs. However, pools are development (man-made changes to land) and must be installed to satisfy the general requirements for development in SFHAs. In all flood zones, pools must be stable under conditions of flooding. In riverine SFHAs, the impact of on-ground and above-ground pools proposed to be located in floodways (and SFHAs with BFEs but without floodways) must be evaluated by floodway encroachment analyses.

In Zone V, the placement of swimming pools under or adjacent to buildings can affect the performance of the buildings during flooding. Guidance is available in FEMA P-499, *Home Builder's Guide to Coastal Construction*, and FEMA P-55, *Coastal Construction Manual*. In-ground and above-ground pools should not be structurally attached to buildings because flood loads imposed on the pools could transfer to the buildings. Building foundation designs should also account for the effects non-attached but adjacent pools may have on flooding, including increased flow velocities, wave runup, wave reflection, and scour that can result from the redirection of flow by the presence of a pool. In addition, swimming pools must not be installed in enclosures below elevated buildings (recreation is not a use permitted in enclosures).

**I-Codes/ASCE 24.** The IRC Section R326.1 and IBC Section 3109 require swimming pools and spas to comply with the International Swimming Pool and Spa Code (ISPSC). The ISPSC Section 304 includes requirements for swimming pools and spas in flood hazard areas, including a requirement to demonstrate pools and spas in floodways will not increase flood elevations.

The ISPSC requires equipment serving pools and spas to be elevated to or above the DFE or anchored to prevent flotation and protected to prevent water from entering or accumulating in the components during flooding. In Chapter 9, ASCE 24 requires pool equipment to comply with the general requirements for mechanical equipment.

The ISPSC requires pools and spas in coastal high hazard areas to comply with ASCE 24, where options are provided: elevate so the lowest horizontal structure member (supporting the pool or spa) is at or above the DFE, designed to breakaway without producing damaging debris, or designed to remain in the ground without obstructing flow that could damage structures.

### 3.3.7 Private Sewage Systems

**NFIP.** The NFIP requires communities to review subdivision proposals and proposals for new development, including manufactured home parks and subdivisions. Among several other requirements are two provisions that apply to private sewage systems. The first applies to new and replacement sanitary sewage systems and requires such systems to be “designed to minimize or eliminate infiltration of floodwater into the systems and discharges from the systems into floodwaters” during flooding conditions. The second requires “onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.”

FEMA P-348, *Protecting Building Utility Systems From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*, contains guidance for sewage systems, including onsite systems with septic tanks. Tanks must be anchored to prevent flotation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy. In Zone V and Coastal A Zone, FEMA recommends burying tanks below the expected depth of erosion and scour.

**IRC.** The IRC has broad requirements for protection of sanitary sewage systems in flood hazard areas, specifying the systems must be designed to minimize or eliminate infiltration of floodwater into the systems and discharges from the systems during flooding. Section R322.1.7 refers to the International Private Sewage Disposal Code (IPSDC), although that code is not adopted by many states and communities. The IPSDC requires soil absorption systems to be located outside of flood hazard areas except where sites with suitable soils are not available, in which case the location should be chosen to minimize the effects of inundation. The IPSDC also requires tanks to be anchored to counter buoyant forces during flooding and vents and tank manholes to be at least 2 feet above the DFE or fitted with watertight covers.

**IBC/ASCE 24.** The IBC references ASCE 24 for the design and construction of buildings and structures. ASCE 24 Chapter 7 includes requirements for utilities and equipment attendant to buildings and structures, including provisions for sanitary systems. In addition to the broad expectation that sanitary systems must be designed to minimize or eliminate infiltration of floodwater into the systems and discharges from the systems during flooding, sanitary system storage tanks must be designed, constructed, installed, and anchored to resist at least 1.5 times the potential buoyant and other flood forces acting on the empty tank during design flood conditions.

### 3.4 Building Design

#### 3.4.1 Flood Loads and Flood Resistance

**NFIP.** The NFIP regulations establish a performance statement for buildings, requiring buildings in SFHAs to 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.”

**I-Codes/ASCE 7.** A basic requirement of building codes is that buildings must be designed to resist anticipated loads, where the anticipated loads are prescribed based on local or site-specific conditions. The IBC performance statement specifically for flood hazard areas is in Section 1612.1, and is phrased similar to the NFIP statement. The IRC, despite being primarily a prescriptive code, also has a flood hazard area performance statement in Section R322.

The IBC references the standard ASCE 7 for minimum design loads. The standard defines loads as “forces or other actions that result from the weight of all building materials, occupants and their possessions, environmental effects, differential movement, and restrained dimensional changes.” ASCE 7 provides minimum load and combination load requirements for dead loads, live loads, flood loads, wind loads, seismic loads, snow loads, rain loads, and ice loads. Loads and appropriate load combinations are developed and used together for strength design and allowable stress design.

For flood loads, ASCE 7 includes a performance statement that is equivalent to the NFIP performance statement: “Structural systems of buildings or other structures shall be designed, constructed, connected, and anchored to resist flotation, collapse, and permanent lateral displacement due to action of flood loads associated with the design flood (see ASCE 7 Section 5.3.3) and other loads in accordance with the load combinations of Chapter 2.” ASCE 7 requires

#### Flood Loads

Flood loads include hydrostatic loads, hydrodynamic loads, wave loads (with specifics for breaking wave loads on vertical pilings and columns, on vertical walls, on non-vertical walls, and from obliquely incident waves), and impact loads (from debris and ice).

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the effects of erosion and scour to be included in load calculations (basically by assuming loss of soil, which increases depth of water, thus increasing flood loads).

### 3.4.2 Flood Design Class and Risk/Occupancy Category

**NFIP.** The NFIP requirements apply to buildings and structures in SFHAs. In SFHAs designated Zone A, whether a building is residential or nonresidential determines (see Section 3.1.2) whether it must be elevated or may be dry floodproofed.

**IBC/ASCE 24.** To recognize a building's importance in terms of occupant protection as well as function, every building designed under the IBC must be assigned a Risk Category (referred to as Occupancy Category in 2009 and earlier editions). Starting with the 2015 edition, if located in flood hazard areas, buildings must also be assigned a Flood Design Class.<sup>3</sup> The assigned class or category affects some aspects of a building's design requirements. The IRC does not require assignment of class or category.

ASCE 24-14 defines Flood Design Class (ASCE 24-05 uses Occupancy Category from ASCE 7). For buildings in flood hazard areas, the assigned class or category is used to establish minimum elevations. The table in ASCE 24 that defines the classes/categories is included in the highlights of the standard prepared by FEMA and is available online: [www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources).

### 3.4.3 Building Elevations

**NFIP.** NFIP regulations specify that buildings in SFHAs must be built to be reasonably safe from flooding using methods and practices that minimize flood damage. In SFHAs identified as Zone A, the lowest floor must be at or above the BFE. Nonresidential buildings in Zone A can be elevated or dry floodproofed to the level of the BFE. In SFHAs identified as Zone V, the bottom of the lowest horizontal structural member of the lowest floor must be at or above the BFE.

**IRC.** IRC Section R322.2.1 specifies elevation requirements in flood hazard areas other than coastal high hazard areas (Zone V) and Coastal A Zones (i.e., in Zone A). The 2018 and 2015 editions of the IRC specify the required minimum elevation of lowest floors of dwellings in Zone A is the BFE plus 1 foot or the DFE, whichever is higher. The 2012 and earlier editions specify that buildings must have lowest floors elevated to or above the BFE or DFE, whichever is higher, except in areas designated as Coastal A Zones. See Section 3.4.4 for a description of the Coastal A Zone and requirements in Coastal A Zones.

IRC Section R322.3.2 specifies elevation requirements in coastal high hazard areas (i.e., Zone V) and, starting with the 2015 edition, elevation requirements in Coastal A Zones, if designated. The 2018 and 2015 IRC specify the required minimum elevation of the lowest horizontal structural member supporting the lowest floor must be the BFE plus 1 foot or the DFE, whichever is higher. The 2012 IRC specifies the required minimum elevation based on orientation of the lowest horizontal structural member relative to the direction of wave approach (consistent with the manner in which elevations are specified in ASCE 24-05).

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<sup>3</sup> The change to Flood Design Class stemmed from a change in the Risk Category descriptions in ASCE 7-10, which had less specificity than previous versions of the descriptions.



## Differences Between NFIP Requirements and the I-Codes

**IBC/ASCE 24.** The IBC, by reference to ASCE 24, specifies the minimum elevations to which buildings must be elevated or dry floodproofed as a function of flood zones and Flood Design Class or Risk/Occupancy Category (see Section 3.1.2).

**Critical Facilities and ASCE 24-14**  
ASCE 24-14 requires critical and essential facilities (Flood Design Class 4) to be elevated or dry floodproofed to or above the specified elevation based on flood zone or the elevation of the 500-year flood, whichever is higher.

Table 3-2 and Table 3-3 summarize elevation requirements from tables in several sections of ASCE 24-14 and ASCE 24-05, respectively. The ASCE 24 tables specify minimum elevations for lowest floors, floodproofing, flood damage-resistant materials, and utilities and attendant equipment. All buildings are required to have lowest floors (or lowest horizontal structural member of the lowest floors in coastal high hazard areas and Coastal A Zones) 1 or 2 feet higher than the BFE, except agricultural facilities, temporary facilities, and minor storage facilities. Importantly, dwellings that are within the scope of the IBC and dwellings in floodways are Flood Design Class 2/Category II and must have lowest floors (or lowest horizontal structural member in coastal high hazard areas and Coastal A Zones) at least 1 foot higher than the BFE.

**Table 3-2: Summary of Selected Elevation Requirements in ASCE 24-14**

		Flood Design Class 1	Flood Design Class 2	Flood Design Class 3	Flood Design Class 4
<b>Elevation of lowest floor (Zone A: ASCE 24, Table 2-1)</b>	Zone A not identified as Coastal A Zones	DFE	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, or 500-year flood elevation, whichever is higher
<b>Elevation of bottom of lowest horizontal structural member of the lowest floor (Zone V and Coastal A Zone: ASCE 24, Table 4-1)</b>	Zone V and Coastal A Zones	DFE	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, whichever is higher	BFE +2 feet or DFE, or 500-year flood elevation, whichever is higher
<b>Dry floodproofing of nonresidential structures and nonresidential portions of mixed-use buildings (Zone A: ASCE 24, Table 6-1)</b>	Zone A	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, or 500-year flood elevation, whichever is higher
	Zone V and Coastal A Zones: dry floodproofing not allowed	Not permitted	Not permitted	Not permitted	Not permitted

Not shown: elevation requirements for flood damage-resistant materials, utilities, and equipment  
Reproduced with permission from ASCE.

## Differences Between NFIP Requirements and the I-Codes

Table 3-3: Summary of Selected Elevation Requirements in ASCE 24-05

		Category I	Category II	Category III	Category IV
Elevation of lowest floor (Zone A: ASCE 24, Table 2-1)	All Zone A not identified as Coastal A Zones	DFE	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, whichever is higher
Elevation of bottom of lowest horizontal structural member (Zone V: ASCE 24, Table 4-1)	All Zone V and Coastal A Zones: where the lowest horizontal structural member is parallel to direction of wave approach	DFE	DFE	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher
	All Zone V and Coastal A Zones: where the lowest horizontal structural member is perpendicular to direction of wave approach	DFE	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, whichever is higher	BFE +2 feet or DFE, whichever is higher
Dry floodproofing of nonresidential structures and nonresidential portions of mixed-use buildings (Zone A: ASCE 24, Table 6-1)	All Zone A not identified as Coastal A Zones: elevation to which dry floodproofing extends	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +1 foot or DFE, whichever is higher	BFE +2 feet or DFE, whichever is higher
	All Zone V and Coastal A Zones: dry floodproofing not allowed	Not permitted	Not permitted	Not permitted	Not permitted

Not shown: elevation requirements for flood damage-resistant materials, utilities, and equipment  
 Reproduced with permission from ASCE.

### 3.4.4 Requirements in Coastal A Zones

**NFIP.** The NFIP regulations for development in SFHAs, and the NFIP regulations that govern identification of SFHA mapping, do not use the term “Coastal A Zone.” Since 2009, coastal flood studies have examined wave conditions in Zone A and where wave heights are expected to be between 1.5 and 3 feet during base flood conditions, FEMA delineates an informational line called the Limit of Moderate Wave Action (LiMWA). See [Figure 3-4](#) and [Figure 3-5](#). FEMA uses term “Coastal A Zone” to refer to areas seaward of the LiMWA and landward of the Zone V boundary or landward of the shoreline where Zone V is not identified. Those areas are not labeled Coastal A Zone on FIRMs. The term does not refer to all areas identified as Zone A that are subject to flooding from a coastal or tidal source.

**IRC.** Beginning with the 2015 edition, the IRC requires dwellings in Coastal A Zones, where delineated on the flood hazard map or otherwise designated by a community, to meet the requirements for Zone V and:

- The walls of enclosures below elevated dwellings in both Coastal A Zones and Zone V must break away under flood loads and must have flood openings to allow floodwater to automatically flow in and out to minimize unequal hydrostatic loads on the walls.

#### Coastal A Zone

Coastal A Zone is the area within a *special flood hazard area*, landward of a V zone or landward of an open coast without mapped *coastal high-hazard areas*. In a Coastal A Zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to 1 ½ feet (457 mm). The inland limit of the Coastal A Zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction.

## Differences Between NFIP Requirements and the I-Codes

- Stem wall foundations that support floor systems and are backfilled with soil or gravel to the underside of the floor system are allowed in Coastal A Zone (but not Zone V), provided the foundations are designed to account for wave action, debris impact, erosion, and local scour. Where susceptible to erosion and local scour, these foundations must have deep footings to accommodate the anticipated loss of soil.

The 2012 IRC specifies that where flood hazard areas are delineated as subject to wave heights between 1.5 and 3 feet, the areas are designated as Coastal A Zones, and dwellings in those areas must have the lowest floors elevated to or above the BFE plus 1 foot or the DFE, whichever is higher.

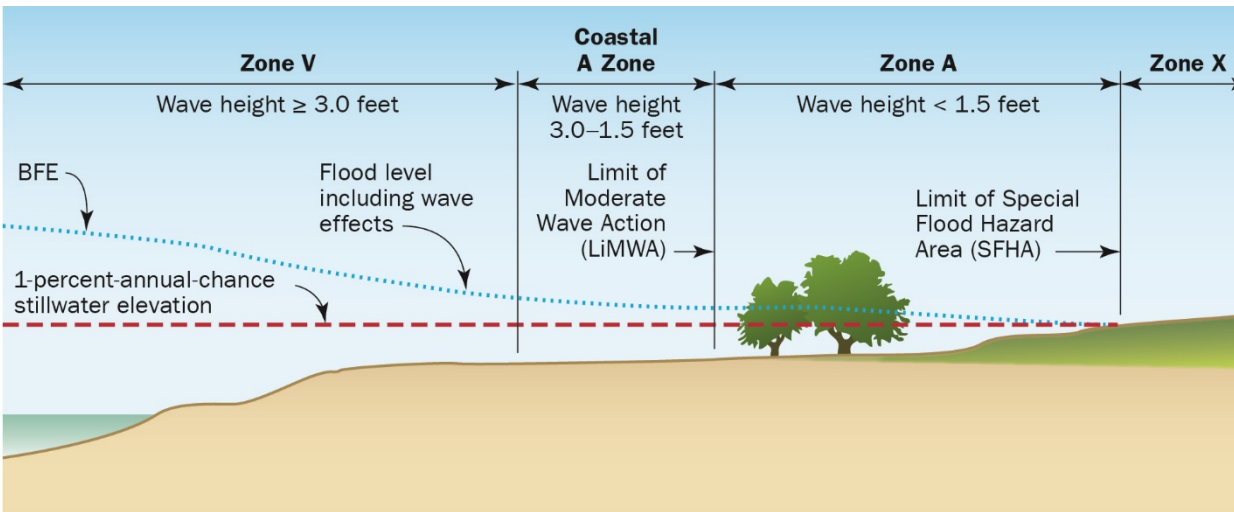
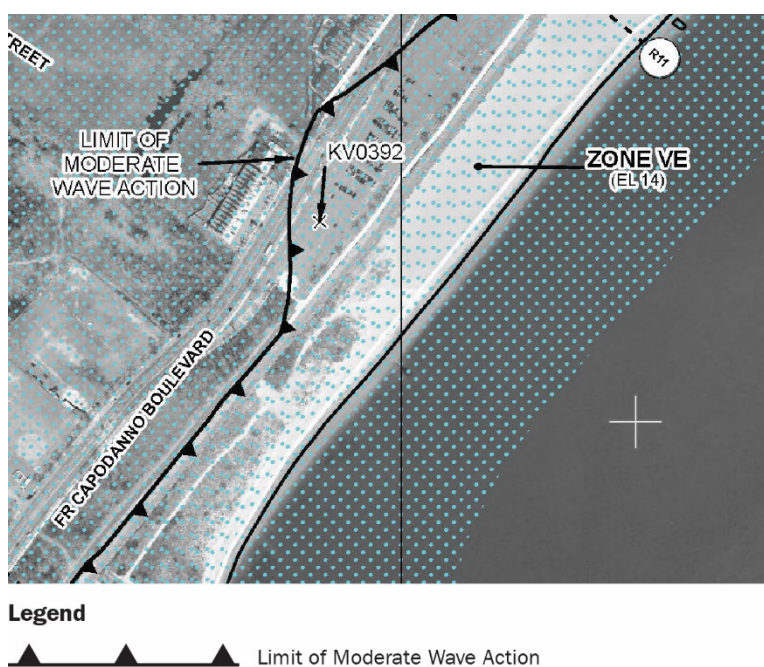


Figure 3-4: Coastal flood zones

## Differences Between NFIP Requirements and the I-Codes



### Notes to Users

The AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5 – foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

**Figure 3-5: Sample FIRM with LIMWA**

**IBC/ASCE 24.** Beginning with the 2015 IBC, which references ASCE 24-14, designers are no longer expected to evaluate location-specific flood conditions to determine whether moderate waves would occur during the base flood. Instead, buildings in Coastal A Zones must be designed to meet Zone V requirements only when the Coastal A Zone is delineated on a FIRM by the LiMWA or when a community otherwise designates a Coastal A Zone. Communities may designate Coastal A Zones by adopting locally prepared maps or by specifying a distance inland from the Zone V boundary. Some communities designated Coastal A Zones by landmarks, such as seaward of a road or other geographic feature.

Editions of the IBC that reference ASCE 24-05 require buildings in areas with Coastal A Zone conditions to be designed in accordance with the requirements for coastal high hazard areas (Zone V). This requirement applied regardless of whether the inland extent of the 1.5-foot wave is delineated on FIRMs. Both the IBC and ASCE 24 require designers to determine flood loads based on location-specific flood conditions. In the process of determining flood conditions, designers may determine that Coastal A Zone conditions are expected to occur during the base flood, in which case building and structure designs must comply with Zone V requirements.

### 3.4.5 Equipment and Utility Elevations

**NFIP.** The NFIP regulations require new construction and Substantial Improvements to have “electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities

## Differences Between NFIP Requirements and the I-Codes

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that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.” FEMA P-348, *Protecting Building Utility Systems From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*, clarifies that locating equipment and utilities to or above the BFE satisfies the requirement and guidance is provided for determining whether equipment may be allowed below the BFE.

**IRC.** The IRC’s provision for protection of equipment and utilities clarifies that electrical systems and components, plumbing fixtures, and duct systems are included. Equipment and utilities must either be elevated or protected against the intrusion of water. However, Section R322.1.6 does not directly specify the required elevation for equipment utilities, but instead refers to sections where dwelling elevations are specified. Thus, equipment and utilities that serve the dwelling must be elevated or protected to or above that same height. The IRC also makes clear that when equipment and utilities are replaced as part of Substantial Improvement, the installations must meet the elevation or protection requirements.

Three additional points the IRC clarifies for equipment and utilities are:

- Because some electric service is necessary for enclosures below elevated dwellings, electrical wiring is permitted below the required elevation as long as the wiring systems “conform to the provisions of the electrical part of this code for wet locations.”
- If permitted below the required elevation, equipment and utilities must not only be designed to prevent water from entering or accumulating within the components, but must also be designed or installed to “resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy.”
- When dwellings have walls designed to break away, utility equipment and components (such as wires and pipes) are not permitted to be mounted on or penetrate through the walls.

**IBC/ASCE 24.** The IBC references the IMC, IPC, and IFGC. Each of those codes has provisions that apply when buildings are located in flood hazard areas. In addition, the IBC by reference to ASCE 24 specifies both utility elevation requirements and requirements when equipment and utility systems are located below the required elevations. ASCE 24 allows equipment to be located in dry floodproofed areas or on platforms, but the equipment must not be mounted on or penetrate through breakaway walls. Tanks are required to be “designed, constructed, installed, and anchored to resist at least 1.5 times the potential buoyant and other flood forces acting on an empty tank during design flood conditions.”

### Institutional Group I-2 and Emergency Power

In the IBC, Institutional Group I-2 occupancies includes buildings “used for medical care on a 24-hour basis for more than five persons who are incapable of self-preservation.” The 2018 IBC requires new essential electrical systems and generators to be installed in accordance with ASCE 24. Connections for hookup of temporary generators, if provided, must be at or above the elevations required by ASCE 24.

### 3.4.6 Dry Floodproofing

**NFIP.** Dry floodproofing measures are allowed only for nonresidential buildings in Zone A. The NFIP regulations define the term “floodproofing” by describing the required performance of measures used to make buildings substantially impermeable to the passage of water and capable of resisting flood load to reduce or eliminate flood damage. For construction, the NFIP requires dry floodproofing

## Differences Between NFIP Requirements and the I-Codes

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measures to extend to at least the BFE (see sidebar for insurance implications). The NFIP regulations that establish design requirements do not specify preparation of maintenance and operations plans for buildings that are dry floodproofed.

A design certification is required for nonresidential structures that are to be dry floodproofed. FEMA Form 086-0-34, *Floodproofing Certificate for Non-Residential Structures*, can be used for this purpose. The 2015 and later versions of the form require certification that dry floodproofed structures have been designed and constructed in accordance with ASCE 24 or an equivalent standard of practice.

### NFIP Flood Insurance and Dry Floodproofing

To qualify for premium rates based on protection to the BFE, dry floodproofing measures must extend to at least the BFE plus 1 foot. Dry floodproofed buildings with floodproofing measures that require human intervention are subject to higher insurance premiums than those with completely passive floodproofing measures that do not require human intervention. Comprehensive maintenance plans for dry-floodproofed structures are required and must address, at a minimum:

- Exterior envelope of the structure
- All penetrations to the exterior of the structure
- All shields, gates, barriers, or components designed to provide floodproofing protection to the structure
- All seals or gaskets for shields, gates, barriers, or components
- Location of all shields, gates, barriers, and components as well as all associated hardware
- Any materials or specialized tools necessary to seal the structure

Source: *NFIP Flood Insurance Manual* (April 2019)

**IRC.** The IRC requires all dwellings to be elevated.

**IBC/ASCE 24.** The IBC, by reference to ASCE 24, restricts the use of dry floodproofing, allowing it only for nonresidential buildings and nonresidential portions of mixed-use buildings that are located in Zone A. Commentary for ASCE 24-14 defines the terms “mixed-use” and “residential portions of mixed-use buildings” (see text box below).

The IBC definition of dry floodproofing is similar to the NFIP definition, with the addition of a specific requirement that structural components have the capacity to resist loads identified in ASCE 7. IBC Section 1612 references ASCE 24, where dry floodproofing limitations that are not included in the NFIP regulations are enumerated. In particular, the elevation of the floodproofing measures is a function of Flood Design Class (see Section 3.4.2) or Risk/Occupancy Category. Refer to Section 3.4.3, where Table 3-2 and Table 3-3 show the elevation requirements in ASCE 24-14 and ASCE 24-05, respectively.

ASCE 24 requires “flood emergency plans” when dry floodproofing measures involve human intervention. These plans must include instructions on activating measures, conditions of activation, maintenance, testing of sump pumps, and periodic practices and inspections.

## Differences Between NFIP Requirements and the I-Codes

### ASCE 24-14 Definitions

The commentary for ASCE 24-14 includes two definitions for terms used in the standard:

- **Mixed use** – Any building or structure that has portions that are classified nonresidential and portions that are classified residential. See commentary for the term “residential portions of mixed-use buildings.” Dwellings and dwelling units are not considered mixed use; they are residential. A dwelling is a building that contains one or two dwelling units. A dwelling unit provides for living, sleeping, eating, cooking, and sanitation, thus providing a complete independent living arrangement for one or more persons.
- **Residential portions of mixed-use buildings** – This standard defines “residential” and “nonresidential” and uses the term “mixed-use,” which is defined in this commentary. Residential portions of mixed-use buildings include residential units, dwelling units, and other spaces meeting the definition of “residential.” Congregate living arrangements, such as nursing homes, assisted living, dormitories, group homes, sororities or fraternities, where residents share living, bathroom, or kitchen space are also considered residential.

### 3.4.7 Flood Openings

**NFIP.** The NFIP regulations have specific requirements for elevated buildings in SFHAs identified as Zone A when those buildings have fully enclosed areas (enclosures) below the lowest floor. Enclosed areas must have at least two flood openings that allow automatic entry and exit of floodwater (i.e., free inflow and outflow in both directions) to equalize the hydrostatic loads. The openings must provide a total net (open) area of 1 square inch for every square foot of enclosed area or openings may be designed by registered professional engineers or architects to meet minimum criteria. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters. Guidance for meeting the flood opening requirements is NFIP Technical Bulletin 1, *Openings in Foundation Walls and Walls of Enclosures*.

**IRC.** The IRC specifications for flood openings are in Section R322.2. In addition to the two options for openings, called non-engineered and engineered, the IRC specifically requires:

- Enclosed areas to be measured on the exterior of enclosure walls
- A minimum of two openings, installed on different sides of each enclosure
- The bottom of each opening to be no higher than 1 foot above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening
- A minimum dimension of not less than 3 inches

The IRC requires flood openings in enclosures below elevated buildings in Zone A and, beginning with the 2015 IRC, openings must be installed in breakaway walls of enclosures below elevated buildings in coastal high hazard areas (Zone V) and Coastal A Zones.

**IBC/ASCE 24.** The IBC, by reference to ASCE 24, requires enclosed areas below elevated buildings to have flood openings. ASCE 24-14 contains the same specific requirements as the IRC, listed above, including the requirement for flood openings in walls designed to breakaway.

#### Flood Openings in Breakaway Walls

Post-flood assessments indicate breakaway walls with flood openings prevent wall failure under frequent, shallow flood events, reducing debris, keeping enclosure interiors and contents protected from wind-driven rain and sand, and avoiding the cost of replacing walls.

## Differences Between NFIP Requirements and the I-Codes

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### 3.4.8 Building Envelope Protection

**NFIP.** The NFIP regulations do not explicitly address the building envelope. The building envelope comprises all building surfaces that separate the enclosed space from the elements, including exterior doors, windows, skylights, exterior wall coverings, soffits, roof systems, and attic vents.

**I-Codes/ASCE 24.** Specifically for buildings in coastal high hazard areas and Coastal A Zones, 2015 and later editions of IRC Section R322.3.6.1 and ASCE 24 Chapter 4 (Coastal High-Hazard Areas and Coastal A Zones), require exterior doors to be installed at the top of stairs when the stairs are enclosed by walls designed to breakaway. The doors must meet building code requirements for wind-loading, testing, and labeling for exterior doors.

#### Exposure of Building Interiors

Post-disaster investigations have identified damage to elevated buildings in coastal areas when stairwell walls fail as designed, exposing building interiors to wave splash, wave run-up, and wind-driven rain entering through unprotected doors at the top of stairs.

### 3.4.9 Tanks

**NFIP.** The NFIP general requirements for utilities and equipment state that all new construction and Substantial Improvements shall “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 in the components during conditions of flooding.” This requirement applies to tanks and fuel systems.

FEMA P-348, *Protecting Building Utility Systems From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*, clarifies that locating tanks to or above the BFE satisfies the requirement, and guidance is provided for determining whether equipment may be allowed below the BFE with component protection:

- In all flood zones, tanks may be installed below ground, in which case they must be anchored to resist buoyancy, should surrounding soils become saturated during conditions of flooding.
- In Zone A, above-ground tanks may be either elevated or, if constructed, installed, and anchored to resist potential buoyant and other food forces, may be installed below the flood protection level required for buildings (or below the BFE if tanks do not serve buildings). Tanks associated with nonresidential buildings may also be protected by component protection (e.g., within dry floodproofed space). In areas where large flood-borne debris is likely, bollards or barriers should be designed to protect tanks from debris impact. Tanks should be located outside of areas designated on FIRMs as floodways due to the increased risk.
- In Zone V, above-ground tanks must be elevated on pile-supported platforms that are designed to resist wave-related loads and debris impact. The potential effects of scour and erosion that disturb soil around the supports should be considered. If not elevated, above-ground tanks located under elevated buildings or attached to buildings below the lowest floor are obstructions to the free passage of floodwater and waves and do not satisfy the free-of-obstruction requirements.

**IRC.** Specific requirements for tanks in SFHAs were added to the IRC in 2015, supplementing the requirements of Section R322.1.6. In all flood hazard areas, underground tanks must be anchored



## Differences Between NFIP Requirements and the I-Codes

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to prevent flotation, collapse and lateral movement under base flood conditions. For above-ground tanks that are elevated, the IRC does not directly specify the required elevation, but instead refers to sections where building elevations are specified. Thus, elevated tanks must be elevated to or above that same height. In addition:

- Section R322.2.4 has requirements for tanks in flood hazard areas other than coastal high hazard areas (Zone V) and Coastal A Zone. Tanks that are not elevated (installed on grade) must be anchored to prevent flotation, collapse, and lateral movement under base flood conditions.
- Section R322.3.3 applies in coastal high hazard areas (Zone V) and Coastal A Zones. Tanks may be elevated on platforms, which may be cantilevered from or knee braced to the building or the platforms must be supported on open foundations that meet the same requirements as building foundations.

**IBC/ASCE 24.** The IBC, by reference to ASCE 24, governs tank and tank inlets, fill openings, outlets, and vents. ASCE 24 has requirements for installation of above-ground and underground tanks. If not elevated on platforms to or above the design flood elevation, tanks are required to be “designed, constructed, installed, and anchored to resist at least 1.5 times the potential buoyant and other flood forces acting on an empty tank during design flood conditions.” In coastal high hazard areas and Coastal A Zones, above-ground tanks are not permitted below elevated buildings or below the elevation of buildings. ASCE 24-14 includes tanks in Chapter 9 (Miscellaneous Construction), while previous editions include tanks in Chapter 7 (Utilities).

### 3.4.10 Stairways and Ramps

**NFIP.** Although the NFIP regulations do not have explicit requirements for stairways and ramps, the regulations do establish a performance statement for buildings, requiring buildings in SFHAs to 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.” FEMA guidance that addresses stairways and ramps includes FEMA P-499, *Home Builder’s Guide to Coastal Construction*, and NFIP Technical Bulletin 5, *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*, which describes the free-of-obstruction requirement for stairways and ramps in Zone V.

**IRC.** Beginning with the 2018 edition, the IRC includes specific requirements for stairways and ramps in Zone V and Coastal A Zones. The requirements allow four options for stairs and ramps located below the lowest floor elevation: (1) open or partially open risers and guards, (2) breakaway, (3) retractable, or (4) designed to resist flood loads. In all cases, the area below stairs and ramps must not be enclosed with walls unless the walls are designed to break away.

**IBC/ASCE 24.** The IBC, through reference to ASCE 24, incorporates specific requirements for stairways and ramps. Stairways and ramps must be constructed of flood damage-resistant materials. Options for meeting the requirements include designing and constructing stairways and ramps to minimize flood load transfer to the structure and its foundation, using breakaway construction, or making the stairways and ramps retractable or able to be raised.

## Differences Between NFIP Requirements and the I-Codes

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### 3.4.11 Concrete Slabs

**NFIP.** The NFIP regulations for coastal high hazard areas specify buildings must be elevated and the space below those buildings must be free of obstructions (or enclosed by breakaway walls). The NFIP Technical Bulletin 5, *Free-of-Obstruction Requirements*, has guidance. Concrete slabs may be used for vehicle parking and floors of enclosed storage areas and building access. To avoid being obstructions to the free flow of water and waves, slabs should be constructed to be frangible, floating slabs not attached to foundations. Alternatively, slabs may be designed to be self-supporting structural slabs capable of remaining intact and functional under base flood conditions, including expected erosion, in which case building foundations must be designed to resist any added loads due to the presence of slabs.

**IRC.** Added in 2015, IRC Section R322.3.4 specifically addresses concrete slabs in Zone V and Coastal A Zones. It requires slabs used for parking, floors of enclosures, landings, decks, walkways, patios, and similar uses that are beneath buildings or located such that they could be undermined or displaced and could cause damage to buildings to either be (1) structurally independent of foundations (with details on thickness, reinforcement, and construction joints) or (2) self-supporting and capable of remaining intact under base flood conditions, taking into account scour and erosion, and building foundations capable of resisting any added loads due to the presence of the slabs.

**IBC/ASCE 24.** The IBC, by reference to ASCE allows slabs below the BFE in Zone A if the slabs are structurally independent of the primary foundation system of buildings or, if structurally attached, the primary structure is capable of resisting added flood loads. Concrete slabs in Zone V and Coastal A Zones are required to be either structurally independent and frangible, or self-supporting capable of remaining intact and functional under base flood conditions if the main structure is capable of resisting added loads.

### 3.4.12 Decks and Porches

**NFIP.** The NFIP regulations do not have explicit requirements for decks and porches. When decks and porches are part of buildings, the general performance expectation applies. Buildings in SFHAs must 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.”

In coastal high hazard areas, decks and porches must be constructed to satisfy the free-of-obstruction requirement. Guidance is in FEMA P-499, *Home Builder’s Guide to Coastal Construction*, Technical Fact Sheet No. 8.2, “Decks, Pools, and Accessory Structures,” and NFIP Technical Bulletin 5, *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*.

**IRC.** Added in 2015, IRC Section R322.3.8 specifically addresses decks and porches in coastal high hazard areas (Zone V) and Coastal A Zone. Section R322.3.8 requires that attached decks and porches be elevated and attached to the primary structure with either a knee-wall or cantilever. Detached decks and porches are prohibited from being enclosed and must either remain in place during the base flood or be frangible and breakaway during the base flood.

**IBC/ASCE 24.** IBC references ASCE 24 for the design and construction of buildings in flood hazard areas. ASCE 24 Section 9.2 contains the requirements for attached and detached decks and porches. In addition to the specific requirements in Section 9.2, Section 9.1 contains general requirements that structures and construction be designed to withstand all flood-related loads.

### 3.4.13 Manufactured Homes

**NFIP.** The NFIP defines a manufactured home as “a structure, transportable in one or more sections, which is built on a permanent chassis and is designed for use with or without a permanent foundation when attached to the required utilities.” The term does not include recreational vehicles, which are built on a single chassis and designed to be self-propelled or permanently towable by a light-duty truck.

The NFIP regulations specify that manufactured homes must be elevated on and anchored to “adequately anchored foundation systems to resist floatation, collapse and lateral movement.” The minimum elevation requirements are the same as for site-built buildings and are based on flood zone: the lowest floor at or above the BFE in Zone A and the bottom of the lowest horizontal structural member of the lowest floor at or above the BFE in Zone V.

As an alternative to elevating manufactured homes to or above the BFE, the NFIP rules allow manufactured homes placed or Substantially Improved on existing sites in existing manufactured home parks or subdivisions to be elevated such that the manufactured home chassis is supported by reinforced piers or foundation elements that are no less than 36 inches above grade, even if lower than the BFE. This “36 inch rule” does not apply to replacement manufactured homes installed on sites where homes have incurred Substantial Damage caused by flooding, nor does it apply to sites in expansions of existing manufactured home parks or subdivisions. On these sites, all manufactured homes must comply with the full elevation requirements. Existing manufactured home parks and subdivisions are those for which facilities serving the lots, including installation of utilities, construction of streets, and final site grading or pouring of concrete pads, were completed before the effective date of floodplain management regulations adopted by communities.

**IRC.** Most states regulate the initial installation of manufactured homes under an authority other than the building code, although many communities require permanent foundations to comply with the building code (typically the residential code).

IRC Section R322.1.9 has requirements for manufactured homes, but does not include the NFIP provision that allows replacement units in existing manufactured home parks and subdivisions to be installed on piers or foundation elements that are only 36 inches above grade. The 2018 and 2015 IRC require the bottom of the frame to be at or above the elevations specified for dwellings. Earlier editions specified elevation of the lowest floor of the manufactured home units.

#### Manufactured vs. Mobile Home

The term “mobile home” is sometimes used as a synonym for manufactured home. However, the U.S. Department of Housing and Urban Development generally considers mobile homes to be units manufactured prior to enforcement of the agency’s Manufactured Home Construction and Safety Standards that became effective on June 15, 1976.

#### FEMA P-85, *Protecting Manufactured Homes from Floods and Other Hazards*

FEMA P-85 explains the regulatory requirements for installation of manufactured homes in flood-prone areas and provides a best practices approach to reducing damage from natural hazards.

The document is available at [www.fema.gov/media-library/assets/documents/2574](http://www.fema.gov/media-library/assets/documents/2574).

#### Modular Buildings

Modular buildings, like manufactured homes, are constructed in factories. However, they are not built on permanent chassis and thus installation of modular buildings is not regulated like installation of manufactured homes. Modular buildings must be regulated to the same requirements as site-built buildings.

## Differences Between NFIP Requirements and the I-Codes

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I-Code appendices are optional unless explicitly adopted. IRC Appendix E, Manufactured Housing Used as Dwellings, includes Section AE101.2 requiring compliance with Section R322 when manufactured homes are installed in flood hazard areas.

**IBC Appendix G.** IBC Appendix G requires manufactured home foundations to be designed in accordance with IRC Section R322, and the NFIP option to allow certain units to be installed on piers or foundation elements that are only 36 inches above grade is not included. IBC Appendix G applies only if explicitly adopted.

### 3.5 Existing Buildings/Existing Structures

#### 3.5.1 Existing Building Requirements

**NFIP.** The NFIP requires participating communities to review permit applications for work on existing buildings to determine whether the work constitutes Substantial Improvement or repair of Substantial Damage. When such determinations are made, communities must require nonconforming buildings to be brought into compliance with the NFIP requirements for new construction. The NFIP uses the terms “new construction” and “existing building”:

- **New construction.** As used by the NFIP, the term “new construction” includes any building that was built after the date a community adopted its first floodplain management regulations and any subsequent improvements to such buildings. Communities began adopting regulations in 1970, shortly after the NFIP was authorized in 1968. Thus, some buildings that meet the NFIP definition for “new construction” are nearly 50 years old. Any work performed on compliant buildings, regardless of the scope or cost, must be performed in a manner that ensures continued compliance with the floodplain management requirements (including BFE and flood zone) that were in effect at the time the buildings were permitted.
- **Existing building.** The term “existing building” is not explicitly defined by the NFIP, although “existing construction” is defined for the purpose of determining flood insurance rates. For floodplain management purposes, the term “existing buildings” refers to buildings that predate a community’s adoption of its first floodplain management regulations. Many existing buildings do not conform to current floodplain management requirements (i.e., they are nonconforming), which means they were not required to meet floodplain management requirements at the time the buildings were permitted.

**I-Codes.** The I-Codes define an existing building as a “building erected prior to the date of adoption of an appropriate code, or one for which a legal building permit has been issued.” A premise of the codes is that any new work on existing buildings and structures must comply with the current code and must not violate the terms of the code that was in effect at the time of original construction. This means, for example, that a building constructed “to code” in 2003 should not be issued a subsequent permit for work that renders the building noncompliant with the code that was in effect in 2003, unless the pertinent requirements of the code have been subsequently modified. Similarly, it means owners who modify buildings in ways that render them noncompliant with the provisions of the code under which they were originally built (if any) are violating the terms of the original permits.

**IRC.** The IRC applies to work on dwellings that can only be performed on existing dwellings, including alteration, movement, enlargement (additions), replacement, repair, removal, and demolition. States

## Differences Between NFIP Requirements and the I-Codes

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and communities that enforce the IEBC typically apply it to all existing buildings and structures, including dwellings. Some states and communities adopt IRC Appendix J, Existing Buildings and Structures.

**IBC/IEBC.** Starting in the 2018 editions of the IBC and IRC, the definitions for existing building and existing structure refer to buildings and structures “erected prior to the date of adoption of an appropriate code, or one for which a legal building permit has been issued.” Definitions in earlier editions reference the effective date of a community’s first floodplain management code, ordinance, or standard. For floodplain management purposes, work proposed to alter, add to, repair, or otherwise improve existing buildings in flood hazard areas must be evaluated to determine whether the work is Substantial Improvement or repair of Substantial Damage (see Section 3.1.5).

### IBC and Existing Buildings

Starting with the 2015 edition, the IEBC is a referenced code in the IBC (see IEBC Sec. 101.4.7). Detailed provisions of IBC Chapter 34, Existing Structures, were removed from the IBC because the requirements for existing buildings and structures are contained in the IEBC.

### 3.5.2 Additions

**NFIP.** Work proposed for existing buildings, including additions, must be evaluated to determine whether the work constitutes Substantial Improvement. Additions are improvements that increase the floor area of buildings and include lateral additions, vertical additions, and enclosure of decks and open areas under elevated buildings. The NFIP regulations do not have an explicit requirement specifying when additions must comply with requirements for new construction or when existing buildings must be brought into compliance when additions are proposed. Some FEMA guidance documents refer to whether the common wall between an existing building and an addition is modified by “more than a doorway.” The implication is that such a minor modification does not alter the load-bearing capacity of the existing (base) building and the lateral addition has its own supporting foundation. Chapter 6 of FEMA P-758, *Substantial Improvement / Substantial Damage Desk Reference*, has specific descriptions of when additions must comply and when additions plus base buildings must be brought into compliance.

Whether an addition is or is not structurally connected and whether a base building is nonconforming are factors that determine whether a base building is required to be brought into compliance. If structurally connected, flood loads imposed on a non-elevated addition would impart loads on the base building. If an addition has a separate foundation (i.e., not structurally connected), then the addition can be elevated without requiring the base building to be brought into compliance. The caveat is that if the base building was permitted after the community’s first regulations were adopted, then all work must conform to the community’s regulations, regardless of the scope or cost of the work.

**IRC.** The scope of the IRC includes work that can be done only on existing dwellings, including alteration, movement, enlargement, replacement, and repair. The code requires all new work to comply. Section R102.7.1 explicitly states that “additions, alterations or repairs shall conform to the requirements for a new structure without requiring the existing structure to comply with the requirements of this code, unless otherwise stated.” Thus, it is implicit that additions to dwellings in SFHAs have to be elevated and otherwise comply with the flood requirements. The IRC, like the NFIP regulations, does not have specific requirements that distinguish when existing base buildings must be brought into compliance when additions are proposed, other than the general statement that

## Differences Between NFIP Requirements and the I-Codes

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projects determined to constitute Substantial Improvement or repair of Substantial Damage are required to meet the requirements of Section R322.

**IBC.** The IBC requires all new work to comply with the code, including work on existing buildings. Beginning with the 2015 IBC, existing buildings are required to comply with the IEBC (below). In earlier editions, IBC Chapter 34, Existing Structures, contains requirements applicable to existing buildings, including a section on additions to buildings in SFHAs. In general, if an addition to a building in an SFHA is structurally connected and determined to be Substantial Improvement, then the addition and the existing building must be brought into compliance with the requirements for new construction in flood hazard areas. If not structurally connected, only the addition must be compliant.

**IEBC.** The IEBC provides three compliance methods (approaches) for determining compliance of work performed on existing buildings: prescriptive compliance method, work area compliance method, and performance compliance method. Each method specifies compliance with flood provisions when proposed work is determined to be Substantial Improvement or repair of Substantial Damage.

The work area compliance methods are articulated in separate chapters for alterations, change of occupancy, additions, and historic buildings. Specific provisions are listed for horizontal additions (structurally connected and not structurally connected), vertical additions, raised or extended foundations, and new or replacement foundations, all of which may trigger the requirement to bring existing buildings into compliance with the requirements for flood hazard areas. The IEBC commentary describes additions that are not structurally connected to mean having isolated, self-supporting foundations. Thus, the condition for structural connection is equivalent to the intent of the NFIP guidance regarding the common wall between a building and an addition.

### 3.5.3 Historic Structures

**NFIP.** The NFIP regulations give special consideration to the unique value of certain historic buildings and structures (see definition in text box below). Provided such structures retain their designations, they are not required to be brought into compliance when proposed work is determined to be Substantial Improvement or repair of Substantial Damage. Communities may use one of two provisions for historic structures: (1) rely on the definition of Substantial Improvement that “does not ... include” historic structures; or (2) provide relief by issuing variances for repair or rehabilitation of historic structures. When the variance approach is used, communities must determine the variances are the minimum necessary to preserve the historic character and design of the structure. As a result, those communities may require compliance with some flood reduction measures that do not affect historic designations, such as relocation and elevation of mechanical equipment and use of flood damage-resistant materials below the BFE.

**I-Codes.** The IBC and IEBC definition of “historic building” includes some buildings that are not within the NFIP definition. Specifically, the term includes designations by state or local programs that may not be certified by the Secretary of the Interior or by a certified state program. Thus, to satisfy the NFIP requirement, the I-Codes first require all historic buildings in SFHAs to be brought into compliance if proposed work is determined to be Substantial Improvement or repair of Substantial Damage. Then, an exception to that requirement captures the NFIP consideration for qualifying historic structures. Historic buildings do not need to be brought into compliance if the buildings meet

## Differences Between NFIP Requirements and the I-Codes

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what is essentially the equivalent of the NFIP definition for historic structures and the proposed work allows them to continue to be designated historic structures.

### Definitions: Historic Structures and Buildings

**NFIP:** Historic structure means any structure that is:

- (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of [the] Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or
- (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
  - (1) By an approved state program as determined by the Secretary of the Interior or
  - (2) Directly by the Secretary of the Interior in states without approved programs.

**2018 IBC/IEBC:** HISTORIC BUILDINGS. Any building or structure that is one or more of the following:

1. Listed or certified as eligible for listing by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.
2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource with in a National Register, state designated or locally designated historic district.

**2015 and earlier IBC/IEBC:** HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law.

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### Chapter 4 Questions Related to Coordinating I-Codes and Floodplain Management Regulations

The benefits of adopting and relying on the flood provisions of the I-Codes to meet the NFIP requirements for buildings and structures in SFHAs are described in Section 2.2 of this guide. However, achieving those benefits can come with challenges. One challenge is to coordinate the codes with local floodplain management regulations to eliminate duplication and conflicts. Over the long term, local enforcement of the flood provisions in the I-Codes should help the NFIP and communities meet the goals of reducing flood losses, reducing the costs and adverse consequences of flooding, and reducing the need for state and federal emergency response and recovery.

State and local floodplain management officials who are not directly involved with building codes may need to learn more about building codes in general, and specifically the flood provisions in the codes. One of the primary objectives of this guide is to provide state and local floodplain management officials with tools to become familiar with the flood provisions in the I-Codes and to identify differences from and similarities with floodplain management regulations (see Chapter 3). Achieving consistency with the NFIP and improving enforcement will help participating communities to fulfill their commitments to the NFIP.

To that end, Table 4-1 identifies pertinent questions described in this chapter that should be answered in the context of existing statutes and codes of each state or community. States and communities should also examine the other chapters of this guide to evaluate their options and make decisions about which approach to floodplain management will be most effective in their state or community (see Chapter 2). One of at least two decisions may result:

- A decision to develop a code-coordinated floodplain management ordinance, in which case the model code-coordinated ordinances introduced in Chapter 6 should be examined and modified as appropriate.
- An informed decision to retain the community's stand-alone floodplain management regulations and also enforce the flood provisions of the building codes. In this case, it is important for the community to contact the NFIP State Coordinator or FEMA Regional Office for assistance with identifying and clarifying differences as soon as possible. Until that clarification is completed, the community must ensure coordination among departments involved in floodplain management and building permits to resolve differences on a case-by-case basis.

#### Review of Local Ordinances

Changes to local floodplain management regulations must be reviewed by NFIP State Coordinators or FEMA Regional Offices before adoption.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

**Table 4-1: Contents of this Chapter: Questions Related to Coordinating I-Codes and Floodplain Management Regulations**

Click on a section to go directly to that question.

- [4.1 Does the State Have Rules for Flood Hazard Area Development That Are Administered by a State Agency?](#)
- [4.2 How Are Differences Between the I-Codes and Other Regulations Resolved?](#)
- [4.3 At What Level Are Building Codes Adopted?](#)
- [4.4 Which Codes \(and Which Editions\) Are Adopted?](#)
- [4.5 Is Chapter 1 of the I-Codes Adopted?](#)
- [4.6 Is Chapter 1 of the I-Codes Modified?](#)
- [4.7 Does the State Regulate Certain Activities or Buildings?](#)
- [4.8 Is Specific Work Exempt from Building Permits?](#)
- [4.9 Are Specific Buildings Exempt from the Code?](#)
- [4.10 Which Code Covers Existing Buildings?](#)
- [4.11 Is IBC Appendix G Adopted?](#)
- [4.12 Were Flood Provisions in the Body of the Codes Modified by the State?](#)
- [4.13 Was IBC Appendix G Modified by the State?](#)
- [4.14 Does the State Allow Local Amendments?](#)
- [4.15 How Are FISs and FIRMs \(and Revisions\) Adopted?](#)
- [4.16 How Are Manufactured Homes Regulated?](#)
- [4.17 Does the State Code Council Issue Interpretations?](#)

### **4.1 Does the State Have Rules for Flood Hazard Area Development That Are Administered by a State Agency?**

Some states adopt rules or regulations that apply to development in flood hazard areas, including buildings and structures. In these states, unless the local floodplain management regulations are explicitly written to incorporate the state requirements, the public could have three sets of requirements to consider, putting considerable burden not only on the public, but also on local officials. The three sets of requirements would be:

1. State rules or regulations administered by a state agency that issues permits
2. Building codes enforced by communities
3. Floodplain management regulations enforced by communities

One solution to this situation would be for the state agency that administers state-level floodplain management requirements to work with the state building code agency to incorporate state-specific requirements for buildings into the building code (and IBC Appendix G, if appropriate, see Section 4.7).

### **4.2 How Are Differences Between the I-Codes and Other Regulations Resolved?**

The answer to this question is particularly important for communities that enforce building codes with flood provisions and that also have stand-alone floodplain management regulations that include explicit provisions for the design and construction of buildings and structures. Having two regulatory instruments that contain similar requirements creates a burden on the regulated public and those charged with enforcing both instruments. Although it is simple to state the premise that the “more restrictive prevails,” determining which is more restrictive, on a case-by-case basis, may be difficult in practice.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

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States have addressed differences and the potential for conflicts in a number of ways, for example:

- **By statute, only the building code governs.** Some states have a clear statutory provision that only the building code governs the design and construction of buildings. In those states, these provisions could conceivably lead to the conclusion that requirements for buildings in local floodplain management regulations are invalid.
- **The building code explicitly provides that the more restrictive measure prevails.** Some states have inserted in their building codes explicit statements that the more restrictive floodplain management requirements of the building code and local regulations prevail. Although most of the actual requirements may be similar, there is a potential for uneven enforcement and misinterpretation because local regulations typically use slightly different phrasing than the building codes, thereby necessitating a case-by-case resolution of differences. Another consequence of this approach is that local officials may not actually know which provisions are more restrictive, in which case continued reliance on local floodplain regulations could result in authorizing construction that does not meet the requirements of the building code.
- **There is no explicit statement.** Many states are silent on the potential for conflicts, with the implication that conflicts are to be resolved by local officials. This can lead to uneven interpretation and enforcement, not only between communities, but over time in any given community. In communities that assign floodplain management and building code responsibilities to different departments, lack of coordination may lead to enforcement of a less restrictive requirement.

### State Codes Based on I-Codes

Even though they are based on the I-Codes, state-adopted building codes are typically referred to as the state's code, not the I-Codes. For example, New York State adopts the I-Codes by regulation (with state amendments) and specifically states the codes are the *New York State Uniform Code*.

### 4.3 At What Level Are Building Codes Adopted?

Building codes are adopted at the state level by many states and may be adopted at the local level in other states. The International Code Council records indicate one or more of the I-Codes is adopted or used in all 50 states and the 4 U.S. territories. Based on data tracked by FEMA, in late 2018, 23 states adopt codes based on the I-Codes and require enforcement by local jurisdictions. The remaining states handle codes in a variety of ways, including:

- State does not require communities to adopt a code, but specifies the code that communities must adopt if they elect to do so.
- State is either silent or expressly permissive regarding building codes, allowing communities to determine whether to adopt a building code and which code to adopt.
- State adopts the code at the state level only for state construction.
- State adopts the code and directly enforces it for certain types of buildings, such as schools, hospitals, and other specific occupancies.
- State adopts only the IBC or the IRC, typically with mandatory local enforcement.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

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Most states have an agency that is responsible for developing building codes. Usually the function is located in a community or economic development agency. Sometimes the State Fire Marshall's office is designated, especially if codes are not adopted at the state level. A simple Internet search is usually sufficient to identify the designated agency. State code agency contacts can be accessed by clicking on states on the interactive map at [www.iccsafe.org/international-code-adoptions/](http://www.iccsafe.org/international-code-adoptions/).

### 4.4 Which Codes (and Which Editions) Are Adopted?

One step in coordinating local floodplain management regulations with building codes is to determine which codes and which editions are adopted by the state or community. Most states and communities adopt codes based on the family of I-Codes.

If the 2012 or later editions of the I-Codes are adopted and enforced, then communities can rely on the flood provisions of the codes to fulfill their responsibilities for participating in the NFIP provided development other than buildings is also regulated. Because requirements for utilities and equipment that serve buildings in flood hazard areas are specified in the IBC (by reference to ASCE 24) and in the IRC, there are no gaps or conflicts if one or more of the codes that govern mechanical, plumbing, and fuel gas installations (IMC, IPC, IFGC) is not adopted.

Although the flood provisions of the adopted code may be relied on, adopting either the IBC or IRC alone does not adequately regulate all buildings. Therefore, if only the IBC or only the IRC is adopted, communities must also have complete floodplain management regulations that include provisions for buildings not within the scope of the adopted code. However, based on a review of data reported to the International Code Council, few states and communities adopt only the IBC or only the IRC.

#### New Editions of the I-Codes

The International Code Council publishes a new edition of the I-Codes every 3 years. Many states also update codes on a 3-year cycle, although some do so every 5 or 6 years.

In states where the adoption of codes is not mandatory or the adoptable code is not specified, each community determines which edition to adopt and when to adopt a more recent edition.

### 4.5 Is Chapter 1 of the I-Codes Adopted?

Another step in coordinating local floodplain management regulations with building codes involves examining the administrative provisions of the codes. Each of the I-Codes has a Chapter 1, *Scope and Administration*. The International Code Council describes this chapter as “establish[ing] the limits of applicability of the code and describ[ing] how the code is to be applied and enforced” and furthers states that the code “cannot be effective without adequate provisions for its administration and enforcement.”

#### State Adoption of I-Codes

The International Code Council's Code Adoption Toolkit includes a summary of the code adoption process by state at [www.iccsafe.org/code-adoption-resources/](http://www.iccsafe.org/code-adoption-resources/). Contact state building code agencies or commissions for more details.

States handle Chapter 1 in several ways:

- Some states adopt multiple codes and retain Chapter 1 of each code, relying on building officials to handle the differences between the administrative provisions.
- Some states adopt a single Chapter 1 (typically with amendments) to be used to enforce all codes.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

- Some states do not adopt Chapter 1, and instead, allow communities to develop their own administrative and enforcement provisions (which many communities do by locally adopting Chapter 1 of the I-Codes). Communities that develop their own administrative provisions should review Chapter 1 of the I-Codes and then determine what modifications are necessary, taking care to include provisions related to enforcing the flood provisions of the codes.
- Some states do not adopt Chapter 1, but write their own state-specific regulations that are used to administer and enforce the codes. These states should take care to include provisions related to enforcing the flood provisions of the codes.

For the most part, Chapter 1 in the IBC and Chapter 1 in the IEBC are the same. Chapter 1 of the IBC and IRC are similar in most respects. Specific to flood hazard areas:

- **Site plans.** The IBC and IRC require site plans to show any flood hazard areas, floodways, and DFEs.
- **Authority to grant modifications.** The IBC, IEBC, and IRC limit the building official's authority to grant modifications of any provision related to flood hazard areas; instead, the codes require the granting of variances, as specifically provided for in the codes.
- **Inspections.** The IBC and IRC require lowest floor/floodplain inspections and submission of elevation documentation "upon placement of the lowest floor, including basement, and prior to further vertical construction" (the IEBC requires the same for additions and Substantial Improvements). In addition, the codes require submission of documentation of building elevations prior to final inspections.

With respect to flood provisions, the most significant differences in administrative provisions of the IBC, IRC, and IEBC are related to:

- **Construction documents.** IRC Section R106.1.3 requires applicants to specify the proposed elevation of the lowest floor (or lowest horizontal structural member). IBC Chapter 1 does not require applicants to specify proposed building elevations in building permit applications. Instead, Section 1603 specifies structural design information that must be included in construction documents, including flood design data (Section 1603.1.7).
- **Substantial Improvement and Substantial Damage determinations.** The 2018 and 2015 editions of the IBC, IRC, and IEBC assign the specific duty to make Substantial Improvement and Substantial Damage determinations to the building official. The 2012 and earlier editions of the IBC and IEBC rely on the definitions for Substantial Improvement and Substantial Damage, and the administrative provisions are silent about the building official making determinations. The 2012 and earlier editions of the IRC specify that the building official makes a finding regarding costs and market values, and the Board of Appeals makes the determination as to whether proposed work constitutes Substantial Improvement or repair of Substantial Damage.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

### 4.6 Is Chapter 1 of the I-Codes Modified?

If Chapter 1, *Scope and Administration*, of the I-Codes is adopted, another step in coordinating local floodplain management regulations with building codes involves examining provisions specific to flood hazard areas.

States that adopt Chapter 1 with modifications should take care to retain the administrative provisions for enforcement of the flood provisions. Consistency with the NFIP can be affected if those administrative provisions are modified or removed, in which case communities must recapture the NFIP requirements in their floodplain management regulations. Examples of Chapter 1 modifications include:

#### Recapturing Provisions in Local Floodplain Management Regulations

When flood provisions are removed from building codes, or when specific types of buildings are exempt from the code (see Section 4.9 of this guide), those provisions must be included—recaptured—in local regulations to maintain consistency with the NFIP.

- **Exempting specific buildings and structures from the building code.** The I-Codes, taken together, include all buildings and structures within their scoping statements. Many states modify Chapter 1 to exempt specific buildings from the requirements of the code (see Section 4.9). Because the NFIP requires communities to regulate *all* development, buildings exempt from the code must be recaptured in local floodplain management regulations (see Section 5.2.1).
- **Removing certain provisions.** For a variety of reasons, some states remove certain provisions from the Chapter 1. If any provision that contains content specific to flood hazard areas is removed, it must be recaptured in the local floodplain management regulations.
- **Adding a provision for issuance of permits based on affidavit.** The I-Codes require submission of applications and construction documents for all buildings and structures, and building officials are required to review the documents before issuing permits. Some states modify Chapter 1 to allow permits to be issued without review if an application is accompanied by a sworn affidavit signed by a design professional to certify the submitted plans conform to the technical provisions of the codes. Because the NFIP regulations require communities to review all permit applications to determine compliance, communities must review applications submitted with affidavits to determine or confirm compliance with the flood provisions.
- **Providing for a waiver of design certifications for one- and two-family dwellings.** Although the IRC is primarily a prescriptive code, there are circumstances in which designs are required to be prepared and sealed by registered design professionals. Some states remove requirements for these certifications. Because the NFIP requires designs for new construction and Substantial Improvements (including buildings that have incurred Substantial Damage) in coastal high hazard areas (Zone V) to be prepared and sealed by registered professional engineers or architects, communities must have a mechanism to require these certifications.

### 4.7 Does the State Regulate Certain Activities or Buildings?

One step in coordinating local floodplain management regulations with building codes is determining whether the state has statutory authority to regulate certain activities or specific types of buildings.

## **Questions Related to Coordinating I-Codes and Floodplain Management Regulations**

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Many states administer state floodplain or water resources regulatory programs under which they issue permits, conduct inspections, and take enforcement action. Some states have broad authority to regulate all activities and development in flood hazard areas, while others are limited to certain activities such as roads, bridges, levees, utility installations, and channelization projects. These state programs do not supplant community responsibilities under the NFIP, and communities must still issue permits to fulfill the NFIP requirement to regulate all development.

Some states, as part of their building code authority, reserve the authority to regulate certain types of buildings, such as hospitals, nursing homes, water supply and wastewater treatment facilities, chemical plants, and some other industrial operations. If communities are explicitly precluded from regulating those buildings, then it is incumbent on the state to ensure that its regulatory criteria meet or exceed the NFIP requirements for construction in SFHAs. States that require those buildings and facilities to comply with the flood provisions of building codes based on the I-Codes fulfill that responsibility.

### **4.8 Is Specific Work Exempt from Building Permits?**

Another step in coordinating local floodplain management regulations with building codes is determining whether specific types of work are exempt from the requirement for building permits. The NFIP requires communities to regulate all “development,” a broadly defined term, in SFHAs, including work that is specifically exempt by a building code from the requirement to obtain building permits.

The IBC, IEBC, and IRC each includes, in Chapter 1, lists of work for which permits are not required. Some of the work listed occurs inside buildings or is temporary in nature. Some of the work under the subset “Building” falls within the NFIP’s broad definition of development: detached accessory structures; fences up to a specified height; certain retaining walls, sidewalks, and driveways; oil derricks; and certain water tanks. Importantly, the codes specify that the exemption “shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of the jurisdiction.” Thus, while compliance is required, building permits are not required to be issued. NFIP communities must still issue permits or approvals for these activities if carried out in SFHAs. This can be done in a companion floodplain management ordinance or IBC Appendix G (see Section 4.11). IBC Appendix G is specifically applicable to development that is not within the scope of the I-Codes, including “certain building work exempt from permit under Section 105.2.” Specific requirements for “other building work” are included in IBC Appendix G, Section G801.

### **4.9 Are Specific Buildings Exempt from the Code?**

The NFIP requires communities to regulate all development in SFHAs, including all buildings and structures. One step in coordinating local floodplain management regulations with building codes is determining whether specific buildings are exempt from the code. Although buildings that are exempt from the code are not required to comply with the code, this is not the same as exempting certain types of *work* from the requirement to obtain permits (see Section 4.8).

The I-Codes do not exempt any buildings or structures from the code: every building and structure is subject to the code. However, many states modify Chapter 1 of the I-Codes (or write their own administrative provisions) to list specific types of buildings and structures that are exempt from the code. Usually the exemption is specified in statutes or regulations and a section in Chapter 1 of the

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

building code either cites that authority or replicates the statutory or regulatory exemptions. The most common exemption is agricultural or farm structures. Other common exemptions include construction trailers used as temporary offices, towers not attached to buildings, residential accessory buildings, private recreational structures (such as hunting or fishing camps, especially those without electric service), facilities ancillary to the railroad, electric utility facilities regulated by a state agency, and temporary housing (such as provided by a state corrections department).

The fact that a state may explicitly exempt certain buildings and structures from the building code does not relieve communities of the responsibility under their commitment to the NFIP to regulate those buildings and structures. Because the NFIP requires communities to regulate all development, buildings exempt from the code must be recaptured in local floodplain management regulations. This can be accomplished by including specific provisions in the regulations for the specific types of buildings exempt from the codes), and by specifying that buildings and structures exempt from the building code are subject to the requirements of ASCE 24. Section 5.2.1 illustrates how IBC Appendix G can be modified to recapture buildings exempt from the building code. Similar provisions can be incorporated into a companion floodplain management ordinance.

### 4.10 Which Code Covers Existing Buildings?

Building codes must govern work on existing buildings to satisfy the NFIP requirements for buildings and structures in SFHAs. If the codes are modified such that work on existing buildings is not regulated, then local floodplain management regulations must explicitly recapture requirements for existing buildings. Incorporating requirements for existing buildings into local floodplain management regulations could introduce differences between the flood provisions of the codes and local regulations (see Section 4.2). Alternatively, local regulations could specify that additions, alterations, improvements, and repairs of existing buildings and dwellings, if determined to be Substantial Improvement or repair of Substantial Damage, are subject to the requirements of ASCE 24.

***The NFIP and Existing Buildings.*** The NFIP has requirements that apply to existing buildings. Communities are required to make determinations as to whether work on existing buildings meets the definition for Substantial Improvement or is repair of Substantial Damage. When work on a building is determined to be Substantial Improvement, or when damage is determined to be Substantial Damage, the NFIP and the building codes require the building to be brought into compliance with the requirements for new construction in SFHAs.

The NFIP regulations define the term “existing construction” (and existing structures) for the purposes of determining rates used to write flood insurance policies. For that purpose, existing buildings are those for which the start of construction commenced before the effective date of a community’s first FIRM or before January 1, 1975, for FIRMs effective before that date.

The NFIP regulations also define “new construction” for floodplain management purposes, referring to buildings for which the start of construction occurred after the effective date of a community’s first floodplain management regulations. The premise is that all new construction and Substantial Improvements built after a community adopted floodplain management regulations should have been designed and built to comply with the floodplain management

#### Post-FIRM and Pre-FIRM

The terms “post-FIRM” and “pre-FIRM” are insurance terms that are tied to a community’s initial FIRM and used by the NFIP to determine flood insurance rates.

Reliance on the terms for compliance can lead to incorrect interpretations of the Substantial Improvement and Substantial Damage requirements.



## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

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regulations in effect at the time the permit was issued. Importantly, the term includes any subsequent improvements to those buildings. Thus, the NFIP uses the term “new construction” to refer to buildings that may be many years old. The first communities joined the NFIP in 1970, which means buildings constructed after their first regulations will be 50 years old in 2020.

FEMA revises FISs and flood hazard maps from time to time, adding another element to enforcement of the Substantial Improvement and Substantial Damage requirements. A building may, indeed, have been compliant when the permit was issued and the building was built, but if the flood hazard area has changed (e.g., a new FIRM shows a different BFE or there has been a change in a flood zone designation), then when that building is undergoing Substantial Improvement or has incurred Substantial Damage, the requirement to bring it into compliance with the *current* flood-resistant provisions applies.

***The I-Codes and Existing Buildings.*** How the I-Codes handle existing buildings has evolved over time. The IBC and IEBC define existing buildings to be structures “erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.” The 2015 and 2018 editions of the IBC reference the IEBC for existing buildings, while the 2012 and earlier editions of the IBC include provisions for existing buildings in Chapter 34.

The IRC, by its scoping statement, governs work on existing buildings (i.e., “shall apply to the construction, alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition...”). Section R105.3.1.1 specifies determination of whether reconstruction, rehabilitation, addition, alteration, repair, or other improvement of existing buildings in flood hazard areas is Substantial Improvement or repair of Substantial Damage.

Some states and communities elect to adopt IRC Appendix J, which applies to existing dwellings. Section AJ102.5 applies to existing dwellings in flood hazard areas and refers to Section R105.3.1.1, which specifies Substantial Improvement and Substantial Damage determinations.

### 4.11 Is IBC Appendix G Adopted?

Appendices to the I-Codes are not applicable unless specifically adopted. If the code is adopted at the state level, a state may:

- **Adopt IBC Appendix G with mandatory enforcement.**

In these states, communities are required to enforce IBC Appendix G. Most communities are likely to also have stand-alone floodplain management ordinances that contain requirements for buildings and requirements similar to those in Appendix G. NFIP State Coordinators should determine how communities should resolve differences. One option is to encourage communities to adopt regulations that are similar to Model Ordinance Version One, which is written to coordinate with the I-Codes and Appendix G. This approach is likely to be most effective when floodplain management responsibilities are assigned to the community’s building department, although IBC Appendix G may be modified to assign it to another department (see Section 5.4.1).

#### IBC Appendix G and NFIP

FEMA prepares checklists that demonstrate how all of the NFIP requirements are addressed by the I-Codes (including IBC Appendix G). Checklists for the 2012 and later editions are available under the “Flood Resistant Provisions of the International Codes” entries on the Flood heading on FEMA’s Building Code Resources page: [www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources).

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

- **Make IBC Appendix G available for adoption by communities.** Some states do not mandate enforcement of IBC Appendix G, but allow its adoption by communities. When communities have this option, they should examine IBC Appendix G and Model Ordinance Version One.
- **Not adopt or make IBC Appendix G available.** In these states, communities have no choice. Adopting local floodplain management regulations that contain provisions equivalent to IBC Appendix G achieves consistency with the NFIP. Model Ordinance Version Two and Model Ordinance Version Three are specifically written for this purpose.

One step in coordinating local floodplain management regulations with building codes is determining how development other than buildings and structures will be regulated. States and communities that adopt the 2012 or later I-Codes with IBC Appendix G and do not make any modifications that weaken the requirements will meet or exceed the NFIP requirements for the purposes of NFIP participation. Modifications that add NFIP-consistent provisions or make provisions more stringent are acceptable (see Section 5.4 for suggestions to modify IBC Appendix G).

IBC Appendix G is intended to fulfill the floodplain management and administrative requirements of the NFIP that are not included in the body of the I-Codes. IBC Appendix G outlines the duties and powers of the official administering the appendix, the requirement to obtain permits for development other than buildings and structures in flood hazard areas, variances, subdivisions, site improvements, installation of manufactured homes, recreational vehicles, tanks, other building work, temporary structures and temporary storage, and Utility and Miscellaneous Group U structures (which are identified in IBC Section 312). Other building work includes garages and accessory structures; fences; oil derricks; retaining walls, sidewalks, and driveways; swimming pools; decks, porches, and patios; nonstructural concrete slabs; and roads and watercourse crossings in floodways.

### **4.12 Were Flood Provisions in the Body of the Codes Modified by the State?**

Just because a state's code is based on the I-Codes does not mean its communities can rely on the codes to meet the NFIP requirements for buildings and structures without further analysis. An important step is to check whether any flood provisions were deleted or modified by the state.

Most states undertake a deliberative process to review the I-Codes and consider amendments, while others adopt the I-Codes and do not have a process for amendments. Sometimes the review process is open to the public and sometimes it is undertaken by committees appointed by state code councils. The codes usually are adopted by rule and thus modifications are also promulgated as state rules.

Every state that has a modification process provides the opportunity to modify the flood provisions, and those modifications may strengthen or weaken the requirements. State-specific modifications are usually accessible online. Some states have the International Code Council publish their state-specific codes. States that do not publish state-specific codes expect building officials, design professionals, and the public to use the I-Codes along with the state-specific amendments. Many state codes are accessible online as read-only files.

Some states modify the codes to incorporate higher standards, such as requiring additional elevation (freeboard) beyond what is specified in the I-Codes. However, some states make modifications that remove or weaken certain flood provisions, such as removing freeboard. Some states remove all flood provisions and, instead, refer to local floodplain management regulations. In

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

these cases, communities cannot rely on the adopted codes to satisfy the NFIP requirements for buildings and structures. Instead, communities must ensure that their floodplain management regulations are in compliance with the NFIP.

### **4.13 Was IBC Appendix G Modified by the State?**

In states that adopt IBC Appendix G (and those that make it available for local adoption), another step in coordinating codes is to determine whether any provisions of IBC Appendix G were modified as part of the state's review and amendment process. As with the body of the code (refer to Section 4.12), if a state removes or weakens the provisions that are required by the NFIP, communities may not be able to rely on the appendix for administrative requirements and requirements for development other than buildings.

### **4.14 Does the State Allow Local Amendments?**

The answer to this question is important for communities that adopt standards that exceed the NFIP requirements for buildings and structures. Entwined with this question is whether standards that exceed the NFIP requirements that are adopted in local floodplain management regulations prevail over the provisions of the building code (see Section 4.2).

Many states that adopt the I-Codes at the state level do not allow local amendments. One of the primary justifications for a statewide building code is uniformity, and many states consider that rationale is weakened if communities are permitted to make amendments, even amendments that make the code more restrictive to address local conditions.

States that allow local amendments usually require that amendments not weaken the code and that amendments be justified based on local conditions. Many specify that local amendments be reported to the state, and some states post local amendments online for ready access by the public. The most common ways states handle local amendments are:

- **Approval by the state code council is not required.** In these states, communities that want to adopt a more restrictive provision may have to follow specific steps and meet certain requirements to justify local amendments, but are not required to obtain formal approval. Some state code councils review local amendments for form only, and have no authority to approve or deny.
- **Approval by the state code council is required.** In these states, communities must follow specific steps and meet certain requirements to justify local amendments, and they are required to submit proposed amendments to the state code council for action.

### **4.15 How Are FISs and FIRMs (and Revisions) Adopted?**

The NFIP requires communities that participate in the NFIP to adopt FISs and FIRMs. Communities may adopt maps of areas not studied by FEMA or maps that show flood-prone areas not shown on FIRMs, as long as the flood-prone areas shown on local maps encompass at least the SFHAs shown on FIRMs. FEMA periodically revises and updates FISs and FIRMs to adjust for changing conditions, improved topographic mapping, and improved modeling technologies. Participating communities are required to adopt revised studies and maps.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

Some states have due process requirements for local adoption of maps used for land use and zoning purposes, requiring every map and every map revision to be adopted after public notice and hearings. Other states do not have similar due process requirements, thus permitting “automatic” adoption of revised FISs and FIRMs. Some states are silent with respect to how communities handle adoption of maps. If automatic adoption is permitted by a state, then local codes and regulations must include phrasing such as “any future amendments and revisions thereto.” Local officials should check with the NFIP State Coordinator to determine whether automatic adoption of revised FISs and revised FIRMs is permitted.

The I-Codes contain “auto-adoption” language in the sections that establish flood hazard areas by adoption of FISs and FIRMs. However, it is important to note that inclusion of the auto-adoption provision in the codes does not preempt state laws that require due process for map adoption. The IBC and IRC sections described here are written with the expectation that communities will insert community-specific data about their FISs and FIRMs, although doing so is uncommon:

- **IBC Section 1612.3.** This section specifies that the applicable governing authority must adopt a flood hazard map and supporting data. At a minimum, the FISs “as amended or revised” and the accompanying FIRMs “and related supporting data along with revisions thereto” must be adopted. Communities are expected to insert the effective date and name of the FIS (which includes the FIRMs).
- **IRC Table R301.2(1).** Local jurisdictions establish climatic and geographic design criteria by completing Table R301.2(1). The table cell labeled Flood Hazards is completed as described in footnote (g), by insertion of the date of the community’s entry into the NFIP, the date of the current FIS, and the panel numbers and dates of all currently effective FIRMs and Flood Boundary and Floodway Maps or other flood hazard map adopted “as amended.”

The most common way that communities adopt their FIS and FIRMs is by identifying the FIS by full title and date in local floodplain management regulations. The FIRMs accompany the FIS and are adopted when the FIS is adopted. When the I-Codes are relied on to meet NFIP requirements, communities should make sure they adopt the FIS and FIRMs, whether by insertion of relevant data in the codes themselves, or by citation in a companion ordinance.

### **4.16 How Are Manufactured Homes Regulated?**

The NFIP requires communities to regulate all development in SFHAs, including the installation of manufactured homes. Most states regulate installation of manufactured homes under separate authorities from building codes, usually by regulations administered by a transportation department or community development agency.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

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HUD publishes an installation standard for new manufactured homes, *Model Manufactured Home Installation Standards* (24 CFR Part 3285). With respect to flood hazard areas, the installation standard requires manufacturers to indicate whether “the foundation specifications *have been designed for flood-resistant considerations...or the foundation specifications are not designed to address flood loads*” (italics added). If the specifications are designed for flood resistance, the conditions of applicability are to be listed (velocities, depths, or wave action). If designs and instructions for installation in areas subject to flood damage are not available from the manufacturer, installers must “obtain an alternate design prepared and certified by a registered professional engineer or registered architect for the support and anchorage.”

The HUD installation standard specifies that in SFHAs, homes “must be installed on foundations engineered to incorporate methods and practices that minimize flood damage during the base flood, in accordance with the requirements of the Local Authority Having Jurisdiction, 44 CFR 60.3(a) through (e), and other provisions of 44 CFR referenced by those paragraphs.”

In addition, the HUD standard requires outside appliances to be anchored and elevated to or above the same elevation as the lowest elevation of the lowest floor of manufactured homes, and requires appliance air inlets and exhausts to be elevated to or above the same elevation. It also states that oil storage tanks in flood hazard areas should be anchored and elevated to or above the DFE, or anchored and designed to prevent flotation, collapse, or permanent lateral movement during the design flood.

Importantly, the burden is on the installer to determine whether a home site is wholly or partly in a flood hazard area. The standard also specifies that the flood hazard zone and BFE are to be determined before the installer and owner agree on the method of installation.

Although most states do not include installation of manufactured homes in the scope of their building codes, the I-Codes have provisions that can be used. The inclusion of requirements for manufactured homes in the I-Codes does not supersede separate state rules. The I-Code provisions are:

- **IRC Section R322.1.9.** All new and replacement manufactured homes in flood hazard areas must be installed such that the bottom of the frame is elevated to the same height as single-family homes within the scope of the IRC (the NFIP’s option to allow certain replacement units to be installed on foundations that are only 36 inches above grade is not included, see Section 3.4.13). If located in a floodway, the home foundation and anchorage must be in accordance with ASCE 24. Basically, the IRC specifies that foundations under manufactured homes must meet the same requirements as foundations for single-family homes.

### HUD Rules for State Programs

HUD establishes minimum requirements for state programs for installation of manufactured homes, under which states must:

- Adopt an installation standard that at least meets HUD’s standards
- Have a program to train and license installers
- Provide an “appropriate level” of inspection of installed homes

### NFPA 225: *Model Manufactured Home Installation Standard*

NFPA maintains a standard with guidelines for safe, efficient, and effective installation of manufactured homes used as dwelling units. NFPA 225 includes provisions for installations in flood hazard areas.

## Questions Related to Coordinating I-Codes and Floodplain Management Regulations

- **IRC Appendix E, Manufactured Housing Used as Dwellings.** If a new or replacement manufactured home is to be installed in a flood hazard area, it must meet the requirements of R322. IRC Appendix E is not mandatory unless specifically adopted.
- **IBC Appendix G, Flood-Resistant Construction.** Provisions for elevation, foundations, and anchoring of manufactured homes are included in this appendix. In addition, specific requirements for enclosures and equipment are included in the 2015 and 2018 editions. IBC Appendix G is not mandatory unless specifically adopted.

### **4.17 Does the State Code Council Issue Interpretations?**

The I-Codes specify the duties and powers of the building official. In addition to being authorized to enforce the provisions of the codes, the building official is authorized to render interpretations and to adopt policies and procedures to clarify application of the code. However, “such interpretations, policies and procedures shall be in compliance with the intent and purpose of this code ... [and] shall not have the effect of waiving requirements specifically provided for in this code.”

In states that adopt the code at the state level, the state code council or commission typically has a role in rendering interpretations, both through informal consultation with state staff and through issuance of formal, written interpretations.

Since the inception of the NFIP in 1968, FEMA has issued numerous guidance documents intended to help state and local officials understand, interpret, and enforce the requirements of the NFIP. Because the flood provisions of the I-Codes meet or exceed the NFIP requirements for buildings and structures, FEMA’s guidance documents are valuable resources for state and local building officials charged with interpreting and enforcing the flood provisions of the building codes.

FEMA and the International Code Council encourage state and local officials to use FEMA’s guidance documents and contact their NFIP State Coordinators before rendering interpretations related to the flood provisions of the building codes and ASCE 24. In their coordination role, NFIP State Coordinators may consult with FEMA Regional Offices for assistance in responding to questions that are not answered in guidance documents.

### Chapter 5 Increasing Resistance to Flood Damage

Chapter 3 describes a number of differences between the NFIP floodplain management requirements and the flood provisions of the I-Codes, identifying I-Codes requirements that exceed the NFIP requirements. FEMA has long encouraged and endorsed state and local adoption of requirements that exceed the NFIP requirements. Such requirements can significantly reduce exposure to future flooding, avoiding or minimizing the cost of recovery and the need for disaster assistance. Some states adopt standards that exceed NFIP requirements, often in statutes other than building codes. Local officials should always work closely with their NFIP State Coordinators to determine whether any state-adopted standards apply.

Whether higher standards are included in building codes or floodplain management regulations, requirements that are more restrictive take precedence. Compliance with some higher standards, notably additional elevation above the minimum required elevation (freeboard), means individual buildings may qualify for lower NFIP flood insurance premiums.

Although communities can achieve a significant level of flood protection by enforcing local regulations based on the NFIP requirements, compliant buildings can still sustain damage, especially when actual flood events are more severe than the base flood used by FEMA to delineate areas prone to flooding.

States and communities adopt higher standards for a variety of reasons, such as:

- Community officials recognize that enforcing regulations based only on the NFIP requirements may not provide the desired degree of long-term resilience against future flood events.
- Past flood events may have been more severe or more frequent than indicated by SFHAs shown on FIRMs. The base flood used to delineate SFHAs is the 1-percent-annual-chance flood (commonly called the “100-year flood”). The base flood was chosen as a compromise between a more frequent flood (such as a “10-year flood”), which would expose buildings to frequent flooding, and a more infrequent flood (such as a “1,000-year flood”), which may be unreasonable as the basis for minimum standards.
- Floods more severe than the estimated base flood can and do occur.
- Estimates of flood elevations associated with specific event probabilities are subject to errors and may be low, especially in areas where long-term flood and rainfall records are not available.
- Communities may have identified unique hazards associated with flooding, including flash flooding, alluvial fan flooding, ice jam flooding, mud flows, debris flows, and flood-related erosion and bluff failure. ASCE 24 includes requirements for buildings in some of these high-risk flood hazard areas.
- Effective FIRMs may not reflect current conditions. For example, urbanization and upland development may have altered runoff conditions so that the magnitude and frequency of flooding have changed since the FIRMs were prepared, or more detailed topographic data than used for FIRMs may be available. In addition, technology advances in recent years have improved the modeling methods used to develop flood hazard mapping. FEMA is updating

## Increasing Resistance to Flood Damage

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maps across the country using newer methods, but it will take many years to revise all maps and map revision is a continual process.

- Engineering methods used to predict flood discharges and water surface elevations are mathematical approximations of the natural phenomenon of flooding. In addition, older flood hazard maps may be based on topographic maps with wide contour intervals. Choosing higher standards, such as freeboard, adds a margin of safety to acknowledge that delineating flood hazard areas is not a precise science.

Section 5.1 summarizes the NFIP Community Rating System (CRS). Many communities that adopt standards that exceed NFIP requirements participate in the CRS so that individual properties owners can receive discounted NFIP flood insurance premiums.

Section 5.2 discusses amending the I-Codes at the state level and local level, when communities are allowed to amend state codes and when communities adopt codes in the absence of state codes.

Section 5.3 contains recommended language to modify specific provisions of the I-Codes to incorporate several higher standards for buildings and structures.

Section 5.4 includes recommended language to modify specific sections of IBC Appendix G (or a code-companion floodplain management ordinance) to incorporate several other higher standards.

### IBC Appendix G or Code-Coordinated Ordinance?

If adopted, IBC Appendix G can be used to fulfill community responsibilities to participate in the NFIP. If Appendix G is not used, communities should adopt code-coordinated companion ordinances (see Section 4.11 and sample ordinances in Chapter 6).

### Using Suggested Texts for I-Code Amendments

Before adopting amendments to the I-Codes, users must verify the underlying text matches their adopted codes. The examples of recommended language to modify the codes is show in legislative format:

- Underline indicates added text.
- ~~Strikethrough~~ indicates deleted text.
- \*Notes with asterisks indicate where changes occurred between editions of the I-Codes (e.g., change in section number).
- {Notes or instructions in curly brackets} indicate options.



### 5.1 NFIP Community Rating System

Communities that participate in the NFIP recognize flood hazards in their planning, zoning, development, and permitting decisions. The NFIP requirements govern how development in SFHAs occurs, rather than guide development away from flood-risk areas. Over the years, many communities have chosen to adopt regulations and administer programs that achieve more flood-resistant communities.

#### CRS Information

For brochures, fact sheets, and other resources for the CRS, visit [www.fema.gov/national-flood-insurance-program-community-rating-system](http://www.fema.gov/national-flood-insurance-program-community-rating-system).

Before 1990, the NFIP had few incentives for communities to do more than administer local regulations based on the NFIP requirements, and NFIP flood insurance rates were the same in every community, even in those that elected to exceed the NFIP requirements. The Community Rating System (CRS) was established in 1990. The CRS is voluntary incentive program that recognizes and encourages communities to exceed the NFIP requirements and undertake a variety of programs and activities that reduce flood losses.

NFIP flood insurance policyholders in CRS communities receive premium discounts to reflect community initiatives that meet the CRS goals:

- Reduce and avoid flood damage to insurable property
- Strengthen and support the insurance aspects of the NFIP
- Foster comprehensive floodplain management

Qualifying for discounted NFIP flood insurance premiums is only one of the rewards communities gain by undertaking activities credited by the CRS. Other benefits include improved public safety, reduced damage to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, protection of the environment, and most importantly, promotion of disaster-resistant communities.

The amount of discount applied to NFIP flood insurance premiums is based on each CRS community's classification, which in turn is based on the total credits (points) assigned to the community's activities. Premium rates are discounted in increments of 5 percent, increasing with lower class numbers. Class 1 communities qualify for the maximum discount of 45 percent for policies on buildings in the SFHA and 10 percent on some policies on buildings outside the SFHA. Class 9 communities receive a 5 percent discount on policies on buildings in the SFHA and 5 percent on some policies on buildings outside the SFHA. (NFIP policies called Preferred Risk Policies are written in Zones B, C, and X for properties shown to have minimal risk of flood damage; these policies are not eligible for CRS discounts.) Class 10 communities receive no discount because either they have not achieved the minimum number of credits for Class 9 or they do not participate in the CRS for other reasons.

The CRS acknowledges that adopting and enforcing building codes improves the quality of construction and provides more staff support for floodplain management functions. Communities that enforce the I-Codes receive CRS credit depending on which codes are adopted.

To obtain a CRS Class 6 or better, communities must enforce building codes and have received and continue to maintain a classification of 5/5 or better under the Building Code Effectiveness Grading

## Increasing Resistance to Flood Damage

Schedule (BCEGS). A BCEGS classification of 5/5 means that both residential/personal and commercial classes must be 5/5 or better. To obtain a CRS Class 4 or better, a BCEGS classification of 4/4 or better is required. The BCEGS program assesses the building codes in effect in a community and how the community enforces its building codes, with emphasis on mitigation of losses from natural hazards.

Table 5-1 shows the maximum number of points for higher regulatory standards (credited under CRS Activity 430) that can be implemented by modifying the I-Codes. Actual credits awarded to individual communities depend on several factors and is determined by FEMA based on the specific characteristics of each community's program. Sections 5.3 and 5.4 provide suggested language to incorporate some of these higher standards into the I-Codes and IBC Appendix G (or a companion ordinance).

**Table 5-1: Maximum Allowable Credits for Selected CRS Activity 430 Higher Regulatory Standards That Affect the Design of Buildings and Structures**

CRS Activity 430: Higher Regulatory Standards	Maximum CRS Credits
<b>DL:</b> Development limitations in the SFHA	
<ul style="list-style-type: none"> <li>Prohibition of fill or compensatory storage</li> </ul>	280 points
<ul style="list-style-type: none"> <li>Prohibition of new buildings</li> </ul>	1,000 points
<ul style="list-style-type: none"> <li>Prohibition of outdoor storage materials</li> </ul>	50 points
<b>FRB:</b> Freeboard (up to 3 feet above BFE); increased points if paired with prohibition on fill or requirement for compensatory storage	500 points
<b>FDN:</b> Foundation protection (fill compaction, engineered design)	80 points
<b>CSI:</b> Cumulative Substantial Improvements (over a specific period); points available for regulating repetitive loss to qualify for Increased Cost of Compliance insurance coverage	90 points
<b>LSI:</b> Lower Substantial Improvements (less than 50% threshold)	20 points
<b>PCF:</b> Protection of critical facilities (to 500-year flood level)	80 points
<b>ENL:</b> Enclosure limits (limit or prohibit); more points if nonconversion agreements are required	390 points
<b>BC:</b> Adoption and enforcement of building codes (state or local level), weighted by BCEGS classification	100 points
<b>LDP:</b> Local drainage protection (from shallow flooding)	120 points
<b>MHP:</b> Manufactured home parks (require full elevation regardless of location, i.e., eliminate 36-inch option)	15 points
<b>CAZ:</b> Coastal A Zones (regulated to Zone V standards)	500 points

Source: FIA-15, *CRS Coordinator's Manual* (FEMA 2017)

### 5.2 Amending the I-Codes at State and Local Levels

Many states adopt the I-Codes at the state level by undertaking a formal process to consider, evaluate, and adopt state-specific amendments. Other states adopt the I-Codes without amendment. States that adopt the I-Codes at the state level, typically do so on a 3- to 6-year cycle, which may or may not be established by statute.

Communities located in states that do not adopt building codes at the state-level, or do not specify which codes communities may adopt, decide which edition of the I-Codes to adopt and when to move from one edition to a more recent edition. These communities may also adopt amendments to tailor the I-Codes to their specific circumstances.

A number of states and communities have amended the flood provisions of the I-Codes. Sometimes state-specific amendments are made to align the codes with state requirements found in different statutes or regulations or to replace the flood provisions of the I-Codes with reference to local floodplain management regulations. Section 2.1 describes the importance of coordinating building codes and local floodplain management regulations to eliminate duplication and conflicts.

States that adopt the I-Codes at the state level either do not permit amendments by local jurisdictions, or permit local amendments only if the amendments make the codes more restrictive. See Sections 4.12, 4.13, and 4.14 of this guide for answers to some questions about state amendments and how some states handle local amendments.

Increasingly, states are considering amending the codes to incorporate higher standards for buildings in flood hazard areas. This is usually prompted by interaction with the NFIP State Coordinating Agency or at the request of communities. The most common higher standard is an increase in the elevation requirements so that buildings are elevated or protected to 1 or 2 feet above the minimum requirements of the I-Codes (see Section 3.4.3 for a description of the minimum elevation requirements in the I-Codes).

Section 4.9 indicates some states exempt specific buildings and structures from building codes. Section 5.2.1 offers language to modify IBC Appendix G to recapture buildings and structures exempt from state building codes. This modification is necessary if communities use building codes to fulfill NFIP responsibilities.

### 5.2.1 Recapturing Buildings Exempt from Building Codes

The NFIP requires communities to regulate all development in SFHAs, including all buildings and structures (see Section 4.9). The fact that a state may explicitly exempt certain buildings and structures from the building code does not relieve communities of the responsibility to regulate those buildings when located in SFHAs. Communities must recapture buildings exempt from the building code by modifying IBC Appendix G (or companion ordinance written to coordinate with the I-Codes).

IBC Appendix G: Modify Appendix G as follows:

**G101.3 Scope.** The provisions of this appendix shall apply to all proposed development in a flood hazard area established in Section 1612 of this code, including certain building work exempt from permit under Section 105.2 of the building code. Pursuant to the requirements of federal regulation for participation in the National Flood Insurance Program (44 C.F.R. Sections 59 and 60), the provisions of this appendix shall apply to buildings and structures that are exempt from the building code specified in {insert reference to section in building code or citation (statutory or regulatory) where exempt buildings are specified, or insert a list here}.

## Increasing Resistance to Flood Damage

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**G103.1 Permit Applications.** The building official shall review all permit applications to determine whether proposed development sites will be reasonably safe from flooding. If a proposed development site is in a flood hazard area, all site development activities, (including grading, filling, utility installation and drainage modification), all new construction and substantial improvements (including the placement of prefabricated buildings and manufactured homes), ~~and~~ certain building work exempt from permit under Section 105.2 of the building code, and structures exempt from the building code, shall be designed and constructed with methods, practices and materials that minimize flood damage and that are in accordance with this code and ASCE 24.

### **G1001 UTILITY AND MISCELLANEOUS GROUP U AND BUILDINGS EXEMPT FROM THE BUILDING CODE**

**G1001.1 Utility and Miscellaneous Group U and buildings exempt from the building code.**

Utility and Miscellaneous Group U includes buildings that are accessory in character and miscellaneous structures not classified in any specific occupancy in the *International Building Code*, including, but not limited to, agricultural buildings, aircraft hangars (accessory to a one- or two-family residence), barns, carports, fences more than 6 feet (1829 mm) high, grain silos (accessory to a residential occupancy), greenhouses, livestock shelters, private garages, retaining walls, sheds, stables, and towers. Buildings exempt from the building code are identified Section G101.3 of this appendix.

**G1001.2 Flood loads.** Utility and miscellaneous Group U buildings and structures and buildings exempt from the building code, including substantial improvement of such buildings and structures, shall be anchored to prevent flotation, collapse or lateral movement resulting from flood loads, including the effects of buoyancy, during conditions of the design flood.

**G1001.3 Elevation.** Utility and miscellaneous Group U buildings and structures and buildings exempt from the building code, including substantial improvement of such buildings and structures, shall be elevated such that the lowest floor, including basement, is elevated to or above the design flood elevation in accordance with Section 1612 of the *International Building Code*.

### 5.3 Incorporating Higher Standards for Buildings and Structures in the I-Codes

The flood provisions of the I-Codes, in part by reference to the standard ASCE 24, *Flood Resistant Design and Construction*, exceed the NFIP requirements in certain respects, and they are more specific in other respects. After community officials review how the I-Codes differ from the NFIP requirements (see [Chapter 3](#)), they may determine some additional higher standards have merit. The next step is to determine the best way to incorporate higher standards in building codes and regulations.

Table 5-2 lists the most common higher standards that apply to buildings and development and are described in this section. The sample language shown in these subsections can be used to amend all editions of the I-Codes (2018, 2015, and 2012) unless specifically noted.

**Higher Standards**  
States and communities may identify higher standards not included in this chapter that can be incorporated into the I-Codes or IBC Appendix G. Contact FEMA Regional Offices for assistance.

**Adoption of Hazard-Resistant Codes**  
Although sample language to add higher standards to the 2012 I-Codes is provided, FEMA encourages states and communities to adopt the latest editions of the I-Codes because of their strengthened hazard-resistant provisions.

**Table 5-2: Contents of this Section: Higher Standards for Buildings and Structures in the I-Codes**

<b>Click on a section to go directly to the description of that standard.</b>	
5.3.1	<a href="#">Additional Height (Freeboard)</a>
5.3.2	<a href="#">Protection of Buildings from Local Drainage Problems</a>
5.3.3	<a href="#">Prohibit Enclosures below Elevated Buildings</a>
5.3.4	<a href="#">Limit the Size of Enclosures below Elevated Buildings</a>
5.3.5	<a href="#">Require Nonconversion Agreements for Enclosures below Elevated Buildings</a>
5.3.6	<a href="#">Regulate Coastal A Zone Like Zone V</a>
5.3.7	<a href="#">Cumulative Substantial Improvement</a>
5.3.8	<a href="#">Repetitive Flood Damage (Substantial Damage)</a>
5.3.9	<a href="#">Limitation on Use of Fill</a>
5.3.10	<a href="#">Design Certification of All Foundations</a>
5.3.11	<a href="#">Require Dwellings to be Designed in Accordance with ASCE 24</a>
5.3.12	<a href="#">Protection of Critical and Essential Facilities</a>
5.3.13	<a href="#">Flood Hazard Map Other Than or in Addition to the FIRM</a>
5.3.14	<a href="#">High Risk Flood Hazard Areas</a>

**Using Suggested Texts for I-Code Amendments**

Before adopting amendments to the I-Codes, users must verify the underlying text matches their adopted codes. The examples of recommended language to modify the codes is show in legislative format:

- Underline indicates added text.
- ~~Strikethrough~~ indicates deleted text.
- \*Notes with asterisks indicate where changes occurred between editions of the I-Codes (e.g., change in section number).
- {Notes or instructions in curly brackets} indicate options.

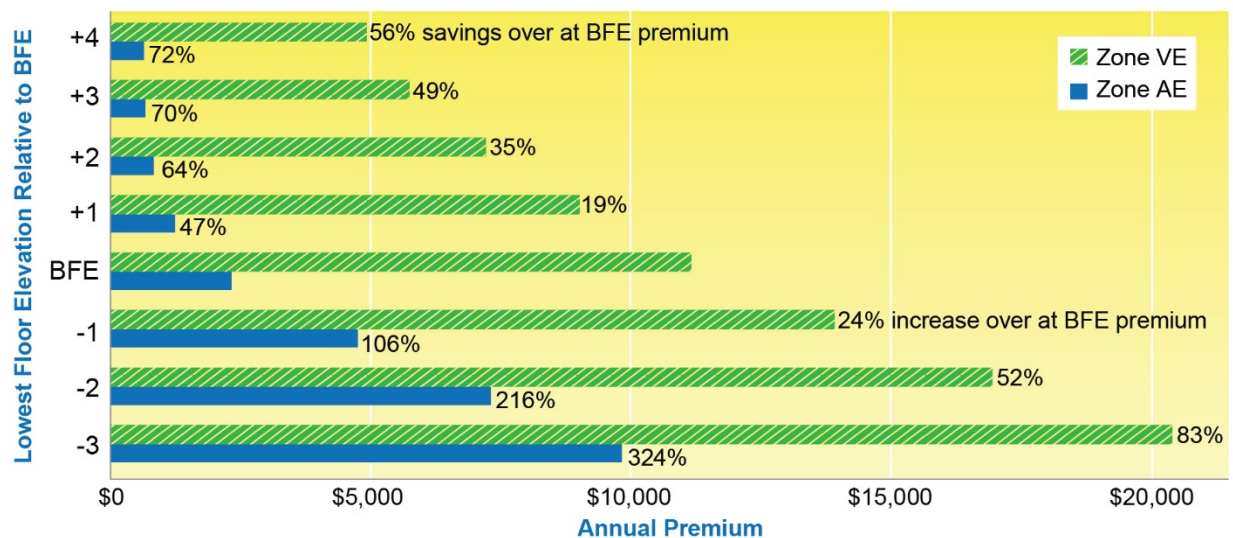
## Increasing Resistance to Flood Damage

### 5.3.1 Additional Height (Freeboard)

The term “freeboard” refers to additional height above a minimum level of protection, typically expressed in feet above the BFE. Freeboard provides a margin of safety for uncertainty in analytical methods and to anticipate future conditions. Floods can and do rise higher than the elevations selected for regulatory purposes. For riverine waterways, continuing development in upstream watersheds will, over time, cause more runoff that may make flooding more severe than depicted on flood hazard maps, especially if the maps are more than a few years old. Future land use conditions, such as increased development and runoff, are not taken into consideration when FIRMs are developed. Similarly, climate changes that may affect sea-level rise, changes in rainfall patterns, and future flood elevations are not reflected in FISs. Adding freeboard helps protect against possible increases in flooding associated with future conditions.

To reflect the reduced risk associated with higher building elevations, NFIP flood insurance premiums are lower for buildings that are elevated above the BFE. [Figure 5-1](#) illustrates how elevation influences the cost of NFIP flood insurance.

A common argument opposing requirements to elevate buildings higher than required by the NFIP is the additional cost of higher foundations. The incremental cost to add up to 4 feet of additional height varies, depending on foundation type, with elevation on fill more costly than other types of foundations. FEMA estimates each foot of freeboard adds between 0.25 and 1.5 percent to the total cost of construction. Analyses show future avoided damage and lower-cost NFIP flood insurance premiums make it cost-effective to build higher. For most buildings built higher than the BFE, the annual insurance savings is enough to recover added costs within several years. Download the FEMA Fact Sheet *Building Higher in Flood Zones: Freeboard – Reduce Your Risk, Reduce Your Premium* at [www.fema.gov/media-library/assets/documents/96411](http://www.fema.gov/media-library/assets/documents/96411).



**Note:** Annual premiums calculated using the *NFIP Flood Insurance Manual*, April 1, 2019, for a one-story single-family home with no basement and no enclosure. Premiums (including fees) are based on the maximum available building coverage of \$250,000 and contents coverage of \$100,000, with \$2,000 deductibles for both building and contents coverages. Zone V building is assumed to be free of obstructions with a building replacement cost ratio of 0.75 or more.

**Figure 5-1: Annual NFIP flood insurance premium costs based on lowest floor elevation (percentages are savings or increases over at-BFE premiums)**

**Freeboard in the IBC.** The IBC requires freeboard by reference to ASCE 24, described in Section 3.4.3 and detailed in Table 3-2 and Table 3-3. The amount of freeboard depends on the assigned Flood Design Class (if ASCE 24-14 is referenced) or the assigned Risk/Occupancy Category (if ASCE 24-05 is referenced). Incorporating additional height requirements in the IBC requires modifying the code to add a provision that takes precedence over the elevations specified in ASCE 24. Because the minimum elevation in ASCE 24 is BFE plus 1, the total additional height above the BFE would be added. For example, adopting 2 feet of freeboard would appear in the amendment as “plus 2 feet.”

IBC: Add a new section as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1\* Modification of ASCE 24: Elevation requirements.** The minimum elevation requirements shall be as specified in ASCE 24 or the base flood elevation plus insert total additional height in feet or inches, whichever is higher.

\*2015 and 2012 Sec. 1612.4

**Freeboard in the IRC.** The IRC specifies minimum elevations as a function of flood zone, described in Section 3.4.3. Amending the IRC to require additional freeboard is accomplished by modifying every location where the code requires elevation to or above the “base flood elevation plus 1 foot” (2015 and later editions) or “base flood elevation” (2012 and earlier editions) to specify the desired total additional height, such as “base flood elevation plus 2 feet.”

IRC: For 2018 and 2015, modify Secs. R322.2.1 and R322.3.2 as follows:

### **R322.2.1 Elevation requirements.**

1. Buildings and structures in flood hazard areas, including flood hazard areas designated as Coastal A Zones\*, shall have the lowest floors elevated to or above the base flood elevation plus insert total additional height in feet or inches ~~1 foot~~, or the design flood elevation, whichever is higher.
2. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM plus insert 1 foot plus additional height in feet or inches ~~1 foot~~, or at least 3 feet plus additional height in feet or inches ~~3 feet~~ if a depth number is not specified.
3. Basement floors that are below grade on all sides shall be elevated to or above base flood elevation plus insert total additional height in feet or inches ~~1 foot~~, or the design flood elevation, whichever is higher.
4. Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.

\*Despite this phrase, R322.3 applies in Coastal A Zones, where delineated or designated (see R322.2).

### R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high-hazard areas and Coastal A Zones shall be elevated so that the bottom of the lowest horizontal structural members supporting the lowest floor, with the exception of piling, pile caps, columns, grade beams and bracing, is elevated to or above the base flood elevation plus {insert total additional height in feet or inches} 1-foot or the design flood elevation, whichever is higher.
2. Basement floors that are below grade on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.
5. Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

IRC: For 2012, modify Secs. R322.2.1 and R322.3.2 as follows:

### R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus {insert total additional height in feet or inches} or the design flood elevation, whichever is higher.
2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus {insert total additional height in feet or inches} 1-foot (305 mm), or to the design flood elevation, whichever is higher.
3. In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet on the FIRM plus {insert additional height in feet or inches}, or at least {insert 2 feet plus additional height in feet or inches} 2-foot (610 mm) if a depth number is not specified.
4. Basement floors that are below grade on all sides shall be elevated to or above the base flood elevation plus {insert total additional height feet or inches} or the design flood elevation, whichever is higher.

**Exception:** Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.



### R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high-hazard areas shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:
  - 1.1 Located at or above the base flood elevation plus {insert total additional height in feet or inches} or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented parallel to the direction of wave approach, where parallel shall mean less than or equal to 20 degrees (0.35 rad) from the direction of approach, or
  - 1.2 Located at the base flood elevation plus {insert total additional height in feet or inches} ~~1-foot (305 mm)~~, or the design flood elevation, whichever is higher, if the lowest horizontal structural member is oriented perpendicular to the direction of wave approach, where perpendicular shall mean greater than 20 degrees (0.35 rad) from the direction of approach.
2. Basement floors that are below grade on all sides are prohibited.
3. The use of fill for structural support is prohibited.
4. Minor grading, and the placement of minor quantities of fill, shall be permitted for landscaping and for drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways.

**Exception:** Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R322.3.4 and R322.3.5.

### 5.3.2 Protection of Buildings from Local Drainage Problems

Many communities have areas that flood frequently but are not shown as SFHA on FIRMs. Approximately 20 percent of NFIP flood insurance claims are paid on buildings located outside of SFHAs. To the extent that flooding is caused by local drainage problems, adopting and enforcing requirements for all buildings to be elevated a specified height above grade can reduce flood losses.

The I-Codes require the ground adjacent to foundations to be graded to drain surface water away, with a grade that falls a minimum of 6 inches within the first 10 feet away from foundations (IBC Section 1804.4 and IRC Section R501.3).

The I-Code drainage requirements may not be sufficient to address flooding from inadequate local drainage systems, especially in communities with flat topography where road beds, buildings, and other features can obstruct drainage. Flooding of buildings in these areas can be addressed by requiring elevation relative to the crown of the nearest street or road or the grade adjacent to foundations.

#### Crown of Road or Street

The elevation of the highest surface of road or street pavement within the right-of-way abutting the property or the elevation approved by the City Engineer.

Many communities define crown of road or street in regulations that govern grading, drainage, stormwater, or local road specifications. Those communities should use the same definition or rely on the definition in other regulations.

## Increasing Resistance to Flood Damage

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IBC and IRC: Add a new definition and new sections as follows:

**CROWN OF ROAD OR STREET.** The elevation of the highest surface of road or street pavement within the right-of-way abutting the property or the elevation approved by the city engineer.

IBC: Add a new section as follows:

**1804.8 Protection from local drainage.** The top surface of floor systems and concrete floors shall be elevated to or above **{insert A}** above the crown of road or street, unless otherwise approved by the **{city/county department/engineer}**.

IRC: Add a new section as follows:

**R501.3 Protection from local drainage.** The top surface of floor systems and concrete floors shall be elevated to or above **{insert B}** above the crown of road or street, unless otherwise approved by the **{city/county department/engineer}**.

**{Note}** Common numbers for **{insert A}** are 6 and 12 inches; common numbers for **{insert B}** are 12 and 18 inches.

### 5.3.3 Prohibit Enclosures below Elevated Buildings

Buildings located in flood hazard areas may be subject to considerable forces exerted on foundations and any portions that extend below the DFE. Enclosures below otherwise properly elevated buildings are allowed under the NFIP and the I-Codes, provided the enclosures meet certain requirements and are used only for parking of vehicles, storage, and building access. The requirements for the walls of enclosures depend on flood zone. The presence of enclosures below elevated buildings results in higher NFIP flood insurance premiums, especially in Zone V.

Some communities choose to prohibit enclosures to minimize obstructing flow, reduce the amount of debris added to floodwater, and minimize damage that can still be sustained by elevated buildings. Additional benefits of prohibiting enclosures below elevated buildings are lower NFIP flood insurance premiums and reduced opportunities for owners to modify enclosures for uses other than those allowed.

IBC: Add a new section as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1 Modification of ASCE 24: Enclosure limitations.** Enclosures below the lowest floor are not permitted.

\*2015 and 2012 Sec. 1612.4

IRC: For 2018 or 2015, modify Secs. R322.2.2, R322.3.5 and R322.3.6 as follows:

**R322.2.2 Enclosed area below design flood elevation.** Enclosed areas, including crawl spaces, that are below the design flood elevation ~~are not permitted. shall:~~

- ~~1. Be used solely for parking of vehicles, building access or storage.~~
- ~~2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
  - ~~2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm<sup>2</sup>) for each square foot (0.093 m<sup>2</sup>) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the construction documents shall include a statement by a registered design professional that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.~~
  - ~~2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.~~
  - ~~2.3. The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.~~~~

**R322.2.2.1 Installation of openings.** The walls of enclosed areas shall have openings installed such that:

- ~~1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings.~~
- ~~2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.~~
- ~~3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.~~

## Increasing Resistance to Flood Damage

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**R322.3.5 Walls below design flood elevation.** Walls and partitions are not permitted below the elevated floor, ~~provided that such walls and partitions are not part of the structural support of the building or structure and:~~

- ~~1. Electrical, mechanical and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and~~
- ~~2. Are constructed with insect screening or open lattice; or~~
- ~~3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a resistance of not less than 10 (479 Pa) and not more than 20 pounds per square foot (958 Pa) as determined using allowable stress design; or~~
- ~~4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), as determined using allowable stress design, the *construction documents* shall include documentation prepared and sealed by a registered *design professional* that~~
  - ~~4.1 The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the base flood.~~
  - ~~4.2 The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on structural and nonstructural building components. Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code.~~
- ~~5. Walls intended to break away under flood loads as specified in Item 3 or 4 have flood openings that meet the criteria in Section R322.2.2, Item 2.~~

**R322.3.6 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation are not permitted ~~shall be used solely for parking of vehicles, building access or storage.~~

Alternative: to allow areas enclosed with insect screening or lattice:

**R322.3.6 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation are permitted to be enclosed solely by insect screening or lattice and shall be used solely for parking vehicles, building access or storage.

**R322.3.6.1 Protection of building envelope.** An exterior door that meets the requirements of Section R609 shall be installed at the top of stairs that provide access to the building and that are enclosed with walls designed to break away in accordance with Section ~~322.3.5.~~

IRC: For 2012, modify Secs. R322.2.2, R322.3.4 and R322.3.5 as follows:

**R322.2.2 Enclosed area below design flood elevation.** Enclosed areas, including crawl spaces, that are below the design flood elevation are not permitted. ~~shall:~~

- ~~1. Be used solely for parking of vehicles, building access or storage.~~
- ~~2. Be provided with flood openings that meet the following criteria:~~
  - ~~2.1. There shall be a minimum of two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings on exterior walls.~~
  - ~~2.2. The total net area of all openings shall be at least 1 square inch (645 mm<sup>2</sup>) for each square foot (0.093 m<sup>2</sup>) of enclosed area, or the openings shall be designed and the construction documents shall include a statement by a registered design professional that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.6.2.2 of ASCE 24.~~
  - ~~2.3. The bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.~~
  - ~~2.4. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.~~
  - ~~2.5. Any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.~~
  - ~~2.6. Openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this section.~~

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**R322.3.4 Walls below design flood elevation.** Walls and partitions are not permitted below the elevated floor, ~~provided that such walls and partitions are not part of the structural support of the building or structure and:~~

- ~~1. Electrical, mechanical, and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and~~
- ~~2. Are constructed with insect screening or open lattice; or~~
- ~~3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a design safe loading resistance of not less than 10 (470 Pa) and no more than 20 pounds per square foot (958 Pa); or~~
- ~~4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), the construction documents shall include documentation prepared and sealed by a registered design professional that:
  - ~~4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the design flood.~~
  - ~~4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on all building components (structural and nonstructural). Water loading values used shall be those associated with the design flood. Wind loading values used shall be those required by this code.~~~~

**R322.3.5 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation are not permitted ~~shall be used solely for parking of vehicles, building access or storage.~~

Alternative: to allow areas enclosed with insect screening or lattice:

**R322.3.5 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation are permitted to be enclosed solely by insect screening or open wood lattice and ~~shall be used solely for parking of vehicles, building access or storage.~~

### 5.3.4 Limit the Size of Enclosures below Elevated Buildings

Limiting the size of enclosures below elevated buildings helps minimize flood damage. Enclosures below otherwise properly elevated buildings are allowed under the NFIP and the I-Codes, provided the enclosures meet certain requirements and are used only for parking of vehicles, storage, and building access. Neither the NFIP nor the I-Codes limit the size of enclosures.

Enclosures do not need to be large to fulfill allowed uses. The benefits of limiting the size of enclosures include smaller obstructions to the free flow of floodwater and owners are less likely to modify smaller enclosures. In Zone V, NFIP flood insurance policies are more expensive when buildings have enclosures larger than 299 square feet. Many communities that limit the size of enclosures select a smaller size, such as 295 square feet. Some communities do not apply the size limit to crawlspaces where the foundation wall height is less than a specified number of feet (typically less than 5 or 6 feet).

IBC: Add a new section as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1 Modification of ASCE 24: Additional requirements for enclosed areas.** In addition to the requirements of ASCE 24, enclosed areas below the lowest floor shall be not more than {insert number} square feet in area.

\*2015 and 2012 Sec. 1612.4

IRC: Modify Secs. R322.2.2 and R322.3.6 as follows:

**R322.2.2 Enclosed area below design flood elevation.** Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
  - 2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm<sup>2</sup>) for each square foot (0.093 m<sup>2</sup>) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.
  - 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
  - 2.3 The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.
3. Be not more than {insert number} square feet in area, except for crawlspace foundations that have a wall height less than {insert number} feet.

**R322.3.6 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation shall be not more than {insert number} square feet in area unless enclosed solely by insect screening or lattice, and shall be used solely for parking of vehicles, building access or storage.

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IRC: For 2015 and 2012, modify Secs. R322.2.2 and R322.3.5 as follows:

**R322.2.2 Enclosed area below design flood elevation.** Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
  - 2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm<sup>2</sup>) for each square foot (0.093 m<sup>2</sup>) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on *exterior walls* by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.
  - 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
  - 2.3 The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.
3. Be not more than {insert number} square feet in area, except for crawlspace foundations that have a wall height less than {insert number} feet.

**R322.3.5 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation shall be not more than {insert number} square feet in area unless enclosed by insect screening or lattice, and shall be used solely for parking of vehicles, building access or storage.

### 5.3.5 Require Nonconversion Agreements for Enclosures below Elevated Buildings

Some communities require property owners to sign nonconversion agreements to acknowledge the restrictions on use of enclosures below elevated buildings and to agree not to modify or convert the enclosures. The objective is to reduce the likelihood that owners, including future owners, might convert enclosures to uses other than permitted uses of parking of vehicles, storage, and building access. Usually, nonconversion agreements are required to be recorded on or with property deeds and other property records to inform future owners of the use limitations. NFIP State Coordinating Agencies may have sample nonconversion agreements. A sample nonconversion agreement is available on the CRS Resources website under the 400 Series tab ([www.crsresources.org](http://www.crsresources.org)). As with all legal documents, communities should have nonconversion agreement forms reviewed for legal sufficiency.

#### Inspection of Enclosures

Some communities use nonconversion agreements that specify the community has the right to periodically inspect inside of enclosures.



IBC Appendix G or Local Floodplain Management Regulations, add new definition as follows:

**DECLARATION OF LAND RESTRICTION (NONCONVERSION AGREEMENT).** A form provided by the Floodplain Administrator to be signed by the owner and recorded on or with the property deed and other property records in Official Records of the Clerk of Courts, for the owner to agree not to convert or modify enclosures below elevated buildings and dwellings in any manner that is inconsistent with the terms of the building permit and these regulations.

IBC Appendix G or Local Floodplain Management Regulations, include the following in the list of required contents of applications for permits:

A declaration of land restriction (nonconversion agreement) if the area under an elevated building or dwelling is enclosed by walls.

### 5.3.6 Regulate Coastal A Zone Like Zone V

FIRMs for coastal communities show flood hazard areas identified as Zone A and Zone V. Zone V, referred to as coastal high hazard areas, is subject to high-velocity wave action where breaking wave heights are equal to or greater than 3 feet. Zone A designates flood hazard areas immediately inland of Zone V and inland of shorelines without Zone V. These areas experience some wind-driven waves, but the breaking wave heights are predicted to be less than 3 feet. The NFIP requirements for buildings do not recognize the risk of wave damage in areas where wave heights are less than 3 feet high.

For many years, post-flood field observations, engineering calculations, and laboratory evaluations have determined that flooding with breaking waves between 1.5 and 3 feet high cause more damage to conventional foundations (other than pilings or columns) than flooding of similar depths without waves. This evidence led FEMA to establish a policy to identify these areas by delineating the landward limit of waves 1.5 feet in height on FIRMs. This landward limit is identified as the Limit of Moderate Wave Action (LiMWA). Although not labeled on FIRMs, the area between the LiMWA and the Zone V boundary (or shoreline if Zone V not present), is known as the Coastal A Zone.

As of mid-2019, FEMA has not completed restudies for all coastal communities and FIRMs for those communities do not yet show LiMWAs. Where LiMWA conditions have not yet been studied, some communities approximate the inland extent of moderate waves by determining the inland extent of the 1.9-foot stillwater depth.<sup>4</sup> The assumption is 1.5-foot breaking waves will develop where stillwater depth is nearly 2 feet deep. This approach is conservative because it does not take into account the presence of obstructions that dampen waves, which is part of FEMA's analysis methodology. Another approach is to require applicants to make site-specific determinations based on surveyed ground elevations and estimated wave heights, which can be calculated using predicted stillwater depths or derived from elevations shown on the FIRM. The presence of obstructions, such as surrounding buildings and trees, can be taken into consideration as part of site-specific determinations.

Section 3.4.4 describes the IRC and IBC/ASCE 24 requirements for buildings in Coastal A Zones. The 2015 and later editions of the I-Codes require buildings in Coastal A Zones to be designed and constructed using the same requirements specified for Zone V, with one exception—backfilled stem

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<sup>4</sup> In shallow water, the maximum height of a breaking wave is usually taken to be 78 percent of the stillwater depth. Therefore, a stillwater depth of 1.9 feet would produce a 1.5-foot breaking wave (see FEMA P-55 Chapter 8).

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walls are permitted. Some communities elect to apply all Zone V requirements to buildings and other development, which requires modification of the IRC and ASCE 24 to eliminate the stem wall foundation option.

IBC/ASCE 24: For 2018 and 2015 IBC, add a new section as follows:

**1612.2.1\*. Modification of ASCE 24: Coastal A Zones and stem walls.** ASCE 24 is amended by removal of provisions allowing backfilled stem walls in Coastal A Zones.

\*2015 Sec. 1612.4

IRC: For 2018 and 2015 IRC, modify as follows:

**R322.3.3 Foundations.** All buildings and structures erected in coastal high-hazard areas and Coastal A Zones shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Piling shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

~~**Exception:** In Coastal A Zones, stem wall foundations supporting a floor system above and backfilled with soil or gravel to the underside of the floor system shall be permitted provided the foundations are designed to account for wave action, debris impact, erosion, and local scour. Where soils are susceptible to erosion and local scour, stem wall foundations shall have deep footings to account for the loss of soil.~~

IBC Appendix G: For 2012, modify Secs. G103.7 and G401.2 Appendix G as follows:

**G103.7 Alterations in coastal areas.** Prior to issuing a permit for any alteration of sand dunes and mangrove stands in ~~flood hazard areas subject to high velocity wave action~~ coastal high-hazard areas and coastal A zones, the building official shall require submission of an engineering analysis ~~which demonstrates~~, prepared by a registered design professional, demonstrating that the proposed alteration will not increase the potential for flood damage.

**G401.2 Coastal high-hazard areas and coastal A zones.** ~~Flood hazard areas subject to high-velocity wave action. In flood hazard areas subject to high-velocity wave action:~~ In coastal high-hazard areas and coastal A zones:

1. New buildings and buildings that are substantially improved shall only be authorized landward of the reach of mean high tide.
2. The use of fill for structural support of buildings is prohibited.

IRC: For 2012, modify Secs. R106.1.3, R322.1, R322.2, R322.2.1, R322.3 and R322.3.2 as follows:

**R106.1.3 Information for construction in flood hazard areas.** For buildings and structures located in whole or in part in flood hazard areas as established by Table R301.2(1), construction documents shall include:

1. Delineation of flood hazard areas, floodway boundaries and flood zones and the design flood elevation, as appropriate.
2. The elevation of the proposed lowest floor, including basement; in areas of shallow flooding (AO zones), the height of the proposed lowest floor, including basement, above the highest adjacent finished grade.
3. The elevation of the bottom of the lowest horizontal structural member in coastal high hazard areas (V Zone) and in Coastal A Zones where such zones are delineated on flood hazard maps identified in Table R301.2(1) or otherwise delineated by the jurisdiction.
4. If design flood elevations are not included on the community's Flood Insurance Rate Map (FIRM), the building official and the applicant shall obtain and reasonably utilize any design flood elevation and floodway data available from other sources.

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**R322.2 Flood hazard areas (including A Zones).** All areas that have been determined to be prone to flooding but not subject to high-velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1.5 feet and 3 feet or otherwise designated by the jurisdiction shall be designated as Coastal A Zones and are subject to the requirements in Section R322.3. All buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R322.2.1 through R322.2.3.

### **R322.2.1 Elevation requirements.**

1. Buildings and structures in flood hazard areas not designated as Coastal A Zones shall have the lowest floors elevated to or above the design flood elevation.
- ~~2. Buildings and structures in flood hazard areas designated as Coastal A Zones shall have the lowest floors elevated to or above the base flood elevation plus 1 foot (305 mm), or to the design flood elevation, whichever is higher.~~
2. ~~3.~~ In areas of shallow flooding (AO Zones), buildings and structures shall have the lowest floor (including basement) elevated at least as high above the highest adjacent grade as the depth number specified in feet (mm) on the FIRM, or at least 2 feet (610 mm) if a depth number is not specified.
3. ~~4.~~ Basement floors that are below grade on all sides shall be elevated to or above the design flood elevation.

**Exception:** Enclosed areas below the design flood elevation, including basements whose floors are not below grade on all sides, shall meet the requirements of Section R322.2.2.

**R322.3 Coastal high-hazard areas (including V Zones and Coastal A Zones, where designated).** Areas that have been determined to be subject to wave heights in excess of 3 feet (914 mm) or subject to high-velocity wave action or wave-induced erosion shall be designated as coastal high-hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1.5 feet and 3 feet or otherwise designated by the jurisdiction shall be designated as Coastal A Zones. All buildings and structures constructed in whole or in part in coastal high-hazard areas and in Coastal A Zones, where designated, shall be designed and constructed in accordance with Sections R322.3.1 through R322.3.6.

### **R322.3.2 Elevation requirements.**

1. All buildings and structures erected within coastal high-hazard areas and Coastal A Zones, shall be elevated so that the lowest portion of all structural members supporting the lowest floor, with the exception of mat or raft foundations, piling, pile caps, columns, grade beams and bracing, is:

*Remainder unchanged.*

**R322.3.3 Foundations.** All buildings and structures erected in coastal high-hazard areas and Coastal A Zones, shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. The space below the elevated building shall be either free of obstruction or, if enclosed with walls, the walls shall meet the requirements of Section R322.3.4. Piling shall have adequate soil penetrations to resist the combined wave and wind loads (lateral and uplift). Water loading values used shall be those associated with the design flood. Wind loading values shall be those required by this code. Pile embedment shall include consideration of decreased resistance capacity caused by scour of soil strata surrounding the piling. Pile systems design and installation shall be certified in accordance with Section R322.3.6. Spread footing, mat, raft or other foundations that support columns shall not be permitted where soil investigations that are required in accordance with Section R401.4 indicate that soil material under the spread footing, mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. If permitted, spread footing, mat, raft or other foundations that support columns shall be designed in accordance with ASCE 24. Slabs, pools, pool decks and walkways shall be located and constructed to be structurally independent of buildings and structures and their foundations to prevent transfer of flood loads to the buildings and structures during conditions of flooding, scour or erosion from wave-velocity flow conditions, unless the buildings and structures and their foundation are designed to resist the additional flood load.

**R322.3.4 Walls below design flood elevation.** Walls and partitions are permitted below the elevated floor, provided that such walls and partitions are not part of the structural support of the building or structure and:

1. Electrical, mechanical, and plumbing system components are not to be mounted on or penetrate through walls that are designed to break away under flood loads; and
2. Are constructed with insect screening or open lattice; or
3. Are designed to break away or collapse without causing collapse, displacement or other structural damage to the elevated portion of the building or supporting foundation system. Such walls, framing and connections shall have a design safe loading resistance of not less than 10 (479 Pa) and no more than 20 pounds per square foot (958 Pa); or
4. Where wind loading values of this code exceed 20 pounds per square foot (958 Pa), the construction documents shall include documentation prepared and sealed by a registered design professional that:
  - 4.1. The walls and partitions below the design flood elevation have been designed to collapse from a water load less than that which would occur during the design flood.
  - 4.2. The elevated portion of the building and supporting foundation system have been designed to withstand the effects of wind and flood loads acting simultaneously on all building components (structural and nonstructural). Water loading values used shall be those associated with the design flood. Wind loading values used shall be those required by this code.
5. In Coastal A Zones, walls shall be provided with flood openings that meet the criteria of Section 322.2.2.

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### 5.3.7 Cumulative Substantial Improvement

One objective of the NFIP is to reduce the long-term exposure of buildings to flood damage. To achieve this objective, the NFIP requires that existing buildings (see definition in Section 3.2.4) be brought into compliance if improvements, including additions and repairs, are determined to be Substantial Improvement (see Section 3.1.5). If the cost of proposed improvements equals or exceeds 50 percent of the market value of the building before the improvements are started, the building must be brought into compliance with the requirements for new construction. The IBC and IEBC have the same definition for Substantial Improvement and the same requirements.

Communities can further reduce flood losses over the long term by adopting a requirement that all improvements and repairs be tracked over time and counted toward the Substantial Improvement determination. Adopting “cumulative Substantial Improvement” means that buildings would be brought into compliance sooner than if the community administers the basic Substantial Improvement requirement, which applies to each separate application for improvements and repairs. Generally, periods of 10 or 15 years, or the life of the structure, are selected by communities committed to long-term resiliency.

Another benefit of adopting a cumulative Substantial Improvement requirement is it reduces the likelihood that property owners will deliberately phase improvements sequentially for the specific purpose of avoiding the compliance requirement. Generally, periods of 1 to 5 years are selected when this is a community’s primary objective.

A good system for recording and accessing records is necessary to administer a cumulative Substantial Improvement provision. Each time an owner applies for a permit to make improvements or repairs, the records for that building must be checked. For more guidance, see FEMA P-758, *Substantial Improvement /Substantial Damage Desk Reference*.

IBC and IEBC: Modify Sec. 104.2.1 as follows:

**104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas.** For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, the building official shall determine where the proposed work constitutes substantial improvement or repair of substantial damage. The substantial improvement determination requires evaluation of previous permits issued for improvements and repairs as specified in the definition of “substantial improvement.” Where the building official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the building official shall require the building to meet the requirements of Section 1612 of the *International Building Code*.

IRC: Modify Sec. R105.3.1.1 as follows:

**R105.3.1.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas.** For applications for reconstruction, rehabilitation, *addition*, alteration, repair or other improvement of existing buildings or structures located in a flood hazard area as established by Table R301.2(1), the *building official* shall examine or cause to be examined the *construction documents* and shall make a determination with regard to the value of the proposed work. The substantial improvement determination requires evaluation of previous permits issued for improvements and repairs as specified in the definition of “substantial improvement.” For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamaged condition. If the *building official* finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the proposed work is a substantial improvement or repair of substantial damage and the building official shall require existing portions of the entire building or structure to meet the requirements of Section R322.

IBC and IEBC, modify definitions:

**SUBSTANTIAL IMPROVEMENT.** Any one or more or any combination of repair, reconstruction, rehabilitation, alteration, addition or other improvement of a building or structure taking place during a {see Notes}-year period, the cumulative cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. For each building or structure, the {see Notes}-year period begins on the date of the first permit issued for improvement or repair of that building or structure subsequent to {see Notes}. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary or safety code violations identified by the building official and that are the minimum necessary to assure safe living conditions.
2. Any alteration of a historic structure provided that the alteration will not preclude the structure’s continued designation as a historic structure.

{Notes}

- Communities may select the period of time over which they will maintain records to accumulate the cost of improvements and repairs. There are pros and cons for selecting longer periods (such as 10 years or the life of the structure) and for selecting shorter periods (such as 1 year or 5 years).
- If the community has previously adopted a cumulative Substantial Improvement provision, insert the effective date of the first ordinance that adopted that provision. If this is the first time the community adopts a cumulative Substantial Improvement provision, insert the actual date of adoption.

### 5.3.8 Repetitive Flood Damage (Substantial Damage)

One objective of the NFIP is to break the cycle of flood damage. To achieve this objective, the NFIP requires that existing buildings be brought into compliance if they incur Substantial Damage. A building is determined to have incurred Substantial Damage if it is damaged by any cause and the cost to repair the building to its pre-damage condition equals or exceeds the market value of the

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building before the damage occurred. The IBC and IEBC have the same definition for Substantial Damage and the same requirements.

Many buildings have been flooded, repaired or rebuilt, and flooded again. Because of the nature of many flood hazard areas where repetitive flooding occurs, buildings in these areas are unlikely to sustain the level of damage that qualifies as Substantial Damage in a single event (cost to repair equals or exceeds 50 percent of market value before damage occurs).

NFIP flood insurance policies on buildings in SFHAs include coverage called Increased Cost of Compliance (sometimes called “ICC”). NFIP-insured buildings in SFHAs that are determined to meet the basic definition of Substantial Damage (50 percent) due to damage *by flooding* are eligible to file an ICC claim for up to \$30,000 (as of April 2019) toward the cost of bringing the building into compliance with the floodplain management requirements for new construction. The actual amount of a claim paid is a function of the nature of the work and eligibility of costs. The Increased Cost of Compliance claim payment may also be used as part of the non-federal cost-share for certain federally funded flood mitigation grants. For additional guidance, see FEMA 301, *Increased Cost of Compliance Coverage: Guidance for State and Local Officials*, and FEMA P-1080, *Answers to Frequently Asked Questions about Increased Cost of Compliance*.

When communities adopt a definition for Substantial Damage that includes “repetitive loss,” owners of NFIP-insured structures that sustain repetitive flood damage may also be eligible to apply for Increased Cost of Compliance claims even if they do not meet the standard 50 percent threshold for Substantial Damage by a single event. To qualify, communities must adopt and enforce the repetitive loss provision on all buildings, not just those that are covered by NFIP flood insurance.

### Repetitive Loss

The term “repetitive loss” refers to flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each flood event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. This definition is specified in the federal statute that authorized the NFIP to include Increased Cost of Compliance coverage in flood insurance policies on buildings in SFHAs.

The best way to implement a repetitive-loss provision is to modify the definition of Substantial Damage to include both the standard 50 percent threshold and flood-related damage sustained on two separate occasions during a 10-year period for which the cost of repairs at the time of each flood event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred. This is most consistent with the expectation that the community must take action to determine whether a building that is repetitively damaged by flooding meets the modified definition of Substantial Damage.

A good system for recording and accessing records is necessary to administer a repetitive flood damage provision. Each time an owner applies for a permit to repair damage caused by flooding, the records for that building must be checked. For more guidance, see FEMA P-758, *Substantial Improvement /Substantial Damage Desk Reference*.



IBC and IEBC: Modify Sec. 104.2.1 as follows:

**104.2.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas.** For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, the building official shall determine where the proposed work constitutes substantial improvement or repair of substantial damage. The substantial damage determination requires evaluation of previous permits issued for repair of flood damage as specified in the definition of “substantial damage.” Where the building official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the building official shall require the building to meet the requirements of Section 1612 of the *International Building Code*.

IRC: Modify Sec. R105.3.1.1 as follows:

**R105.3.1.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas.** For applications for reconstruction, rehabilitation, *addition*, alteration, repair or other improvement of existing buildings or structures located in a flood hazard area as established by Table R301.2(1), the *building official* shall examine or cause to be examined the *construction documents* and shall make a determination with regard to the value of the proposed work. The substantial damage determination requires evaluation of previous permits issued for repair of flood damage as specified in the definition of “substantial damage.” For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamaged condition. If the *building official* finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the proposed work is a substantial improvement or repair of substantial damage and the building official shall require existing portions of the entire building or structure to meet the requirements of Section R322.

IBC and IEBC, modify definitions:

**SUBSTANTIAL DAMAGE.** Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. The term also includes flood-related damage sustained by a structure on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

### 5.3.9 Limitation on Use of Fill

Structural fill is a common method of elevating buildings in flood hazard areas not subject to wave action. However, even in floodway fringe areas, the placement of fill may reduce the ability of floodplains along riverine waterways to store and convey floodwater, sometimes increasing water levels. In areas subject to flooding from coastal sources, the placement of fill can contribute to local drainage problems. Using fill can have an adverse impact on native vegetation, wetlands, local drainage, infiltration, and water quality.

The NFIP and the I-Codes do not prohibit the use of fill, although both require submission of engineering analyses when fill and other encroachments are proposed in designated floodways and other riverine flood hazard areas for which BFEs are shown on FIRMs but floodways have not been designated. To prevent the adverse effects of fill, some communities elect to prohibit fill in flood

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hazard areas. Many communities that limit fill do not consider backfilled stem wall foundations to be fill, although some do limit stem wall use. Some communities require compensatory storage only for filled areas (see Section 5.4.5 for compensatory storage).

IBC: Select Option 1 or Option 2.

Option 1 (prohibit use of earthen fill pads): Add new Sec. 1612.2.1 as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1 Modification of ASCE 24: Limitation on use of structural fill.** Use of structural fill to elevate buildings and foundations shall not be permitted.

Option 2 (prohibit use of earthen fill pads and stem wall foundations): Add new Sec. 1612.2.1 as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1 Modification of ASCE 24: Limitation on use of structural fill.** Use of structural fill to elevate buildings and foundations, and use of earthen-filled stem walls, shall not be permitted.

\*2015 and 2012 Sec. 1612.4

IRC: Select Option 1 or Option 2.

Option 1 (prohibit use of earthen fill pads): Modify Sec. R322.2.3 as follows:

**R322.2.3 Foundation design and construction.** Use of fill to elevate buildings and foundations shall not be permitted. Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4. *(remainder unchanged)*

Option 2 (prohibit use of earthen fill pads and filled stem wall foundations): Modify Sec. R322.2.3 as follows:

**R322.2.3 Foundation design and construction.** Use of fill to elevate buildings and foundations, and use of earthen-filled stem walls, shall not be permitted. Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4. *(remainder unchanged)*

### 5.3.10 Design Certification of All Foundations

The NFIP and the I-Codes have general performance expectation statements that buildings and foundations in flood hazard areas must be designed and adequately anchored to prevent flotation, collapse, or lateral movement resulting from flood loads.

The NFIP requires registered professional engineers or architects to develop or review the structural design, specifications, and plans for the construction of foundations in Zone V, and requires the design professionals to certify that the design and methods of construction meet NFIP requirements. Except for nonresidential buildings designed to be dry floodproofed, the same requirement does not apply in Zone A, which means foundations may be constructed without the benefit of a site-specific design, and prescriptive foundation designs may not account for flood loads.

The IBC requires that designs for all buildings be prepared and sealed by registered design professionals. The IRC, like the NFIP, only requires certified designs in Zone V.

Requiring certification of foundation designs for dwellings in all flood zones ensures that dwellings are designed for the specific conditions that contribute to flood loads, including water depth, velocity, waves, and debris impact. Designers are expected to consider site-specific conditions and determine whether specific locations are subject to differential settling and local scour and erosion.

Recognizing the importance of accounting for flood loads, some communities require designs to be certified by registered design professionals for all buildings regardless of flood zone designation.

IRC: Modify Section R322.2.3 as follows:

**R322.2.3 Foundation design and construction.** Foundation walls for all buildings and structures erected in flood hazard areas shall meet the requirements of Chapter 4 and construction documents shall include documentation that is prepared and sealed by a registered design professional that the design and methods of construction to be used meet the applicable criteria of this section and Chapter 4.

**Exception:** ~~Unless designed in accordance with Section 404:~~

- ~~1. The unsupported height of 6 inch (152 mm) plain masonry walls shall be no more than 3 feet (914 mm).~~
- ~~2. The unsupported height of 8 inch (203 mm) plain masonry walls shall be no more than 4 feet (1219 mm).~~
- ~~3. The unsupported height of 8 inch (203 mm) reinforced masonry walls shall be no more than 8 feet (2438 mm).~~

~~For the purpose of this exception, unsupported height is the distance from the finished grade of the under floor space to the top of the wall.~~

### 5.3.11 Require Dwellings to be Designed in Accordance with ASCE 24

The NFIP and the IRC do not require one- and two-family dwellings and townhomes in flood hazard areas identified on FIRMs as Zone A to be designed by registered design professionals. Conditions in many Zone A areas, whether riverine or coastal, may warrant determination of flood loads and conditions, including fast moving floodwater, flood depths greater than a few feet, wave action, and potential scour and erosion.

The IRC permits ASCE 24 as an alternative to the requirements in Section R322, and requires it as a reference standard in floodways. Requiring all dwellings to be designed in accordance with ASCE 24 ensures consideration of flood loads in accordance with the standards of practice.

IRC: Modify Section R301.2.4 as follows:

**R301.2.4 Floodplain construction.** Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1), and substantial improvement and repair of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with ASCE 24 Section R322. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. ~~Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.~~

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IRC: Modify Section R322.1 as follows and delete the remainder of R322:

**R322.1 General.** Buildings and structures constructed in whole or in part in flood hazard areas, including A or V Zones and Coastal A Zones, as established in Table R301.2(1), and substantial improvement and repair of substantial damage of buildings and structures in flood hazard areas, shall be designed and constructed in accordance with ASCE 24 ~~the provisions contained in this section~~. Buildings and structures that are located in more than one flood hazard area shall comply with the provisions associated with the most restrictive flood hazard area. ~~Buildings and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.~~

Delete the remainder of R322.

### 5.3.12 Protection of Critical and Essential Facilities

The term “critical and essential facilities” is used to describe buildings and structures that, if destroyed, damaged, or functionally impaired, have the potential to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities. They typically include public and private facilities that a community considers essential for the delivery of vital services and the protection of public safety, such as emergency response facilities (fire stations, police stations, rescue squads, and emergency operation centers), custodial/residential facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), and any other assets determined by the community to be of critical importance for the protection of health, safety, and welfare.

#### Critical and Essential Facilities

The NFIP does not have requirements specific to critical and essential facilities, although communities should be aware that Presidential Executive Order 11988 on floodplain management requires federal agencies to complete a deliberative decision-making process when they undertake or propose to provide federal funding for certain critical actions in SFHAs, including the construction, upgrade, or repair of critical facilities.

The IBC requires that each building and structure be assigned to a Risk/Occupancy Category. For buildings and structures in flood hazard areas, certain requirements are specified as a function of the Flood Design Class (if ASCE 24-14 is referenced) or Risk/Occupancy Category (if ASCE 24-05 is referenced). See Section 3.4.2 for a description of the Flood Design Class and Risk/Occupancy Category. Critical and essential facilities are assigned Flood Design Classes 3 and 4 (or Categories III and IV).

Where feasible, critical and essential facilities are best protected if located outside of areas prone to flooding, preferably outside of the 0.2-percent-annual-chance (500-year) floodplain. Alternatively, some communities adopt regulations that allow new critical facilities in SFHAs, but set higher protection standards than required by ASCE 24 (see Table 3-2 and Table 3-3 in Chapter 3).

IBC: Select Option 1 or Option 2.

Option 1 (in Section 1612): Add new Sec. 1612.2.1 as follows:

**1612.2\* Design and construction.** The design and construction of buildings and structures located in flood hazard areas, including coastal high-hazard areas and coastal A zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

**1612.2.1 Modification of ASCE 24: Critical facilities.** New critical facilities (Flood Design Class 3\*\* and Flood Design Class 4\*\* assigned pursuant to ASCE 24) shall, to the extent feasible, be located outside of the flood hazard area and outside of the 0.2% annual chance flood hazard area (500-year floodplain). If documentation is provided that feasible sites that satisfy the objectives of a proposed critical facility are not available outside of the flood hazard area and outside of the 0.2% annual chance flood hazard area (500-year floodplain), then the critical facility shall have the lowest floor or level of dry floodproofing, if permitted, at or above the base flood elevation plus 3 ft or the 500-year flood elevation plus 1 ft, whichever is higher.

\*2015 and 2012 Sec. 1612.4

\*\*2012 Category III and Category IV, per ASCE 24-05

Option 2 (in IBC Appendix G): Add a new definition and new Sec. G1002.1 as follows:

**CRITICAL FACILITY.** Facilities that are assigned Flood Design Class 3\* or Flood Design Class 4\* assigned pursuant to ASCE 24, if applicable. Critical facilities include but are not limited to hospitals, police stations, fire stations, and emergency operation centers that are needed for flood response activities before, during, or after a flood; public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood; and structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.

\*2012 Category III and Category IV, per ASCE 24-05

**G1002.1 Location of Critical Facilities.** New critical facilities shall, to the extent feasible, be located outside of the flood hazard area and outside of the 0.2% annual chance flood hazard area (500-year floodplain). If documentation is provided that feasible sites that satisfy the objectives of a proposed critical facility are not available outside of the flood hazard area and outside of the 0.2% annual chance flood hazard area (500-year floodplain), then the critical facility shall have the lowest floor or level of dry floodproofing, if permitted, at or above the base flood elevation plus 3 ft or the 500-year flood elevation plus 1 ft, whichever is higher.

### 5.3.13 Flood Hazard Map Other Than or in Addition to the FIRM

Most communities that participate in the NFIP adopt FISs and FIRMs produced by FEMA as the basis for enforcing floodplain management regulations and the flood provisions of building codes. The NFIP recognizes that some communities may adopt other flood maps or studies that cover all or just some areas within their jurisdiction. Use of other maps and supporting studies is allowed, provided the maps show either flood-prone areas that are larger than the SFHA or flood-prone areas that are not identified on FIRMs.

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The I-Codes and ASCE 24 define and use the terms “design flood,” “design flood elevation” and “flood hazard area” to refer to SFHAs shown on FIRMs as well as flood hazard areas delineated on other flood hazard area maps that communities may elect to adopt (see Sections 3.2.1 and 3.1.3).

### DFE vs BFE and SFHA vs FHA

Most communities use FIRMs, and thus, when those communities enforce building codes based on the I-Codes, the DFE is equal to the BFE and the flood hazard area is equal to the SFHA.

Communities may adopt different or additional flood hazard maps for several reasons:

- To delineate areas that have experienced flooding but are not shown as SFHAs on FIRMs
- To delineate historic floods of record that affected areas outside the limits of the FEMA-defined SFHA
- To delineate areas anticipated to be subject to future flooding because of changing conditions, such as climate change or upper watershed development estimated based on zoning

IBC: To refer to adoption in local floodplain management ordinances, which then specify the FIS and FIRMs and/or other studies and maps, modify Section 1612.3 as follows:

**1612.3 Establishment of flood hazard areas.** To establish flood hazard areas, the applicable governing authority shall, by local floodplain management ordinance, adopt a flood hazard map and supporting data. ~~The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency in an engineering report entitled “The Flood Insurance Study for [INSERT NAME OF JURISDICTION],” dated [INSERT DATE OF ISSUANCE], as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto.~~ The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this Section.

IRC: To refer to adoption in local floodplain management ordinances, which then specify the FIS and FIRMs and/or other studies and maps, modify Table R301.2(1) footnote (g) as follows:

**Table R301.2(1) Climatic and Geographic Design Criteria (partial)**

Flood Hazards <sup>g</sup>

g. The jurisdiction shall, by local floodplain management ordinance, adopt a flood hazard map and supporting data which are hereby adopted by reference and declared to be part of this Section. ~~fill in this part of the table with (a) the date of the jurisdiction’s entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.~~

**5.3.14 High Risk Flood Hazard Areas**

The nature of some flood-related risks makes identification and mapping difficult. These risks include alluvial fan flooding, flash floods, mudslides, erosion, high-velocity flows, high-velocity wave action outside of coastal areas, and damage-causing ice or debris. FEMA depicts some areas subject to alluvial fan flooding on FIRMs. Some communities and states may have regulatory or non-regulatory maps or other information to identify and characterize other flood-related risks. ASCE 24 commentary provides guidance on identifying High Risk Flood Hazard Areas. ASCE 24 Chapter 3 contains additional requirements in High Risk Flood Hazard Areas subject to those risks.

IBC: To refer to adoption in local floodplain management ordinances, which then specify the maps or other information that identify and characterize high risk flood hazard areas, modify Section 1612.3 as follows:

**1612.3 Establishment of flood hazard areas.** To establish flood hazard areas, the applicable governing authority shall, by local floodplain management ordinance, adopt a flood hazard map and supporting data. ~~The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency in an engineering report entitled “The Flood Insurance Study for [INSERT NAME OF JURISDICTION],” dated [INSERT DATE OF ISSUANCE], as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto.~~ The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this Section.

IRC: To refer to adoption in local floodplain management ordinances, which then specify the FIS and FIRMs and/or other studies and maps, modify Table R301.2(1) footnote (g) as follows:

**Table R301.2(1) Climatic and Geographic Design Criteria (partial)**

Flood Hazards <sup>g</sup>

g. The jurisdiction shall, by local floodplain management ordinance, adopt a flood hazard map and supporting data which are hereby adopted by reference and declared to be part of this Section. ~~fill in this part of the table with (a) the date of the jurisdiction’s entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of all currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.~~

**5.4 Amending IBC Appendix G for Other Higher Standards**

IBC Appendix G, paired with the flood provisions of the I-Codes, satisfy the floodplain management and administrative requirements for community participation in the NFIP. Some states do not adopt Appendix G, some states adopt it as a mandatory appendix, and some states allow local jurisdictions to adopt it (see Section 4.11).

## Increasing Resistance to Flood Damage

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Table 5-3 lists options for amending IBC Appendix G for selected higher standards illustrated in this section. Communities that do not use Appendix G can adopt similar provisions in local floodplain management regulations (see [Chapter 6](#) for model code-coordinated ordinances written for communities that do not use Appendix G).

**Table 5-3: Contents of this Section: Amending IBC Appendix G for Other Higher Standards**

**Click on a section to go directly to a discussion of that option.**

- [5.4.1 Designating the Floodplain Administrator](#)
- [5.4.2 Manufactured Home Limitations](#)
- [5.4.3 Flood Protection Setback along Waterways](#)
- [5.4.4 Subdivision Limitations](#)
- [5.4.5 Compensatory Storage](#)

### Using Suggested Texts for I-Code Amendments

Before adopting amendments to the I-Codes, users must verify the underlying text matches their adopted codes. The examples of recommended language to modify the codes is show in legislative format:

- Underline indicates added text.
- ~~Strikethrough~~ indicates deleted text.
- \* Notes with asterisks indicate where changes occurred between editions of the I-Codes (e.g., change in section number).
- {Notes or instructions in curly brackets} indicate options.

### 5.4.1 Designating the Floodplain Administrator

When communities apply to participate in the NFIP they legislatively “appoint or designate the agency or official with the responsibility, authority, and means to implement commitments” to the NFIP (44 CFR § 59.22(b)(1)). The designated official is commonly called the “floodplain administrator” or the “floodplain manager.” In most communities, the designated official has other duties and may be the head of a department, the city engineer, the principal planner, the building official, or a similar position. In small communities, the designated official may be the town clerk.

Chapter 1 of the I-Codes, in Section 103, creates the enforcement agency (generically referred to as the “Department of Building Safety”) and requires the “chief appointing authority of the jurisdiction” to appoint the building official. Further, the building official is given the authority to appoint a deputy, technical officers, inspectors, plan examiners, and other employees. Many states that mandate code enforcement have licensing requirements for building professionals, although some rely on qualifications established by the International Code Council.

IBC Appendix G identifies the building official as the responsible official. However, some communities may want to designate a different official to be responsible for administration and enforcement of Appendix G or companion code-coordinated floodplain management regulations. This is common in communities that assign floodplain management responsibilities to an agency other than the building department. Having more than one agency involved is common (see Chapter 2). Designating an official other than the building official can be accomplished one of two ways:

- The building official can exercise the authority already provided in the building code to designate other employees.



- The community may formally designate another official by amending IBC Appendix G or in its floodplain management regulations. Some states narrowly prescribe the authority of building officials to the building code, making this approach preferable.

IBC Appendix G: Designate an official other than the building official: Add a new Sec. G101.5:

**G101.5 Designation of floodplain administrator.** The {insert jurisdiction's selected position title} is designated as the floodplain administrator and is authorized and directed to enforce the provisions of this appendix. The floodplain administrator is authorized to delegate performance of certain duties to other employees of the jurisdiction. Such designation shall not alter any duties and powers of the building official.

Throughout Appendix G, replace “building official” with the “floodplain administrator” (example below shows only one of several locations where this change should be made):

**G103.2 Other permits.** It shall be the responsibility of the floodplain administrator ~~building official~~ to assure that approval of a proposed development shall not be given until proof that necessary permits have been granted by federal or state agencies having jurisdiction over such development.

### 5.4.2 Manufactured Home Limitations

The NFIP regulations, IBC Appendix G, and IRC Appendix E specify requirements for installation of manufactured homes in SFHAs (see Section 3-31). The IRC includes a provision for manufactured homes, although most states and communities do not include installation of manufactured homes in the scope of the IRC. In addition, requirements are included in the manufactured home installation standard promulgated by HUD (24 CFR Part 3285).

Post-flood investigations by FEMA and others document that manufactured homes, even if elevated to the minimum height specified by the NFIP, are more vulnerable to flood damage than conventional homes and modular homes with lowest floors at the same elevation. In addition, typical pier construction may not provide adequate resistance in some flood conditions, such as in floodways and Zone V where floodwater tends to be deeper, velocities tend to be faster, debris impacts may be more significant, and waves are higher.

To protect public health, safety, and welfare, some communities prohibit the installation of new manufactured homes in floodways and Zone V.

IBC Appendix G: Prohibit new installations of manufactured homes in floodways, Zone V and Coastal A Zones and require all replacements to be on compliant elevated foundations, modify Sec. G501 as follows:

#### **SECTION G501 MANUFACTURED HOMES**

**G501.1 Limitation on installation in floodways, coastal high hazard areas and Coastal A Zones.** New installations of manufactured homes shall not be permitted in identified floodways, coastal high hazard areas and Coastal A Zones.

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**G501.2 ~~G501.1~~ Elevation.** ~~All new and replacement manufactured homes to be placed or~~ New manufactured homes in flood hazard areas other than identified floodways, coastal high hazard areas and Coastal A Zones, and substantially improved ~~and replacement~~ manufactured homes in a flood hazard area shall be elevated such that the lowest floor of the manufactured home is elevated to or above the design flood elevation.

**G501.3 ~~G501.2~~ Foundations.** ~~All new and replacement manufactured homes, including~~ substantial improvement of existing New manufactured homes in flood hazard areas other than identified floodways, coastal high hazard areas and Coastal A Zones, and substantially improved ~~and replacement~~ manufactured homes, shall be placed on a permanent, reinforced foundation that is designed in accordance with Section 1612.

**G501.4 ~~G501.3~~ Anchoring.** ~~All new and replacement manufactured homes to be placed or~~ New manufactured homes in flood hazard areas other than identified floodways, coastal high hazard areas and Coastal A Zones, and substantially improved ~~and replacement~~ manufactured homes in a flood hazard area shall be installed using methods and practices which minimize flood damage. Manufactured homes shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement. Methods of anchoring are authorized to include, but are not to be limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

IRC: If used to regulate installation of manufactured homes, modify Section R322.1.9 as follows:

**R322.1.9 Manufactured homes.** New manufactured homes shall not be permitted in identified floodways, coastal high hazard areas (V Zones) and Coastal A Zones. New or replacement manufactured homes shall be elevated in accordance with Section R322.2 (flood hazard areas including A Zones) and replacement manufactured homes shall be elevated in accordance with ~~or~~ Section R322.3 in coastal high-hazard areas (V Zones and Coastal A Zones). The foundation and anchorage of replacement manufactured homes to be located in identified floodways shall be designed and constructed in accordance with ASCE 24.

IRC Appendix E (Manufactured Housing Used as Dwellings): If IRC Appendix E is used to regulate installation of manufactured homes, modify the exception to Section AE101.1 as follows:

**AE 101.2\* Flood hazard areas.** New manufactured homes shall not be permitted in identified floodways, coastal high hazard areas (V Zones) and Coastal A Zones. New and replacement manufactured homes to be installed in flood hazard areas as established by Table R301.2(1) shall meet the applicable requirements of Section R322.

\*2015 and 2012 Sec. AE101.1 Exception

### 5.4.3 Flood Protection Setback along Waterways

In general, areas immediately adjacent to bodies of water tend to be where floodwater is deeper and where velocities and waves are likely to be higher than farther away. In addition, areas near bodies of water are more likely to include wetlands and often serve as corridors for movement of wildlife. For these and other reasons, many states and communities establish buffers or setbacks, typically by prohibiting all development or limiting development (e.g., prohibit grading and fill) within specified minimum distances from the

#### Benefits of Natural Floodplains

FEMA describes some benefits of preserving natural floodplains on this web page: [www.fema.gov/benefits-natural-floodplains](http://www.fema.gov/benefits-natural-floodplains).

body of water. Enforcing setback distances can guide development to locations outside of floodways and areas prone to flood-related erosion, and help protect natural shorelines. Setbacks and wetlands buffers are used to minimize the effect of non-point sources of pollution caused by land development activities, timber harvesting, and agricultural activities. Setbacks help preserve the natural and beneficial functions of the floodplain.

Setbacks may take a number of forms, including specified distances:

- Measured from the centerline of a waterway, where the waterway under normal flow is less than a specified width
- Measured from the top of bank where the waterway under normal flow is wider than a specified width
- Equal to half the distance between the waterway and the SFHA boundary
- Landward of the floodway boundary
- Landward of the landward reach of mean high tide
- Landward of the coastal high hazard area (Zone V) boundary
- Landward of the 30- or 60-year erosion zone

### Setback Proxies for Floodways

Some communities adopt setbacks along watercourses where FEMA has not determined BFEs or designated floodways. With FEMA concurrence, setbacks can be proxies for floodways, minimizing the need to perform site-specific engineering to evaluate the impacts of fill and development.

The NFIP and the I-Codes, including IBC Appendix G, do not have specific requirements that govern the location of buildings with respect to bodies of water and flood hazard areas. Where floodways are designated, both the NFIP and the I-Codes require analyses of the effect of encroachments into floodways to ensure that flood heights are not increased more than a specified amount. While the encroachment requirement may, in effect, limit development in floodways, the requirement is not equivalent to enforcing setbacks.

Setback requirements may be adopted in local zoning ordinances, stormwater regulations, or local floodplain management regulations. If IBC Appendix G is enforced, it may be modified to incorporate a setback.

IBC Appendix G: Add new Section G401.1 as follows and renumber subsequent sections:

**G401.1 Setback requirements on riverine watercourses.** All development, including fill, buildings, and structures, shall be set back from the top of bank a distance equal to **{insert A}** times the width of the water course (measured at the top of bank) or **{insert B}** feet from the top of the bank, whichever is greater, unless documentation is submitted that there are no alternative locations for the development and all other requirements of the code and this appendix are satisfied.

{Note} A common number for **{insert A}** is two; common numbers for **{insert B}** are 50 (smaller waterways) to 100 or more (larger waterways).

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### 5.4.4 Subdivision Limitations

Many communities use subdivision ordinances to avoid or minimize impacts on floodplains through lot layout and open space requirements. Developers may be required to set aside some or all flood hazard areas for open space or recreational areas, or lots may be required to be platted so that building footprints are on high ground. Linear parks and greenways that connect open space areas throughout a community are becoming popular amenities. These more restrictive provisions have advantages over simply requiring buildings to be elevated:

- Fewer buildings are isolated by floodwater, avoiding strains on local emergency services during flood events.
- More open space and recreation areas, generally considered valuable amenities, are included in the design.

The NFIP requirements do not specify how subdivisions in SFHAs are laid out. The only requirement applies where BFEs are not provided on FIRMs, in which case communities must require applicants for new subdivisions (including manufactured homes parks and subdivisions) and other proposals to include BFEs in proposals when the proposals include more than 50 lots or involve more than 5 acres, whichever is the lesser.

IBC Appendix G requires all subdivision proposals to include DFEs on tentative and final plats.

#### **Subdivisions and Flood Hazards**

The American Planning Association's 2016 PAS Report 584, *Subdivision Design and Flood Hazards*, complements the 1997 PAS Report 473, *Subdivision Design in Flood Hazard Areas*. The newer report reflects a more comprehensive approach to reducing flood risks through subdivision planning and design.

IBC Appendix G: Select Option 1 or Option 2.

Option 1 (lot layout to put flood hazard areas in open space): Modify Secs. G301.1 and G301.2 as follows:

**G301.1 General.** Any subdivision proposal, including proposals for manufactured home parks and subdivisions, or other proposed new development in a flood hazard area shall be reviewed to verify all of the following:

1. All such proposals are consistent with the need to minimize flood damage.
2. All public utilities and facilities, such as sewer, gas, electric and water systems are located and constructed to minimize or eliminate flood damage.
3. Adequate drainage is provided to reduce exposure to flood hazards.
4. Flood hazard areas shall be restricted to open space uses and not included in individual platted lots.

**G301.2 Subdivision requirements.** The following requirements shall apply in the case of any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within a flood hazard area:

1. The flood hazard area, including floodways, coastal high-hazard areas and coastal A zones, as appropriate, shall be delineated on tentative and final subdivision plats.
2. Design flood elevations shall be shown on tentative and final subdivision plats.
- ~~3. Residential building lots shall be provided with adequate buildable area outside the floodway.~~
- 3.4. The design criteria for utilities and facilities set forth in this appendix and appropriate *International Codes* shall be met.

Option 2 (lot layout to put building locations outside flood hazard areas): Modify Sec. G301.2 as follows:

**G301.2 Subdivision requirements.** The following requirements shall apply in the case of any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within a flood hazard area:

1. The flood hazard area, including floodways, coastal high-hazard areas and coastal A zones, as appropriate, shall be delineated on tentative and final subdivision plats.
2. Design flood elevations shall be shown on tentative and final subdivision plats.
3. Residential building lots shall be provided with adequate buildable area outside the flood hazard area floodway.
4. The design criteria for utilities and facilities set forth in this appendix and appropriate *International Codes* shall be met.

### 5.4.5 Compensatory Storage

The NFIP definition of “development” includes filling and grading. In some flood hazard areas, the placement of development and fill or grading that alters the shape of the land may create obstructions that affect the free flow of floodwater. Applications for grading or filling may be submitted for site development activities, even if buildings are not proposed to be supported on the filled areas.

## Increasing Resistance to Flood Damage

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The NFIP requires communities to prohibit encroachments, including fill and other development, in regulatory floodways unless it is demonstrated that proposed encroachments will not result in any increase in flood levels during the base flood. Because FEMA's mapping rules for delineating floodways allow as much as a 1-foot increase in BFE, authorizing fill and development in the floodway fringe can, over time, result in increasing the BFEs shown on the FIRM. By itself, the basic floodway requirement is not a "higher standard."

The placement of fill in Zone A areas, especially riverine waterways and ponded areas, can reduce floodplain storage capacity that may result in increased flood depths or changes in flow direction and erosion potential. Placement of fill in Zone A areas inland of Zone V may create local drainage problems, but is not expected to contribute to a general increase in flood elevations. Filling and grading in flood hazard areas can adversely affect vegetation, wetlands, drainage, and water quality.

Compensatory storage refers to a practice of offsetting the effects of earthen fill or other development encroaching into all or part of the SFHA by providing hydraulically equivalent, excavated floodplain storage capacity. Especially along waterways where buildings are already at-risk, compensatory storage can minimize the impact of allowing additional development. Most communities that require compensatory storage do not require compensation when buildings are elevated on columns or pilings although some do require compensation for perimeter wall (crawl space) foundations and backfilled stem wall foundations. Requiring the creation of floodplain storage capacity can compensate for proposed encroachments, but there may be environmental impacts caused by the excavation itself.

The concept of "hydraulically equivalent" is important. It means that with offsetting excavation, the encroachment of development in a flood hazard area will not adversely affect the BFE. To be considered hydraulically equivalent, compensatory storage is usually provided at a ratio of 1 to 1 (i.e., 1 cubic yard of excavation for every cubic yard of fill or development). However, it takes more than simply excavating an equal volume to be hydraulically equivalent: engineering analyses are needed to ensure the excavation is correctly located to actually offset the hydraulic impact of the development or fill.

IBC Appendix G: Modify Sec. G104.2, add a new definition of compensatory storage, and add new Sec. G401.7 as follows:

**G104.2 Application for permit.** The applicant shall file an application in writing on a form furnished by the building official. Such application shall: *[only pertinent item shown]*

1. Be accompanied by construction documents, grading and filling plans, plans and engineering analyses to document compensatory storage, and other information deemed appropriate by the building official.

**COMPENSATORY STORAGE.** Excavation within or directly contiguous to a flood hazard area, above the seasonal high groundwater table elevation and below the design flood elevation, of a hydraulically-equivalent volume provided to balance the effects of proposed fill and development on the flood hazard area (no net loss of floodplain storage volume). Areas excavated for compensatory storage shall become part of the flood hazard area and not be separated from the flood hazard area by an open channel or closed conduit or culvert.

**G401.7\* Requirement for compensatory storage.** Fill and development (other than temporary structures and temporary storage) are permitted in flood hazard areas outside of floodways if compensatory storage is provided. Engineering analyses prepared by a qualified professional shall be submitted to demonstrate the compensatory storage hydraulically balances the proposed development or fill. The Floodplain Administrator shall be permitted to waive the requirement for compensatory storage if the applicant demonstrates that the development or fill will not increase the design flood elevation on adjacent properties.

\*2012 Sec. G401.6

{ **Note** } To require compensatory storage only for fill, modify as shown above, but remove “development” in three places.

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## Chapter 6 Model Code-Coordinated Floodplain Management Ordinances

This chapter introduces three versions of a model floodplain management ordinance that are explicitly written to coordinate with the I-Codes (see [Table 6-1](#)).

State and local officials should review the excerpts of the flood provisions of the I-Codes to compare specific sections of the I-Codes with the comparable provisions in state model floodplain management ordinances and local regulations. Excerpts of the flood provisions of the 2012 and later editions of I-Codes and checklists that illustrate how those codes address specific sections of the NFIP regulations for buildings and structures are available online at [www.fema.gov/building-code-resources](http://www.fema.gov/building-code-resources).

The three model ordinances are available online at [www.fema.gov/media-library/assets/documents/96224](http://www.fema.gov/media-library/assets/documents/96224), as is the NFIP Checklist for Version 3, which demonstrates how that version, with the I-Codes, satisfies all requirements of the NFIP.

**Table 6-1: Selecting the Applicable Code-Coordinated Model Ordinance**

	I-Codes with Chapter 1 <sup>(1)</sup>	I-Codes without Chapter 1 <sup>(2)</sup>
I-Codes with IBC Appendix G <sup>(3)</sup>	Model Ordinance Version One	<i>[FEMA has not identified any states in this situation]</i>
I-Codes without IBC Appendix G <sup>(4)</sup>	Model Ordinance Version Two	Model Ordinance Version Three

**Table notes:**

- (1) Most states retain I-Code Chapter 1, some remove/modify some provisions, some retain only the IBC Chapter 1 and apply to all codes, and some retain Chapter 1 for each code. Refer to Sections 4.5 and 4.6 of this guide.
- (2) Even if I-Code Chapter 1 is not adopted, states usually have adopted equivalent administrative provisions that may or may not have retained the flood provisions in the I-Code Chapter 1. Refer to Section 4.5 of this guide.
- (3) Some states adopt and require enforcement of IBC Appendix G and some states make IBC Appendix G available for local adoption. Refer to Section 4.11 of this guide.
- (4) Most states do not adopt IBC Appendix G and do not make it available. Refer to Section 4.11 of this guide.

### 6.1 Examining Approaches

The first and most important step in examining approaches to coordinating local floodplain management regulations and building codes is to determine whether the flood provisions of the codes will replace the requirements in existing stand-alone floodplain management regulations. This question and the other questions in Chapter 4 should be examined.

In states that adopt building codes and mandate local enforcement, this examination should be conducted at the state level. In states where communities have the choice of whether to adopt building codes, communities should examine their current approaches. Section 2.3 of this guide, which references two worksheets that will help reviewers ensure all NFIP requirements are addressed, suggests one way to do this examination.

### 6.2 Modifying Approaches

The next step is to determine whether and how to modify codes and local floodplain management regulations, perhaps by using one of the three code-coordinated model ordinances described in [Table 6-1](#). Section 2.4 of this guide describes recommended steps to modify a community’s

## Model Code-Coordinated Floodplain Management Ordinances

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approach. The answers to the questions in [Chapter 4](#) will inform decisions on modifying the codes and local floodplain management regulations.

As part of this process, states and communities should examine the options for increasing resistance to flood damage by incorporating higher standards, as described in [Chapter 5](#).

## **Appendix A: References and Resources**

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- Technical Bulletin 0. *User's Guide to NFIP Technical Bulletins*
  - Technical Bulletin 1. *Openings in Foundation Walls and Walls of Enclosures Below Elevated Buildings in Special Flood Hazard Areas*

- Technical Bulletin 2. *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*
- Technical Bulletin 3. *Non-Residential Floodproofing - Requirements and Certification for Buildings Located in Special Flood Hazard Areas*
- Technical Bulletin 4. *Elevator Installation for Buildings Located in Special Flood Hazard Areas*
- Technical Bulletin 5. *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*
- Technical Bulletin 6. *Below-Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas*
- Technical Bulletin 7. *Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas*
- Technical Bulletin 8. *Corrosion Protection of Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas*
- Technical Bulletin 9. *Design and Construction Guidance for Breakaway Walls Below Elevated Buildings Located in Coastal High Hazard Areas*
- Technical Bulletin 10. *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding*
- Technical Bulletin 11. *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*

### Codes and Standards

American Society of Civil Engineers (ASCE) publications can be purchased online at [www.asce.org/Bookstore/](http://www.asce.org/Bookstore/).

- ASCE 24: *Flood Resistant Design and Construction*
- ASCE 7: *Minimum Design Loads of Buildings and Other Structures*

International Code Council, International Codes can be purchased online [shop.iccsafe.org/](http://shop.iccsafe.org/) or viewed for free online at [codes.iccsafe.org/](http://codes.iccsafe.org/).

- International Building Code (IBC)
- International Code Council Performance Code (ICCPC)
- International Existing Building Code (IEBC)
- International Fuel Gas Code (IFGC)
- International Green Construction Code (IgCC)
- International Mechanical Code (IMC)
- International Plumbing Code (IPC)
- International Private Sewage Disposal Code (IPSDC)
- International Residential Code (IRC)
- International Swimming Pool and Spa Code (ISPSC)

## Appendix A

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International Code Council, International Codes Commentary combines the text of each I-Code with expert technical commentary: available for purchase online at [shop.iccsafe.org/](http://shop.iccsafe.org/).



*Useful Web Links*

Building Code Effectiveness Grading Schedule (BCEGS)	<a href="http://www.isomitigation.com/bcegs/">www.isomitigation.com/bcegs/</a>
FEMA Building Science	<a href="http://www.fema.gov/building-code-resources">www.fema.gov/building-code-resources</a>
FEMA Regional Contacts	<a href="http://www.fema.gov/fema-regional-contacts">www.fema.gov/fema-regional-contacts</a>
National Flood Insurance Program (NFIP)	<a href="http://www.floodsmart.gov">www.floodsmart.gov</a>
NFIP Community Rating System (CRS)	<a href="http://www.fema.gov/national-flood-insurance-program-community-rating-system">www.fema.gov/national-flood-insurance-program-community-rating-system</a> <a href="http://www.CRSresources.org">www.CRSresources.org</a>
National Oceanic and Atmospheric Administration Shoreline Website	<a href="http://shoreline.noaa.gov/">shoreline.noaa.gov/</a>
State Code Agencies	<a href="http://codes.iccsafe.org/search/map">codes.iccsafe.org/search/map</a>

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## **Appendix B: Sample Plan Review and Inspection Checklists**

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## Zone A Plan Review Checklist

Application #: \_\_\_\_\_

Applicant: \_\_\_\_\_

### SAMPLE Plan Review Checklist – Flood Hazard Area Zone A

Terms: BFE = Base Flood Elevation; DFE= Design Flood Elevation (if local maps used); CAZ = Coastal A Zone

**NOTE: For variance requests, use this form to document efforts to ensure the variance is the minimum necessary to afford relief.**

Initials and Date	Review Steps
	<b>Flood Hazard Determination</b>
FIRM Panel # and date: _____ _____  Flood Zone: _____ BFE / DFE: _____ Datum: _____ Flood depth (AO Zone): _____	Check FIRM, floodplain / floodway boundaries, base flood elevations, <u>and</u> map revisions and LOMRs issued by FEMA. Is proposal in the floodplain and / or floodway? <input type="checkbox"/> NO, sign and date this form; no further review. <input type="checkbox"/> YES, must comply with flood resistant provisions of the code. <input type="checkbox"/> YES, FLOODWAY. Require engineer's "no rise" analysis and supporting hydraulic data in file before continuing review. <input type="checkbox"/> YES, FLOODWAY. All residential structures (including Manufactured Homes) in floodways to comply with ASCE24. <input type="checkbox"/> YES, in SFHA without BFEs. Check other sources, use estimating methods, or require applicant to determine. <input type="checkbox"/> YES, in SFHA, but applicant has elevation data that shows natural site elevation above BFE. Advise applicant to obtain LOMA and submit copy for the file. <input type="checkbox"/> YES, in Coastal A Zone (seaward of LiMWA or if designated by community; use Zone V/CAZ Checklist). <input type="checkbox"/> YES, in Zone V; use Zone V/CAZ Checklist. <input type="checkbox"/> YES, in 500-year floodplain (shaded Zone X/Zone B). Floodplain review not required; advise applicant and encourage minimizing flood hazards.
	<b>Location and Site Plan</b>
	Site plan shows nature of development proposal, location, dimensions, wetlands, flood hazard areas (Zone A, Coastal A Zone, Zone V) and floodway boundaries, BFE / DFE, ground elevations, proposed fill and excavation, and drainage patterns and infrastructure? <input type="checkbox"/> YES, proceed with review. <input type="checkbox"/> NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid floodplain? <input type="checkbox"/> YES, explain flood hazards to applicant and offer recommendations to modify proposal to minimize flood hazards and damage potential. <input type="checkbox"/> NO, but can impacts be minimized? Reduce fill? Locate on higher ground?
	Has the applicant provided copies of all necessary state and federal permits, e.g., wetlands? <input type="checkbox"/> NO, advise applicant which agencies may require permits. <input type="checkbox"/> YES, request copies for the file.
	Is fill proposed? Compaction specified? Side-slopes are no steeper than 2H:1V? Protected from erosion? <input type="checkbox"/> NO, fill is not used, proceed with review. <input type="checkbox"/> YES, fill used to elevate building will be compacted, sloped, and stabilized. <input type="checkbox"/> YES, but not for building elevation. Purpose for fill and quantity: _____

# Zone A Plan Review Checklist

Application #: \_\_\_\_\_

Sample

Initials and Date	Review Steps
	<p>Are public utilities and facilities located and constructed to minimize or eliminate flood damage?</p> <p><input type="checkbox"/> NOT APPLICABLE, proceed with review.</p> <p><input type="checkbox"/> YES, proceed with review.</p> <p><input type="checkbox"/> NO, return to applicant to revise application and site plan.</p>
	<p>Is adequate drainage provided to reduce exposure to flood hazards? Is storm drainage system designed to convey the flow of surface waters to minimize or eliminate damage to buildings?</p> <p><input type="checkbox"/> YES, proceed with review.</p> <p><input type="checkbox"/> NO, return to applicant to revise application and site plan.</p>
	<p>Is a swimming pool proposed?</p> <p><input type="checkbox"/> NO, proceed with review.</p> <p><input type="checkbox"/> YES, outside of floodway, proceed with review.</p> <p><input type="checkbox"/> YES, in floodway. If above-grade or with fill, floodway encroachment analysis and certification are:</p> <p><input type="checkbox"/> Included in application; review for compliance with no-rise requirement.</p> <p><input type="checkbox"/> Not included, return to applicant to provide documentation.</p>
	<p>Will a watercourse be altered?</p> <p><input type="checkbox"/> NO, proceed with review.</p> <p><input type="checkbox"/> YES, applicant to provide copies of notices to adjacent communities, federal agencies, and the NFIP State Coordinator.</p> <p><input type="checkbox"/> YES, engineer's analysis required to show same flood carrying capacity; method of maintenance specified.</p>
	<p>Is a road or watercourse crossing proposed?</p> <p><input type="checkbox"/> NO, proceed with review.</p> <p><input type="checkbox"/> YES. If alters floodway, floodway encroachment analysis and certification are:</p> <p><input type="checkbox"/> Included in application; review for compliance with no-rise requirement.</p> <p><input type="checkbox"/> Not included, return to applicant to provide documentation.</p>
<b>Plans/Drawings for New Construction or Work on Existing Building</b>	
	<p>Is new building proposed to be elevated (new residential building, nonresidential building, manufactured home)? Give applicant a blank FEMA Elevation Certificate.</p> <p><input type="checkbox"/> NO – STOP! A permit cannot be issued for nonelevated residential buildings.</p> <p><input type="checkbox"/> NO, nonresidential buildings may be floodproofed (see below for pertinent elements).</p> <p><input type="checkbox"/> YES, on fill. Basements into fill are <u>not</u> allowed.</p> <p><input type="checkbox"/> YES, on piers, pilings, or columns.</p> <p><input type="checkbox"/> YES, on solid foundation walls (see Enclosed areas below lowest floor).</p> <p><input type="checkbox"/> YES, on backfilled stem wall or monolithic slab.</p>
	<p>Is the application for repair, alteration, improvement or addition to an existing building?</p> <p><input type="checkbox"/> YES, existing building conforms to current flood provisions; new work required to comply.</p> <p><input type="checkbox"/> YES, but "historic structure" documentation in file and proposed work will not change historic designation; encourage flood resistance (variance may be required).</p> <p><input type="checkbox"/> YES, costs of work are documented and compared to market value of building:</p> <p><input type="checkbox"/> If costs equal or exceed 50% of market value of building (SI / SD), require compliance (foundation, elevation, enclosures, materials, equipment). Continue review.</p> <p><input type="checkbox"/> Proposed work is not SI / SD, flood hazard review not required.</p>

Initials and Date	Review Steps
	<b>Lowest Floor Elevation</b>
	Elevation of the low est floor is specified or shown on the plans at or above the required elevation? <input type="checkbox"/> YES, proceed with review. Specified elevation of the low est floor: _____ <input type="checkbox"/> NO, return to applicant for revision.
	<b>Enclosure(s) Below Lowest Floor</b>
	Enclosed areas below the low est floor (stairwells, elevator foyers, garages, storage areas, crawl spaces)? <input type="checkbox"/> NO enclosed areas, proceed with review. <input type="checkbox"/> YES, plan shows acceptable use (parking, limited storage, and building access). <input type="checkbox"/> Size of each enclosed area (measured on outside): _____ sq. ft. _____ sq. ft.
	Enclosed areas (except elevator shafts) have flood openings? See Technical Bulletin 1. <input type="checkbox"/> NO, floor of enclosure is at or above the required elevation (note: without openings, floor of enclosure will be considered the low est floor for NFIP insurance rating). <input type="checkbox"/> YES, number and location of flood openings conform to plan: <input type="checkbox"/> At least two openings, on different sides. <input type="checkbox"/> Openings not more than 12" above higher of interior grade/floor or exterior grade. <input type="checkbox"/> Nonengineered openings: total net open area provided: _____ sq. in. <input type="checkbox"/> Engineered openings: total "rated" or "coverage" area provided: _____ sq. in. <input type="checkbox"/> Engineered openings certification provided? <input type="checkbox"/> NOT COMPLIANT, return to applicant for revision.
	Materials used below the low est floor are flood damage-resistant materials (exterior finishes, enclosures)? See Technical Bulletin 2. <input type="checkbox"/> YES, proceed with review. <input type="checkbox"/> NO, return to applicant for revision.
	<b>HVAC, Equipment, Utilities</b>
	<input type="checkbox"/> Electrical, mechanical, plumbing, heating / air conditioning components elevated (or protected if nonresidential)? Minimum electrical necessary for life safety allowed below. <input type="checkbox"/> Elevator? See Technical Bulletin 4. <input type="checkbox"/> Sanitary sewage system designed to minimize floodwater inflow / sewage discharge under flood conditions? <input type="checkbox"/> On-site water supply designed to minimize floodwater inflow under flood conditions? <input type="checkbox"/> Above-ground tanks are anchored / elevated to required elevation? <input type="checkbox"/> Below-ground tanks are designed to resist flotation?
	<b>Floodproofed Nonresidential Buildings</b>
	If new, nonresidential structure is not elevated, will it be dry floodproofed? <input type="checkbox"/> YES, nonresidential building will be dry floodproofed per ASCE24, signed and sealed design documentation and maintenance and emergency plan included. <input type="checkbox"/> NO, return to applicant to revise in compliance. <input type="checkbox"/> Elevation of dry floodproofing shown on plans? Nonresidential structures with finished floor below the required elevation must be engineered to be dry floodproofed to the required elevation or higher. <input type="checkbox"/> Dry floodproofing methods and flood shields shown on plans? <input type="checkbox"/> Flood shield storage location shown on plans? <input type="checkbox"/> Maintenance and emergency operation plan provided? <input type="checkbox"/> If machinery/equipment servicing the building is outside the building is it elevated? In dry floodproofed area?

# Zone A Plan Review Checklist

Application #: \_\_\_\_\_

Sample

Initials and Date	Review Steps
	<b>Manufactured Homes</b>
	<input type="checkbox"/> Are flood hazards avoided as much as possible? <input type="checkbox"/> In Floodway, refer to ASCE 24 for foundation design. <input type="checkbox"/> Foundation is permanent, reinforced (dry-stack block NOT allowed). <input type="checkbox"/> Ground anchors and tie-downs shown on plans? <input type="checkbox"/> Bottom of chassis frame at or above the required elevation?
	<b>Recreational Vehicles</b>
	<input type="checkbox"/> In a Floodway? STOP, RVs not permitted in the Floodway. <input type="checkbox"/> RV fully licensed and ready for highway use? Permitted for less than 180 days. <input type="checkbox"/> RV not fully licensed and ready for highway use or will be on site more than 180 days? Must comply with requirements for Manufactured Homes.
	<b>Permit Documents and Records</b>
	<input type="checkbox"/> Record permit in log of floodplain permits. <input type="checkbox"/> Make sure all necessary documents are in the file. <input type="checkbox"/> Issue Permit and transfer file to Inspections.

PERMIT APPLICATION REVIEW COMPLETED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

ISSUE PERMIT approved by: \_\_\_\_\_

DENY PERMIT approved by: \_\_\_\_\_



## Zone A Inspection Checklist

Permit #: \_\_\_\_\_

Applicant: \_\_\_\_\_

### SAMPLE Inspection Checklist: Flood Hazard Area Zone A

Initials and Date	Inspection Steps
	Before site inspection: <ul style="list-style-type: none"> <li><input type="checkbox"/> REVIEW permit file before going in the field.</li> <li><input type="checkbox"/> ASK permit reviewer questions to understand requirements.</li> <li><input type="checkbox"/> ALWAYS review work to see if in accordance with permit and approved plans. When work is in accordance with permit documents, complete inspection.</li> <li><input type="checkbox"/> When work deviates from permit documents, advise applicant/contractor that revised permit documents need to be submitted for review and approval prior to performing inspection.</li> </ul>
	<b>Location and Site Plan</b>
	Measure stake out distances from lot line, street, waterway or landmark. Is development in the right place? <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with inspection.</li> <li><input type="checkbox"/> NO, advise corrections; take enforcement action.</li> </ul>
	<b>Foundation / Lowest Floor Elevation</b>
	Foundation type as specified on plans? Permittee submitted Elevation Certificate? Is lowest floor at or above required elevation? <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, elevation of lowest floor checked during foundation inspection after lowest floor is in place and prior to further vertical construction.</li> <li><input type="checkbox"/> NO, require permittee to submit Elevation Certificate.</li> <li><input type="checkbox"/> NO, lowest floor is below required elevation. Advise corrections; take enforcement action.</li> </ul>
	<b>Enclosure(s) below Lowest Floor</b>
	Enclosed areas below the lowest floor (stairwells, elevator foyers, garages, storage areas, crawl spaces)? <ul style="list-style-type: none"> <li><input type="checkbox"/> NO enclosed areas.</li> <li><input type="checkbox"/> YES, use of enclosure appears to be limited to parking, building access and limited storage.</li> <li><input type="checkbox"/> Size of each enclosed area (measured on outside):                _____ sq. ft. _____ sq. ft.</li> </ul>
	Enclosed areas (except elevator shafts) have flood openings? <ul style="list-style-type: none"> <li><input type="checkbox"/> NONE or NOT COMPLIANT, take enforcement action to correct problem.</li> <li><input type="checkbox"/> NO, floor of enclosure is at or above the required elevation (note: without openings, floor of enclosure will be considered the lowest floor for NFIP insurance rating).</li> <li><input type="checkbox"/> YES, flood openings per plans: type (engineered, nonengineered); number and location (on at least two sides and no more than 12" above the higher of the interior grade/floor or exterior grade).</li> </ul>
	Materials used below the lowest floor are flood damage-resistant materials (exterior finishes, enclosures) as specified? <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with inspection.</li> <li><input type="checkbox"/> NO, advise corrections; take enforcement action.</li> </ul>

# Zone A Inspection Checklist

Permit #: \_\_\_\_\_

Sample

Initials and Date	Inspection Steps
	<b>HVAC, Equipment, Utilities</b>
	Electrical, mechanical, plumbing, heating / air conditioning components elevated at or above required elevation? Only minimal electrical necessary for life safety below required elevation? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Sanitary sewage system constructed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	On-site water supply constructed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Above-ground tanks are anchored / elevated? Below-ground tanks installed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	<b>Dry Floodproofed Nonresidential Buildings</b>
	Floodproofing Inspection: Is floodproofing to or above the required elevation? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Flood shields stored at designated storage location? Maintenance and emergency operations plan at site? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Outside machinery/equipment servicing building elevated or protected to or above required elevation? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action. <input type="checkbox"/> Machinery inside dry floodproofed area or enclosure.
	<b>Manufactured Homes</b>
	Permanent and reinforced foundation? Ground anchors and tie-downs in place? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Permittee submitted Elevation Certificate? Bottom of chassis frame at or above required elevation? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, require permittee to submit Elevation Certificate. <input type="checkbox"/> NO, lowest floor is below required elevation. Advise corrections; take enforcement action.
	Enclosure(s) present? <input type="checkbox"/> YES, complete "Enclosure(s) Below Lowest Floor" section above. <input type="checkbox"/> NO enclosure(s).

Sample

### Zone A Inspection Checklist

Permit #: \_\_\_\_\_

Initials and Date	Inspection Steps
	<b>Recreational Vehicles</b>
	RV fully licensed and ready for highway use (if permitted on-site for more than 180 days)? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, RV required to comply with Manufactured Home requirements. Complete "Manufactured Homes" section above.
	<b>Final Inspection; Documents and Records</b>
	Permittee submitted as-built Elevation Certificate or as-built Floodproofing Certificate (if applicable)? <input type="checkbox"/> YES, perform final inspection; maintain copy of certificates in permanent records. <input type="checkbox"/> NO, require permittee to submit as-built certificates and perform final inspection.
	Other Notes Based on Inspection (attached additional pages if necessary):
	Issue Occupancy Certificate only if final inspection shows compliance with flood hazard requirements. Put final Elevation Certificate in permanent file.

FINAL INSPECTION COMPLETED BY: \_\_\_\_\_ DATE: \_\_\_\_\_



## Zone V Plan Review Checklist

Application #: \_\_\_\_\_

Applicant: \_\_\_\_\_

### SAMPLE Plan Review Checklist – Flood Hazard Area Zone V / Coastal A Zone

Terms: BFE = Base Flood Elevation; DFE = Design Flood Elevation (if local maps used); CAZ = Coastal A Zone

**NOTE: For variance requests, use this form to document efforts to ensure the variance is the minimum necessary to afford relief.**

Initials and Date	Review Steps
	<b>Flood Hazard Determination</b>
FIRM Panel # and date: _____ _____  Flood Zone: _____  BFE / DFE: _____  Datum: _____  Flood depth (VOZone): _____	Check FIRM, floodplain / floodway boundaries, base flood elevations, <u>and</u> map revisions and LOMRs issued by FEMA. Is proposal in the floodplain and / or floodway?  <input type="checkbox"/> NO, sign and date this form; no further review. <input type="checkbox"/> YES, must comply with flood resistant provisions of the code. <input type="checkbox"/> YES, Zone A, use Zone A checklist. <input type="checkbox"/> YES, in SFHA, but applicant has elevation data that shows natural site elevation above BFE. Advise applicant to obtain LOMA and submit copy for the file. <input type="checkbox"/> YES, in Zone V. <input type="checkbox"/> YES, in Coastal A Zone (seaward of LiMWA or if designated by community).  Is proposal in Coastal Barrier Resources Area (CoBRA) or Otherwise Protected Area (OPA)? <input type="checkbox"/> YES, advise applicant that federal flood insurance is not available for new construction, substantial improvement, and repair of substantial damage. Must comply with flood provisions. <input type="checkbox"/> NO, proceed with review.
	<b>Location and Site Plan</b>
	Site plan shows nature of development proposal, location, dimensions, wetlands, flood hazard areas (Zone A, Coastal A Zone, Zone V), BFE / DFE, ground elevations, proposed fill and excavation, and drainage patterns and infrastructure? Building landward of the reach of mean high tide?  <input type="checkbox"/> YES, proceed with review. <input type="checkbox"/> NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid floodplain? <input type="checkbox"/> YES, explain flood hazards to applicant and offer recommendations to modify proposal to minimize flood hazards and damage potential. <input type="checkbox"/> NO, but can impacts be minimized? Locate on higher ground, farther back from water?
	Has the applicant provided copies of all necessary state and federal permits, e.g., wetlands? <input type="checkbox"/> NO, advise applicant which agencies may require permits. <input type="checkbox"/> YES, request copies for the file.
	Will dunes or mangrove stands be altered? <input type="checkbox"/> NO, proceed with review. <input type="checkbox"/> YES, require analysis that alteration will not increase potential flood damage.

# Zone V Plan Review Checklist

Application #: \_\_\_\_\_

Sample

Initials and Date	Review Steps
	<p>Is fill proposed?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NO, proceed with review.</li> <li><input type="checkbox"/> YES, to support building. STOP! Foundations in Zone V must be pilings or columns (or stem walls in CAZ).</li> <li><input type="checkbox"/> YES, minor quantities of fill permitted for landscaping and drainage purposes, and for support of parking slabs, pool decks, patios and walkways. Quantity and description of fill: _____</li> </ul>
	<p>Are public utilities and facilities located and constructed to minimize or eliminate flood damage?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NOT APPLICABLE, proceed with review.</li> <li><input type="checkbox"/> YES, proceed with review.</li> <li><input type="checkbox"/> NO, return to applicant to revise application and site plan.</li> </ul>
	<p>Is adequate drainage provided to reduce exposure to flood hazards? Is storm drainage system designed to convey the flow of surface waters to minimize or eliminate damage to buildings?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with review.</li> <li><input type="checkbox"/> NO, return to applicant to revise application and site plan.</li> </ul>
	<p>Is a swimming pool proposed?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NO, proceed with review.</li> <li><input type="checkbox"/> YES, in-ground, flush with final grade; proceed with review.</li> <li><input type="checkbox"/> YES, outside of building footprint. If above-grade and not elevated, analysis submitted to show swimming pool does not create an obstruction?</li> <li><input type="checkbox"/> YES, elevated (see ASCE 24).</li> <li><input type="checkbox"/> YES, creates an obstruction, return to applicant to revise application and site plan.</li> </ul>
<b>Plans/Drawings for New Construction or Work on Existing Building</b>	
	<p>Is new building proposed to be elevated (new residential building, nonresidential building, manufactured home)? Give applicant a blank FEMA Elevation Certificate.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NO – STOP! A permit cannot be issued for nonelevated buildings.</li> <li><input type="checkbox"/> YES, on fill. STOP! Fill not permitted for structural support.</li> <li><input type="checkbox"/> YES, on pilings or columns.</li> <li><input type="checkbox"/> YES, on parallel shear walls (high-rise only if required for lateral loads, see ASCE 24).</li> <li><input type="checkbox"/> YES, on backfilled stem wall or monolithic slab (Coastal A Zone only).</li> </ul>
	<p>Is the application for repair, alteration, improvement or addition to an existing building?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, existing building conforms to current flood provisions; new work required to comply.</li> <li><input type="checkbox"/> YES, but “historic structure” documentation in file and proposed work will not change historic designation; encourage flood resistance (variance may be required).</li> <li><input type="checkbox"/> YES, costs of work are documented and compared to market value of building:             <ul style="list-style-type: none"> <li><input type="checkbox"/> If costs equal or exceed 50% of market value of building (SI / SD), require compliance (foundation, elevation, enclosures, materials, equipment). Continue review.</li> </ul> </li> <li><input type="checkbox"/> Proposed work is not SI / SD, flood hazard review not required.</li> </ul>
	<p>Analysis detailing recommended minimum depth of piling or spreadfooting?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with review.</li> <li><input type="checkbox"/> NO, return to applicant for revision.</li> </ul>
	<p>Signed and sealed design certification submitted?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with review.</li> <li><input type="checkbox"/> NO, return to applicant for revision.</li> </ul>

Initials and Date	Review Steps
<b>Lowest Horizontal Structural Member of the Lowest Floor</b>	
	Elevation of the bottom of the lowest horizontal structural member of the lowest floor is specified or shown on the plans at or above required elevation? <input type="checkbox"/> YES, proceed with review. Specified elevation of the bottom of the lowest horizontal structural member: _____ <input type="checkbox"/> NO, return to applicant for revision.
<b>Enclosure(s) Below Lowest Floor</b>	
	Enclosed areas below the lowest floor (stairwells, elevator foyers, garages, storage areas, crawl spaces)? <input type="checkbox"/> NO enclosed areas, proceed with review. <input type="checkbox"/> YES, plan shows acceptable use (parking, limited storage, and building access). <input type="checkbox"/> Size of each enclosed area (measured on outside): _____ sq. ft. _____ sq. <input type="checkbox"/> Exterior door at top of enclosed building access?
	Enclosure walls (except elevator shafts) breakaway? <input type="checkbox"/> NO, return to applicant for revision. <input type="checkbox"/> YES, enclosed by insect screen or lattice. <input type="checkbox"/> YES, specifications for breakaway walls shown and design certification included. See Technical Bulletin 9.
	Enclosed areas (except elevator shafts) have flood openings? See Technical Bulletin 1. <input type="checkbox"/> YES, number and location of flood openings shown on plans: <input type="checkbox"/> At least two openings, on different sides. <input type="checkbox"/> Openings not more than 12" above higher of interior grade/floor or exterior grade. <input type="checkbox"/> Nonengineered openings: total net open area provided: _____ sq. in. <input type="checkbox"/> Engineered openings: total "rated" or "coverage" area provided: _____ sq. in. <input type="checkbox"/> Engineered openings certification provided? <input type="checkbox"/> NONE or NOT COMPLIANT, return to applicant for revision.
	Parking slab underneath is frangible? Floor of enclosure is frangible concrete slab or breakaway wood floor? <input type="checkbox"/> YES, proceed with review. <input type="checkbox"/> NO, return to applicant for revision.
	Materials used below the lowest floor are flood damage-resistant materials (exterior finishes, enclosures)? See Technical Bulletin 2. <input type="checkbox"/> YES, proceed with review. <input type="checkbox"/> NO, return to applicant for revision.
<b>HVAC, Equipment, Utilities</b>	
	<input type="checkbox"/> Electrical, mechanical, plumbing, heating / air conditioning components elevated? Minimum electrical necessary for life safety allowed below. <input type="checkbox"/> Elevator? See Technical Bulletin 4. <input type="checkbox"/> Sanitary sewage system designed to minimize floodwater inflow / sewage discharge under flood conditions? <input type="checkbox"/> On-site water supply designed to minimize floodwater inflow under flood conditions? <input type="checkbox"/> Above-ground tanks are on platform elevated to required elevation? <input type="checkbox"/> Below-ground tanks are designed to resist flotation?
<b>Manufactured Homes</b>	
	<input type="checkbox"/> Are flood hazards avoided as much as possible? <input type="checkbox"/> Foundation is pilings or columns and signed and sealed design certification submitted? <input type="checkbox"/> Ground anchors and tie-downs shown on plans? <input type="checkbox"/> Bottom of frame at or above the required elevation?

# Zone V Plan Review Checklist

Application #: \_\_\_\_\_

Sample

Initials and Date	Review Steps
	<b>Recreational Vehicles</b>
	<input type="checkbox"/> In a Coastal High Hazard Area? STOP, RVs not permitted in the Zone V.
	<b>Permit Documents and Records</b>
	<input type="checkbox"/> Record permit in log of floodplain permits. <input type="checkbox"/> Make sure all necessary documents are in the file. <input type="checkbox"/> Issue Permit and transfer file to Inspections.

PERMIT APPLICATION REVIEW COMPLETED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

ISSUE PERMIT approved by: \_\_\_\_\_

DENY PERMIT approved by: \_\_\_\_\_



## Zone V Inspection Checklist

Permit #: \_\_\_\_\_

Date: \_\_\_\_\_

Applicant: \_\_\_\_\_

### SAMPLE Inspection Checklist – Flood Hazard Area Inspections – Zone V / Coastal A Zone

Initials and Date	Inspection Steps
	<p>Before site inspection:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> REVIEW permit file before going in the field.</li> <li><input type="checkbox"/> ASK permit reviewer questions to understand requirements.</li> <li><input type="checkbox"/> ALWAYS review work to see if in accordance with permit and approved plans. When work is in accordance with permit documents, complete inspection.</li> <li><input type="checkbox"/> When work deviates from permit documents, advise applicant/contractor that revised permit documents need to be submitted for review and approval prior to performing inspection.</li> </ul>
	<b>Location and Site Plan</b>
	<p>Measure stake out distances from lot line, street, waterway or landmark. Is development in the right place? Is building footprint the specified distance from waterway or landmark?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, proceed with inspection.</li> <li><input type="checkbox"/> NO, advise corrections; take enforcement action.</li> </ul>
	<b>Foundation / Lowest Floor Elevation</b>
	<p>Foundation type as specified on plans? Permittee submitted Elevation Certificate? Is bottom of the lowest horizontal structural member of the lowest floor at or above required elevation?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, elevation of lowest horizontal structural member checked during foundation inspection after lowest floor is in place and prior to further vertical construction.</li> <li><input type="checkbox"/> NO, require permittee to submit Elevation Certificate.</li> <li><input type="checkbox"/> NO, lowest floor is below required elevation. Advise corrections; take enforcement action.</li> </ul>
	<b>Enclosure(s) Below Lowest Floor</b>
	<p>Enclosed areas below the lowest floor (stairwells, elevator foyers, garages, storage areas)?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NO enclosed areas, proceed with inspection.</li> <li><input type="checkbox"/> YES, use of enclosure appears to be limited to parking, building access and limited storage.</li> <li><input type="checkbox"/> Size of each enclosed area (measured on outside): _____ sq. ft. _____ sq. ft.</li> <li><input type="checkbox"/> Exterior door at top of enclosed building access?</li> </ul>
	<p>Are enclosure walls of breakaway construction? See Technical Bulletin 9.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> YES, enclosed by insect screen or lattice.</li> <li><input type="checkbox"/> YES, in accordance with plans. See Technical Bulletin 9.</li> <li><input type="checkbox"/> NO, advise corrections; take enforcement action.</li> </ul>
	<p>Enclosed areas (except elevator shafts) have flood openings?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> NONE or NOT COMPLIANT, take enforcement action to correct problem.</li> <li><input type="checkbox"/> YES, flood openings per plans: type (engineered, nonengineered); number and location (on at least two sides and no more than 12" above the higher of the interior grade/floor or exterior grade).</li> </ul>

# Zone V Inspection Checklist

Permit #: \_\_\_\_\_

Sample

Initials and Date	Inspection Steps
	Materials used below the lowest floor are flood damage-resistant materials (exterior finishes, enclosures) as specified? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
<b>HVAC, Equipment, Utilities</b>	
	Electrical, mechanical, plumbing, heating / air conditioning components elevated at or above required elevation? Only minimal electrical necessary for life safety below required elevation? <input type="checkbox"/> YES, and not mounted on or passing through breakaway walls, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Sanitary sewage system constructed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	On-site water supply constructed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Above-ground tanks are elevated? Below-ground tanks installed as specified? <input type="checkbox"/> YES or not applicable, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
<b>Manufactured Homes</b>	
	Permanent and reinforced piling or column foundation? Ground anchors and tie-downs in place? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, advise corrections; take enforcement action.
	Permittee submitted Elevation Certificate? Bottom of chassis frame at or above required elevation? <input type="checkbox"/> YES, proceed with inspection. <input type="checkbox"/> NO, require permittee to submit Elevation Certificate. <input type="checkbox"/> NO, bottom of chassis frame is below required elevation. Advise corrections; take enforcement action.
	Enclosure(s) present? <input type="checkbox"/> YES, complete "Enclosure(s) Below Lowest Floor" section above. <input type="checkbox"/> NO enclosure(s).
<b>Permit and Inspection Documents and Records</b>	
	Permittee submitted as-built Elevation Certificate (if applicable)? <input type="checkbox"/> YES, perform final inspection; maintain copy of certificates in permanent records. <input type="checkbox"/> NO, require permittee to submit as-built certificates and perform final inspection.
	Other Notes Based on Inspection (attached additional pages if necessary):
	Issue Occupancy Certificate only if final inspection shows compliance with flood hazard requirements. Put final Elevation Certificate in permanent file.

FINAL INSPECTION COMPLETED BY: \_\_\_\_\_ DATE: \_\_\_\_\_