



Reducing Flood Losses Through the International Codes[®]

Coordinating Building Codes and
Floodplain Management Regulations

4th Edition, 2014



in cooperation with the Federal Emergency Management Agency

“Portions of this publication reproduce excerpts from the *2015 International Building Code*, the *2012 International Building Code*, the *2015 International Residential Code for One- and Two-Family Dwellings*, the *2012 International Residential Code for One- and Two-Family Dwellings*, the *2015 International Existing Building Code* and the *2012 International Existing Building Code*, International Code Council, Inc., Washington, D.C. Reproduced with permission. All rights reserved.” www.iccsafe.org

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ASCE	American Society of Civil Engineers
BCEGS	Building Code Effectiveness Grading Schedule
BFE	Base flood elevation
CFR	Code of Federal Regulations
CRS	Community Rating System
DFE	Design flood elevation
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Studies
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®
ICC	Increased Cost of Compliance
ICCPC	International Code Council Performance Code®
I-Codes	International Codes®
IEBC	International Existing Building Code®
IFGC	International Fuel Gas Code®
IgCC	International Green Construction 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
NFIP	National Flood Insurance Program
SFHA	Special Flood Hazard Area

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Chapter One Introduction

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

Communities either enforce building codes adopted at the State level or, if not required by the State, they 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 and the 4 U.S. territories. In a 2013 report to Congress (FEMA 2013), the Federal Emergency Management Agency (FEMA) determined that 22 States, the District of Columbia, and all 4 territories had adopted building codes based on the I-Codes and require local enforcement, and many communities in the other States have elected to adopt and enforce the I-Codes.

Communities that are identified by FEMA as prone to flooding may elect to participate in the NFIP. Of the nearly 24,000 communities identified as having some degree of flood risk, more than 22,000 participate (as of mid-2014). 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) Part 60 for land management and use.

Community

For the purposes of the NFIP and this guide, the term “community” means any State or area or political subdivision thereof, any Indian tribe, authorized tribal organization, 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, and parishes are communities. In some States, flood control districts or planning districts that exercise land use authority may meet the definition.

1.1 Purpose of Guide

This guide is intended to help State and local officials integrate the I-Codes into their current floodplain regulatory processes related to structures, buildings, and other development in order to meet the requirements to participate in the NFIP. 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.

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 guidance 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 of relying on the flood provisions of the codes to meet the NFIP requirements.

- 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 exceed the NFIP minimum requirements, and some provisions are more specific than the NFIP, especially in the International Building Code (IBC), which references ASCE 24, *Flood Resistant Design and Construction* (a standard developed by the American Society of Civil Engineers [ASCE] that is referenced by the I-Codes and thus is part of the code; the I-Codes achieve consistency with the NFIP in part through reference to ASCE 24).
- Chapter 4 contains questions that States and communities need to answer to know whether and how to modify existing floodplain management regulations to coordinate with the building codes.
- Chapter 5 describes modifications that can be adopted to incorporate higher standards in the I-Codes to further increase resistance 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 includes a checklist that demonstrates how the flood provisions of the 2012 I-Codes, along with ASCE 24-05, meet or exceed the NFIP requirements.¹
- Appendix C provides links to three versions of the model code-coordinated ordinance prepared by FEMA.
- Appendix D provides sample plan review and inspection checklists.

Referenced Standards

As used in building codes, “referenced standard” refers 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, which is the family of codes developed by the International Code Council. The flood provisions in each code in the series (2009 edition and later) either meet or exceed the minimum requirements of the NFIP. Because the flood provisions of the I-Codes meet or exceed minimum NFIP requirements, communities that participate in the NFIP can rely on the I-Codes to form the basis of their floodplain management practices related to

Earlier Editions of the I-Codes

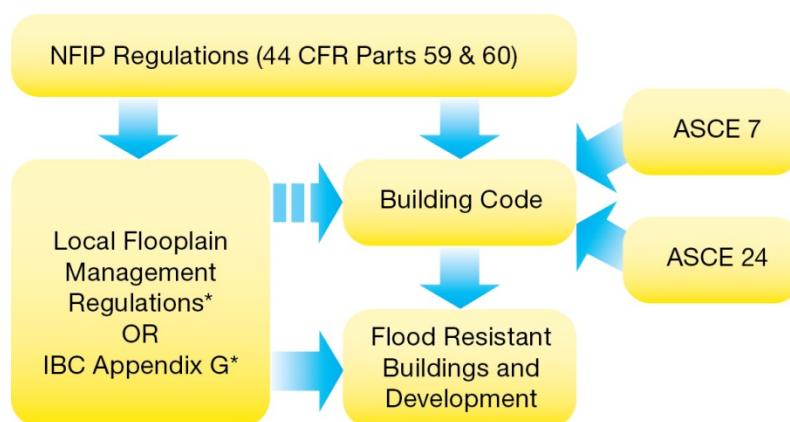
Since the first edition was published in 2000, the I-Codes have included flood provisions. While most flood provisions in the early editions are consistent with the NFIP requirements for buildings, the changes between the 2006 and 2009 editions addressed a small number of gaps and inconsistencies.

¹ Excerpts and checklists for later editions of the I-Codes will be prepared when those codes are published.

buildings and structures. All specific I-Code provisions cited in this guide are from the 2012 edition unless otherwise noted.

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 prepares resources related to buildings codes, which are accessible at <http://www.fema.gov/building-code-resources>:

- Excerpts of the flood provisions in each code in the I-Codes (2009 and later editions)
- Checklists that demonstrate how the flood provisions of the I-Codes meet or exceed the requirements of the NFIP (2009 and later editions)
- “Highlights of ASCE 24-05 Flood Resistant Design and Construction”²
- A paper that describes the higher standards in the I-Codes and ASCE 24 and the provisions in the I-Codes and ASCE 24 having more specific requirements than the NFIP performance-based requirements



* 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

The I-Codes that contain flood provisions include:

- **International Building Code® (IBC):** The IBC, in large part by reference to the American Society of Civil Engineers’ standard, *Flood Resistant Design and Construction* (ASCE 24), meets the minimum design and construction requirements of the NFIP for all buildings and structures other than one- and two-family dwellings. IBC Appendix G addresses other NFIP requirements such as map-related duties; variances; and

² Highlights of ASCE 24-14 will be prepared when that edition is published.

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 the minimum 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 the minimum requirements for flood-resistant design and construction for existing buildings by reference to the requirements of the IBC and IRC.
- **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.
- **International Green Construction Code® (IgCC):** The IgCC establishes minimum green standards for buildings and includes flood provisions.

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. Contact information for the NFIP State Coordinators is online at <http://www.floods.org>, and a list of the 10 FEMA Regional Offices (see Figure 1-2) can be found at <http://www.fema.gov/regional-operations>. A list of State code agencies can be accessed through <http://www.iccsafe.org/gr/Pages/adoptions.aspx>.

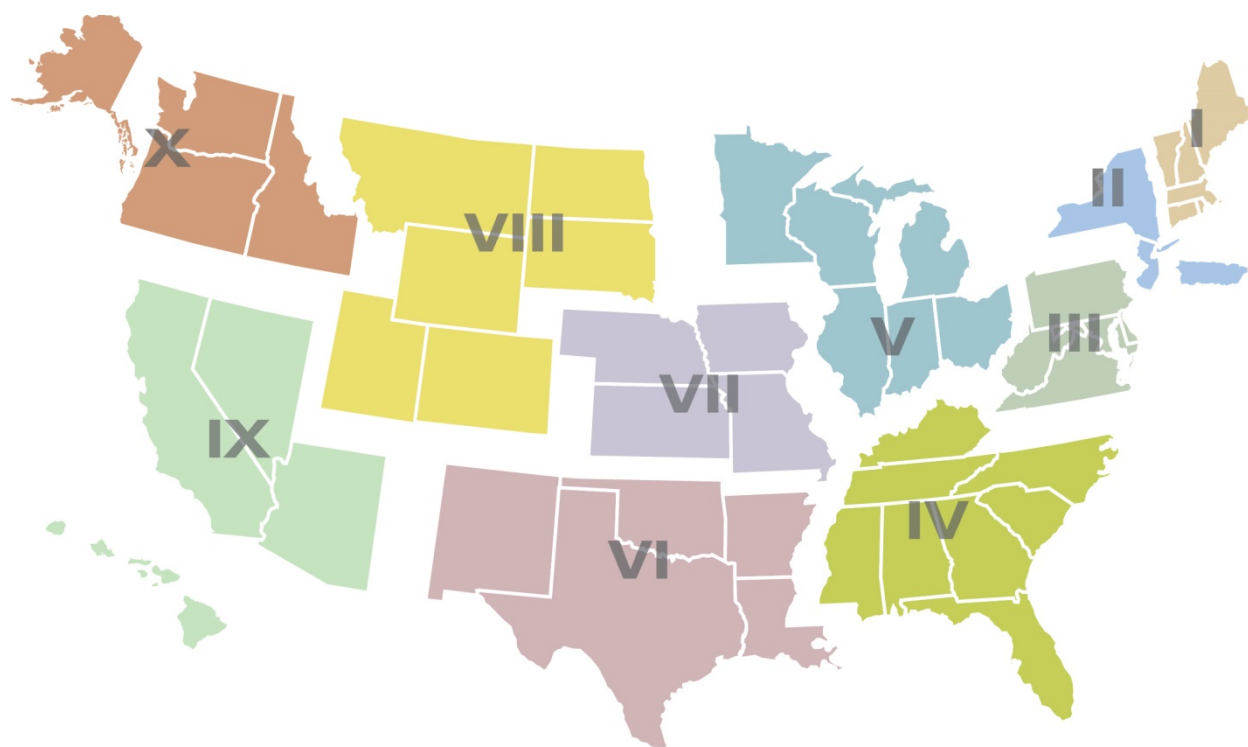


Figure 1-2: FEMA Regions

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.C. 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.” Since 1968, the act has been amended several times.

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 minimum 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.

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

Base Flood Elevation (BFE): Elevation of flooding, including wave height, having a 1 percent chance of being equaled or exceeded in any given year (also known as “base flood” and “100-year flood”).

Flood Insurance Rate Map (FIRM): A map produced by FEMA to show flood hazard areas and risk premium zones. The SFHA and BFE are both shown on FIRMs.

Overview of the NFIP. At the Federal level, the NFIP is managed by FEMA and has three main elements:

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

Federal flood insurance is an alternative (or supplement) to disaster assistance and disaster loans for home and business owners. Disaster assistance rarely comes close to covering all of the costs to repair and cleanup after floods, and disaster loans do not significantly ease the financial burden because of repayment terms. Disaster assistance is available only after a flood is declared a major disaster by the President of the United States, and disaster loans are only available after major disasters and when the U.S. Small Business Administration determines that an event has 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 online at 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 floodprone areas (and nonconforming buildings that are improved or that incur major 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. Through land development regulations, new development can be guided away from high-risk areas and building codes can require buildings to be designed and constructed in ways that minimize future 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 any applicable State laws and regulations. The

NFIP State Coordinator stays current on NFIP issues and can advise communities 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:

- Whenever necessary, enact 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 training opportunities
- Help FEMA and communities to identify floodprone areas on FIRMs
- Notify FEMA of problems with community programs if such problems cannot be resolved through technical assistance

An important responsibility of the NFIP State Coordinating Agency is to work with State agencies that undertake development in SFHAs. The NFIP includes States in the definition for "community" (44 CFR § 59.1). Therefore, just as in local jurisdictions, 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, handling variances, inspecting construction, and remedying violations
- Produce a floodplain management newsletter for community officials and others
- Review proposed code and ordinance amendments to ensure NFIP compliance

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- 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)

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

- Adopt and enforce floodplain management regulations that either meet or exceed the minimum requirements of the NFIP
- Apply the regulations to all designated SFHAs throughout its jurisdiction
- Submit to FEMA the regulations adopted to reduce or prevent flood-related damage (and subsequent amendments thereto), 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 such legal actions such as annexation

1.7 Benefits of Participating in the NFIP

While there is no Federal requirement that communities participate in the NFIP, most communities that have identified flood hazards choose to do so to make flood insurance available to their citizens. In addition, Federal funding assistance for acquisition or construction of buildings in SFHAs is not available in communities that do not participate. Officials in communities that do presently participate in the NFIP are strongly urged to learn more about the benefits of the program. For assistance, contact the NFIP State Coordinator or the FEMA Regional Office (see Section 1.4).

There are significant benefits of participation in the NFIP:

1. Development that complies with the minimum NFIP performance criteria is less likely to incur major damage. NFIP insurance claims data indicate that as a class, buildings designed and constructed to meet the minimum requirements of the NFIP sustain 80 percent less flood damage. Ample evidence suggests that buildings designed to standards that exceed the minimum requirements are even less likely to sustain damage.
2. Federally insured or regulated lenders must require buildings in mapped SFHAs to be insured for flood damage. If a community does not participate in the NFIP, then lenders must notify borrowers that Federal disaster assistance for flood damage, including grants and loans, will not be available. Some lenders may decline to provide mortgages.
3. 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. 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 non-residential buildings, and coverage can be added for contents. Policies on buildings in SFHAs include coverage to help defray certain costs when a flood-damaged building is required to be brought into compliance with community floodplain management requirements. This additional coverage, called "Increased Cost of Compliance," is described in Section 5.3.7 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). If a community chooses 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 will not be provided in the event of a flood disaster.
- Direct Federal mortgage loans for properties in the SFHA are not available from 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, the community should contact the NFIP State Coordinator.

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 has contributed to the development of the I-Codes since the first edition was 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 Codes and 2010 Florida Building Code* (Ingargiola 2012a).

FEMA develops 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 and the second edition in 2005. The third edition will be published in 2014. The history of ASCE 24 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 2012b).

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

Chapter Two Approaches to Floodplain Management

From the inception of the NFIP, it was anticipated that communities may want to adopt 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.” (Emphasis added.)

States and communities throughout the United States use different approaches to floodplain management. In some States, communities may be required to adopt floodplain management regulations to satisfy State laws. In other 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 will govern how they integrate floodplain management regulations and building codes.

State and community officials should consider the value of integrating (or coordinating) building codes and floodplain management regulations, and then examine their current floodplain management 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 review, permitting, and enforcement processes. This chapter focuses on the value of undertaking that examination.

2.1 Importance of Coordinating Building Codes and Local Floodplain Management Regulations

Section 1.6 of this guide explains that communities that elect to participate in the NFIP must adopt and enforce minimum requirements for development in mapped SFHAs. Now that FEMA deems that the provisions of the 2009 and later editions of the I-Codes meet or exceed the NFIP requirements for buildings (see Section 1.2), the concept of States and communities 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:

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 to be noncompliant, which may lead to sanctions by the NFIP.

1. **Wording differences.** If regulations use different, albeit similar, words to describe similar requirements, the differences may be interpreted to be meaningful, which can complicate resolution of the differences.
2. **Differences in requirements.** Although the concept that more restrictive provisions prevails is common, allowing known conflicts to remain can be confusing. Having such differences places an undue burden on property owners, design professionals, and community officials who have to determine which regulation or code contains the more restrictive provisions. Importantly, community 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 of buildings and structures. In those States, it is possible that locally adopted provisions for buildings in SFHAs may not prevail, especially any local provisions that exceed the minimum requirements of the State building code. This demonstrates the importance of examining the questions raised in Chapter 4 so States and communities can resolve those differences and 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 and with their local floodplain management regulations. There are advantages to relying on the flood provisions of the I-Codes:

- **Fewer conflicts.** Communities that have coordinated their 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 that also contain requirements for buildings are administered by different offices within a community. Another way that conflicts can arise is when amendments are made to one code or regulation and others are not amended at the same time to maintain consistency.

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* (2013c). 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.

- **All hazard-related building construction requirements are 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 a building code, communities have less assurance that buildings will be “designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement” (44 CFR § 60.3(a)(3)(i)). Improperly constructed buildings are likely to sustain significantly more damage than those built to code.
- **Codes have some “higher standards” and some more specific provisions than the NFIP requirements.** Chapter 3 describes some of the provisions of the I-Codes that exceed the NFIP minimum requirements and some code provisions that are more specific than the broad performance statement of the NFIP. In large part, these provisions are contained in the referenced standard ASCE 24, *Flood Resistant Design and Construction*, and are applicable to buildings and structures that are within the scope of the IBC (all buildings except one- and two-family dwellings, although dwellings located in identified floodways are required to comply with ASCE 24).
- **Consistent permit conditions and requirements.** Regulating the design and construction of buildings and structures under the flood provisions of the I-Codes can eliminate problems that arise when building permits, construction plans and specifications, and inspection forms do not explicitly state the elements required for compliance with floodplain management regulations. Inspectors may lack the information they need to perform their required duties effectively. 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 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.
- **Permits are issued for all buildings and structures.** In communities that issue building permits, property owners, design professionals, and contractors are familiar with the requirement to obtain permits before starting 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 a building code, the public may not be as aware of other types of permit requirements because only a portion of the community is regulated (i.e., the mapped flood hazard area).

Two sample plan review checklists are included in Appendix D, one for development in Zone A and one for development in Zone V.

- **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 they have clear authority and responsibility to require compliance and enforce building permit conditions. Stand-alone floodplain management regulations also include administrative provisions, including enforcement. Often, these enforcement provisions 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 have suggested 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 the 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 the building inspections. In addition, when building inspectors familiar with floodplain management requirements are in the field on a regular basis, unpermitted buildings and activities are more likely to be identified.

Two sample inspection checklists are included in Appendix D, one for development in Zone A and one for development in Zone V.
- **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 NFIP requirements related to Substantial Improvement and Substantial Damage.

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.** The NFIP requires communities to regulate all development in flood hazard areas. 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 other than buildings that occurs in flood hazard areas.

- **Planning and zoning tools help guide development.** Building codes are not intended to guide development to less hazard-prone areas and do not accomplish the same objectives as planning tools. Therefore, communities should retain planning and zoning tools and use these tools to support floodplain management, even if building codes are enforced.
- **States may limit local adoption of higher standards.** Many States that adopt building codes at the State level either have certain requirements for local amendments or do not allow local amendments. Although the I-Codes already exceed the NFIP minimum requirements in certain ways, State limitations could affect the ability of communities to adopt additional requirements for buildings. Additional information on this topic is provided in Section 4.14 and Chapter 5.
- **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, while required to comply with the code, are not required to 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 flood hazard areas. This issue is discussed further in Sections 4.8 and 4.9.

2.3 Examining Approaches

Examining how a State or community handles enforcement of building codes and administration of floodplain management regulations is an important step to undertake before considering changes in approaches. Tables 2-1 and 2-2 (Worksheets A and B) can be used to help State and community officials understand the approach to floodplain management that their agency or community currently uses. Although the following discussion is focused on communities, the NFIP State Coordinator may want to have a similar discussion with the State agency responsible for the building code in those States that adopt building codes at the State level.

Worksheet A (Table 2-1) 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 (Table 2-2) 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 table 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 approach 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 that are written to ensure that all other requirements of the NFIP are adopted.
- **Comprehensive approach.** Many communities use a variety of planning, zoning, building codes, and other regulatory tools to achieve multiple goals, including floodplain management. Although this is described in Section 2.7 as a separate approach, it in fact relies in part on enforcement of building codes and floodplain management regulations. Consequently, communities that use several regulatory tools to administer floodplain management should examine the description of the “building codes approach” and undertake the same evaluation and coordination process described in this guide.
- **Stand-alone floodplain management regulations approach.** Regulations that incorporate all requirements necessary for participation in the NFIP 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.”

Table 2-1: Worksheet A. The NFIP and the I-Codes (2009/2012)

National Flood Insurance Program Provisions and Processes	2009/2012 International Codes®							
	IBC	IBC App. G	IRC	IEBC	IPC	IMC	IPSDC	IFGC
Development Review								
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.	◆	◆	◆					
Records								
17. Maintain record of permits, certifications, required analyses, and variances; make available for public inspection.	◆	◆	◆	◆				
Inspection and Enforcement								
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, floodproofing, flood openings, breakaway wall).	◆		◆	◆				
25. Damaged buildings (to determine if building is substantially damaged).	◆		◆	◆				

Table 2-2: 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	
										Development Review
										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.
										Records
										17. Maintain record of permits, certifications, required analyses, and variances; make available for public inspection.
										Inspection and Enforcement
										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, floodproofing, flood openings, breakaway wall).
										25. Damaged buildings (to determine if building is substantially damaged).

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 may want to have a similar discussion with the State agency that is 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 need to 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, and
- Review Chapter 6, which introduces three versions of a code-coordinated model ordinance (links to these documents are listed in Appendix C).

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

- All NFIP requirements must be met in order 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, and
- If more than one department in a community handles elements of the floodplain management program, then communication between the departments needs to be arranged to facilitate review of permit applications and supporting plans and documentation, as well as to ensure inspection of both buildings and other development.

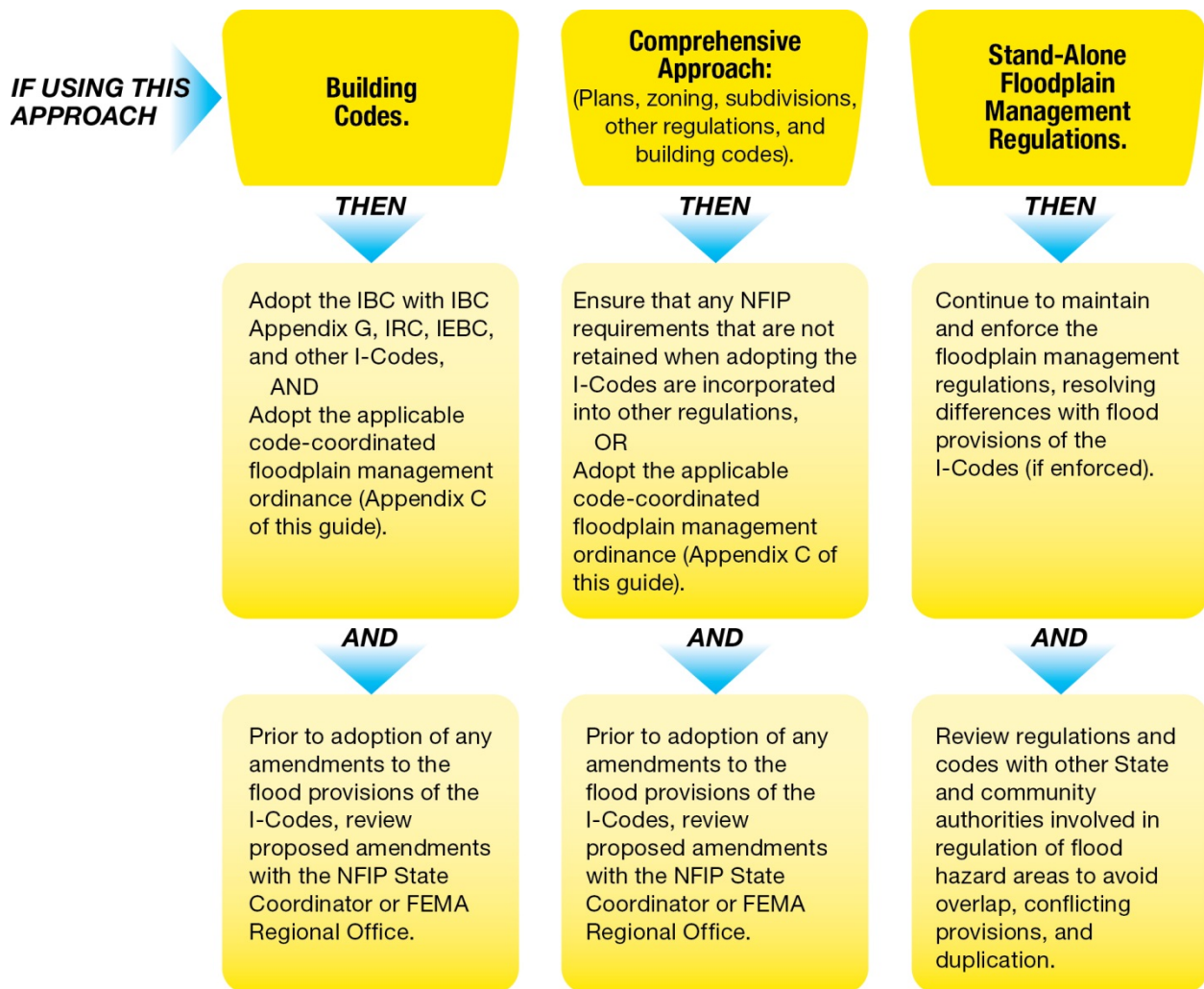
2.5 Implementing the Selected Approach

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 bring about the desired outcome. Figure 2-1 illustrates the primary point—that the end result is to have regulatory tools that are coordinated.

Communities that participate in the NFIP should request that the NFIP State Coordinator (or the FEMA Regional Office) review and comment on proposed changes to their floodplain

Approaches to Floodplain Management

management regulations, even if they elect to use one of the model code-coordinated ordinances prepared by FEMA (links to these documents are listed in Appendix C). Because floodplain management regulations were adopted to qualify for participation in 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. Prior to adoption of amendments consult with the NFIP State Coordinator or FEMA Regional Office.

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

2.6 The Building Codes Approach

Communities that elect 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:

- The IBC (with either IBC Appendix G or a companion ordinance for development other than buildings),
- The IRC, and
- Requirements for existing buildings (either IEBC or IBC Chapter 34³).

Limitations on 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 modified to be noncompliant with the NFIP minimum requirements. Modifications to strengthen the flood provisions, often called “higher standards,” are acceptable, or
- If only the IBC or only the IRC are adopted, or if existing buildings are not addressed by the adopted codes; if this is the case, the building codes do not govern all 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 Appendix G. See Chapter 4 for discussions of several questions related to these topics.

Chapter 6 introduces three versions of a model ordinance written to accomplish the “building codes” approach. Different versions are provided because some States and communities do not adopt IBC Appendix G, while others do. Similarly, while most 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 model ordinances to complement the codes for each of the more likely scenarios.

2.7 The Comprehensive Approach

Under the broad concept of “floodplain management,” many communities coordinate several planning, zoning, and other regulatory functions in different offices to achieve multiple land use, environmental, risk reduction, and public safety goals. Floodplain management goals often include avoiding development in flood hazard areas when buildable, non-floodprone 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.

³ Starting with the 2015 I-Codes, IBC Chapter 34, Existing Buildings, is replaced with a reference to the IEBC.

Approaches to Floodplain Management

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, as well as general and specific requirements for development in identified flood hazard areas. These regulations are enforced through issuance of permits. Many communities, even those that enforce building codes, adopt floodplain regulations that include all NFIP requirements, including specific 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, as 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 type. 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 in which only development that is compatible with open space and recreational uses is allowed. 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, 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 minimum NFIP requirements for subdivisions proposed in flood hazard areas (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.
- **Sanitation regulations.** Sanitation regulations set the standards for the location, design, and installation of water and sewer systems. Sanitation regulations place limitations on the location of these systems in floodprone 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 in Flood Hazard Areas* (American Planning Association 1997).

2.8 The Stand-Alone Floodplain Management Regulations Approach

As used in this guide, “stand-alone” floodplain management regulations are regulations that incorporate all necessary requirements 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 building-specific design and construction requirements. Many communities that participate in the NFIP enforce building codes, yet also enforce stand-alone regulations. The community 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.

A small number of communities, typically in rural areas, do not regulate development in general, and may not enforce building codes. However, to meet the requirements for participation in the NFIP, they adopt stand-alone floodplain management regulations and issue a “special use” permit that is required only in SFHAs shown on FIRMs.

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Chapter Three Differences Between NFIP Requirements and the I-Codes

This chapter summarizes some 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. FEMA states that the flood provisions of the I-Codes (2009 edition and later) are consistent with the NFIP minimum requirements for buildings and structures in flood hazard areas. While there is not a one-to-one equivalency between each section of the I-Codes and the NFIP regulations, the flood provisions of the codes either meet or exceed the NFIP minimum requirements, and thus they are described as consistent. 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 2009 and later editions of the I-Codes are accessible at <http://www.fema.gov/building-code-resources>.

The IRC, a prescriptive code that governs one- and two-family dwellings, contains detailed flood provisions that trace their origins to the NFIP regulations. The International Code Council manages a public consensus process to develop and maintain the I-Codes. Over the past several code development cycles, FEMA has proposed some requirements that exceed the NFIP minimum requirements. Reason statements submitted to support those code changes characterize the merits of the proposals in terms of being cost-effective and providing increased resistance to flood damage. Similarly, FEMA has proposed code changes to clarify the flood provisions to facilitate interpretation and enforcement.

The IBC achieves consistency with the NFIP largely through a standard referenced by the code, ASCE 24, *Flood Resistant Design and Construction*. The IBC and ASCE 24 both reference ASCE 7, *Minimum Design Loads for Buildings and Other Structures*, for determination of flood loads. Referenced standards are considered part of the requirements of the code.

The American Society of Civil Engineers 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 is weaker than the NFIP minimums. Over time, the committee has incorporated a number of provisions that exceed the NFIP minimums in order to improve building resistance to flood damage. Similarly, some ASCE 24 provisions are written to be more specific than the NFIP minimum requirements, which help both the designer and the building official ensure that buildings and structures resist flood conditions.

The following resources provide additional detail about the differences between the NFIP and the I-Codes, including any higher standards and more specific provisions:

- *Flood Provisions of the International Code Series: Higher Standards and More Specific Requirements than the Minimum Requirements of the National Flood Insurance*

Program. (FEMA 2013a; available at <http://www.fema.gov/media-library/assets/documents/33389>)

- *Quick Reference Guide: Comparison of Select NFIP & Building Code Requirements for Special Flood Hazard Areas.* (FEMA 2012, updated 2014; available at <http://www.fema.gov/media-library/assets/documents/25986>)
- *Flood Provisions of the International Code Series and 2010 Florida Building Code* (Ingargiola 2012a).
- *ASCE 24: Improving the Performance of Buildings and Structures in Flood Hazard Areas* (Ingargiola 2012b).

3.1 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 or zoning ordinances to define the areas in which the regulations apply. Communities may adopt a different 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 on FIRMs.

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

- *IBC Section 1612.3* assumes that 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.”
- *IRC Table R301.2(1)* assumes that 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.”

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

3.2 Flood Loads and Flood Resistance

NFIP. The NFIP regulations establish a performance statement for buildings, requiring that buildings in SFHAs 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. 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 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, *Minimum Design Loads for Buildings and Other Structures*, 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 to be 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 floatation, collapse, and permanent lateral displacement due to action of flood loads associated with the design flood and other loads in accordance with load combinations.” 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). ASCE 7 requires 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).

3.3 Base Flood Elevation and Design Flood Elevation

NFIP. The NFIP regulations use the base flood as the regulatory flood and the base flood elevation (BFE) as the minimum elevation required for elevation or protection of buildings and structures. FIRMs depict SFHAs, which are areas subject to flooding by the base flood. Many SFHAs were delineated using estimation methods that do not produce BFEs, instead of detailed engineering methods that do. 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 methods.

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.

I-Codes. The I-Codes and ASCE 24 use the term “design flood elevation” (DFE), which is the elevation of the design flood (it is not the elevation to which buildings are designed). Most NFIP communities adopt the FIRM as their regulatory instrument, and in those communities the DFE

is the BFE. If a community adopts a different flood hazard map, then the elevations shown on that map are the DFE. The DFE will always be equal to or higher than the BFE. The origin of the term traces back many years to the 1998 edition of ASCE 7 and the first edition of ASCE 24, published in 1998.

3.4 Special Flood Hazard Areas and Flood Hazard Areas

NFIP. The NFIP uses 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 also Figures 3-1 and 3-2.

Flood Hazard Area: 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.

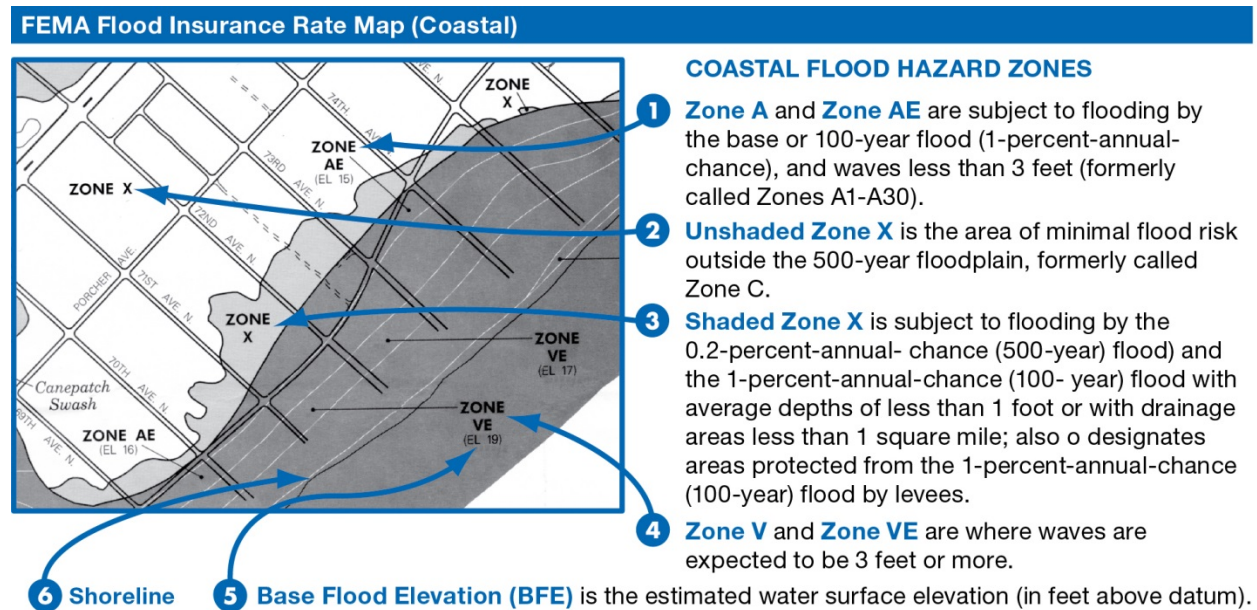


Figure 3-1: FEMA FIRMs and coastal flood zone terminology

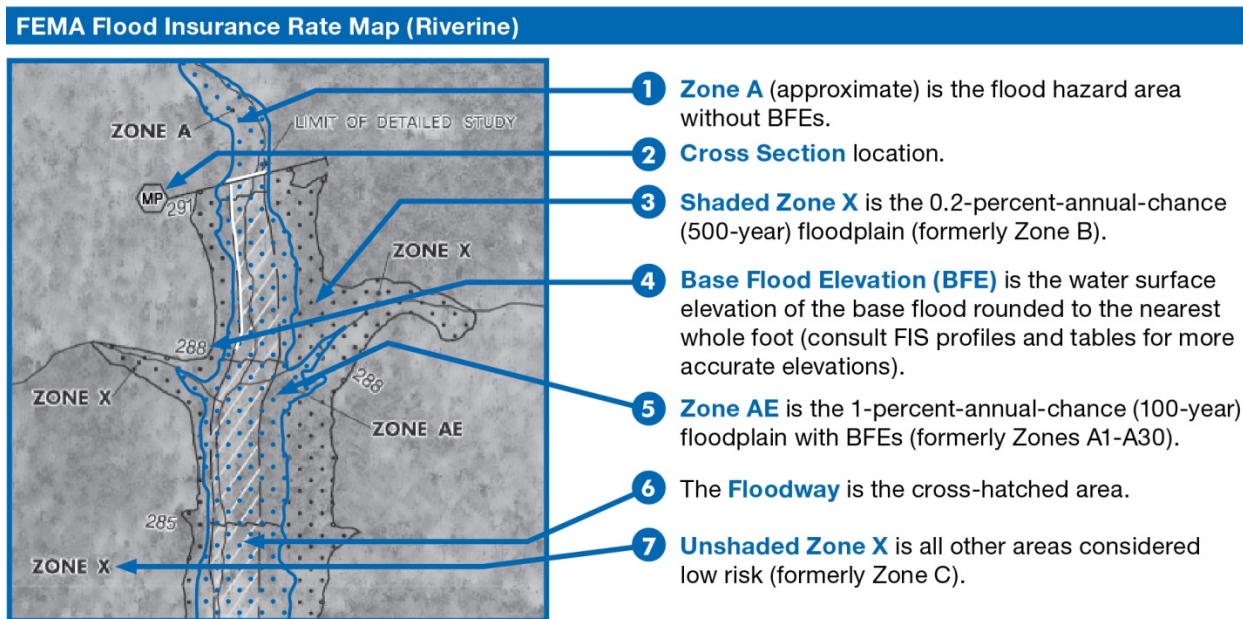


Figure 3-2: FEMA FIRMs and riverine flood zone terminology

3.5 Buildings, Structures, and Development

NFIP. The NFIP has floodplain management regulations that 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.”
- For floodplain management purposes, the NFIP defines a structure as “a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home.” The NFIP has a more detailed definition of structure for insurance purposes: it includes buildings with “two or more outside rigid walls and a fully secured roof, that [are] affixed to a permanent site,” as well as manufactured homes and “travel trailers” provided they are “affixed to a permanent foundation.” The definition used by the NFIP for insurance purposes does not include gas or liquid storage tanks.

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. Development and 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.” Requirements for development other than buildings and structures are included in IBC Appendix G. This appendix defines “development” the same as the NFIP, but includes slightly different examples: “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.”

3.6 Risk/Occupancy Category and Flood Design Class

NFIP. The NFIP requirements apply to buildings and structures. The only distinction is whether a building is residential or non-residential (see Section 3.9).

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). The assigned category affects some aspects of a building’s design requirements. The IRC does not require such assignment.

ASCE 24-05 uses Occupancy Category, and ASCE 24-14 uses a new term, Flood Design Class. For buildings in flood hazard areas, the assigned category or class is used to establish minimum elevations. The tables in ASCE 24 that define the categories and classes are included in the highlights of the standard prepared by FEMA and available online:

<http://www.fema.gov/building-science/building-code-resources>.

3.7 Required 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. Non-residential buildings in Zone A can be dry floodproofed to the level of the BFE rather than be elevated. 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. The NFIP also specifies elevation requirements for flood damage-resistant materials and equipment, all referenced to the BFE.

IRC. IRC Section R322.2.1 specifies elevation requirements in flood hazard areas that are not subject to high-velocity wave action (i.e., in Zone A). In such areas, the 2012 and earlier editions specify that buildings must have the lowest floors elevated to or above the BFE or DFE, whichever is higher, except in areas designated as Coastal A Zones. See Section 3.14 for a description of the Coastal A Zone and the elevation requirement in Coastal A Zones.

The 2015 IRC specifies the required minimum elevation of lowest floors of dwellings in Zone A to be the BFE + 1 foot or the DFE, whichever is higher.

IRC Section R322.3.2 specifies elevation requirements in coastal high hazard areas (i.e., Zone V). The 2009 and 2012 IRC specify 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). The 2015 IRC specifies the required minimum elevation of the lowest horizontal structural member supporting the lowest floor must be the BFE + 1 foot or the DFE, whichever is higher.

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 Risk/Occupancy Category or Flood Design Class (see Section 3.6).

Critical Facilities and ASCE 24-14

ASCE 24-14 includes a new elevation requirement for critical and essential facilities (Flood Design Class 4), requiring them to be built to or above the specified elevation based on flood zone or the elevation of the 500-year flood, whichever is higher.

Tables 3-1 and 3-2 summarize selected elevation requirements from tables in several sections of ASCE 24-05 and ASCE 24-14. 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 their lowest floor (or lowest horizontal structural member 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 required to have their lowest floor (or lowest horizontal structural member elevation in coastal high hazard areas and Coastal A Zones) at least 1 foot higher than the BFE.

Table 3-1: Summary of Selected Elevation Requirements in ASCE 24-05

		Category I	Category II	Category III	Category IV
Elevation of lowest floor (Zone A: Table 2-1)	All Zone A not identified as Coastal A Zones	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
Elevation of bottom of lowest horizontal structural member (Zone V: 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 ft or DFE, whichever is higher	BFE +1 ft 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 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
Dry floodproofing of non-residential structures and non-residential portions of mixed-use buildings (Zone A: Table 6-1)	All Zone A not identified as Coastal A Zones: elevation to which dry floodproofing extends	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft 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

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
Elevation of lowest floor (Zone A: Table 2-1)	Zone A not identified as Coastal A Zones	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Elevation of bottom of lowest horizontal structural member of the lowest floor (Zone V: Table 4-1)	Zone V and Coastal A Zones	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Dry Floodproofing of non-residential structures and non-residential portions of mixed-use buildings (Zone A: Table 6-1)	Zone A	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
	Zone V and Coastal A	Not permitted	Not permitted	Not permitted	Not permitted

Not shown: elevation requirements for flood damage-resistant materials, utilities, and equipment

3.8 Equipment and Utility Elevations

NFIP. The NFIP regulations require that new construction and Substantial Improvements have “electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.”

IRC. The IRC’s provision for protection of equipment and utilities clarifies that plumbing fixtures and ductwork are included and are required to be either elevated or protected against the intrusion of water. However, the IRC does not directly specify the required elevation for utilities, but instead refers to the dwelling’s required elevations. Thus, if a dwelling’s lowest floor is required to be higher than the BFE, then the equipment and utilities that serve the dwelling are required to 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 elevations as long as the wiring systems “conform to the provisions of the electrical part of this code for wet locations.”
- If permitted to be located 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 a dwelling has 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 that equipment may be located in dry floodproofed areas or on platforms, but 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.”

3.9 Residential and Non-Residential Buildings

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

While the *NFIP Flood Insurance Manual* (FEMA 2014) has definitions for the terms residential and non-residential, those definitions are used for insurance purposes and should not be used to determine which non-residential buildings may be dry floodproofed. For example, for insurance purposes, nursing homes are considered “non-residential,” and thus qualify for higher policy limits than residential buildings. However, FEMA floodplain management guidance explains that buildings where people live, that are used for sleeping purposes, or where people are cared for on a 24-hour basis are “residential” in nature.

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.”

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 bases structural requirements on a building’s occupancy, and each building must be assigned one of four Risk/Occupancy Categories (see Section 3.6). Most buildings, including residential buildings such as apartments and condominiums, are assigned to Risk/Occupancy Category II.

ASCE 24-05 and ASCE 24-14 define any building or portion thereof that is not residential as non-residential. Residential is defined as:

- (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) residential 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-hour 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.

3.10 Definition of 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. Non-residential 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.

However, FEMA issued interim guidance in Technical Bulletin 11, *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas* (FEMA 2011), which provides guidance to communities that wish to allow crawlspaces that are below grade on all sides to be considered sub-grade crawlspaces (not basements) but only if they meet certain very specific criteria that limit depth below grade and total foundation wall height. To allow sub-grade crawlspaces that comply with the specific criteria in Technical Bulletin 11, communities must adopt specific language in their floodplain management regulations. To reflect the increased risk associated with below-grade crawlspace foundations, NFIP flood insurance rates for buildings with sub-grade crawlspaces are higher than for buildings with crawlspaces that have the interior grade at or above the exterior grade.

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,” but 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): “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 related 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.

3.11 Floodway

NFIP. Floodways are the channels and adjacent areas of riverine SFHAs that must be reserved to convey the base flood without increasing the water surface elevation by more than a certain amount. In general, floodwaters in floodways are deeper and faster than in the adjacent floodway fringe areas. The NFIP regulations require that, where floodways are designated on FIRMs, “no new construction, substantial improvement, or other development (including fill) shall be permitted ... 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.”

IBC/ASCE 24/IRC. The IBC/ASCE 24 and IRC specify that structures and fill must not be allowed in floodways unless it is demonstrated there will be no increase in the flood level and no reduction in the conveyance of floodwaters within the floodway. The IRC specifies that dwellings in floodways must be designed and constructed in accordance with ASCE 24.

Homes that would otherwise be within the scope of the IRC may be designed in accordance with the IBC/ASCE 24, in which case they are assigned Risk/Occupancy Category II/Flood Design Class 2, which means the minimum required lowest floor elevation is BFE + 1 foot or DFE, whichever is higher. Therefore, under the 2012 IRC and earlier, homes in floodways are required to be elevated at least 1 foot higher than homes in floodway fringe areas.

3.12 Use of Fill

NFIP. The NFIP regulations for development in SFHAs are silent on the use and compaction of earthen fill to elevate buildings, although the general performance expectation that building sites will be reasonably safe from flood applies. To properly support a building, earthen fill must be free of organic material, construction debris, cobbles, and boulders, and it must be placed in layers and compacted 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 saturation by floodwaters may alter the bearing capacity of the fill material. FEMA Technical Bulletin No.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 that buildings on fill are “reasonably safe from flooding.”

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 assure uniform support of the slab, and except where approved, the fill depths shall not exceed 24 inches for clean sand or gravel or 8 inches for earth.” Given those depth limitations, approval is often required for fills used to elevate homes in flood hazard areas, and building officials can require builders to obtain a report or design from a qualified design professional.

IBC/ASCE 24. IBC Chapter 18 covers soils and foundations in general. In addition to the other requirements of this chapter, Section 1804.4 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 covers use of 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.

3.13 Dry Floodproofing

NFIP. Dry floodproofing is applicable only to non-residential 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. The NFIP requires dry floodproofing measures to extend to at least the BFE (although to qualify for flood insurance rates based on protection to the BFE, the measures must extend to at least the BFE + 1 foot and be passive, meaning human intervention is not required to implement the measures). The NFIP regulations that establish design requirements do not specify preparation of maintenance and operations plans for buildings that are dry floodproofed. However, to obtain an NFIP flood insurance policy on a dry-floodproofed building, the NFIP requires submission of a “comprehensive maintenance plan.”

NFIP Flood Insurance and Dry Floodproofing

At a minimum, comprehensive maintenance plans for dry-floodproofed structures must address:

- 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, and any materials or specialized tools necessary to seal the structure

Source: *NFIP Flood Insurance Manual* (June 2014)

IRC. The IRC does not permit dry floodproofing of dwellings.

IBC/ASCE 24. The IBC, by reference to ASCE 24, restricts use of dry floodproofing, permitting it only for non-residential buildings and non-residential 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 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 1612.4 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 Risk/Occupancy Category: for Categories II and III, the

minimum protection elevation is BFE +1 foot or DFE (whichever is higher); for Category IV, the minimum protection elevation is BFE + 2 feet or DFE (whichever is higher). Refer to Section 3.7, where Tables 3-1 and 3-2 show the elevation requirements in ASCE 24-05 and ASCE 24-14.

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

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.

3.14 Coastal A Zone

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.” The term refers to areas subject to damaging waves less than 3 feet in height during base flood conditions. A threshold of 3-foot waves delineates the inland boundary of areas subject to high-velocity wave action, which are designated Zone V on FIRMs. See Section 5.3.5 of this guide for more information about Coastal A Zones.

IRC. Beginning with the 2009 edition, the IRC specifies that if flood hazard areas have been delineated as subject to wave heights between 1.5 and 3 feet, then the areas are designated as Coastal A Zones, and dwellings in those areas must have their lowest floors elevated to or above the BFE + 1 foot or to the DFE, whichever is higher.

The 2015 IRC requires dwellings in Coastal A Zones, if delineated on the flood hazard map or otherwise designated by the 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 load on the walls.
- 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 they 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.

IBC/ASCE 24. Editions of the IBC that reference ASCE 24-05 (or ASCE 24-98) 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 applies 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.

Effective with the 2015 IBC, which references ASCE 24-14, buildings in Coastal A Zones must be designed to meet Zone V requirements only if the Coastal A Zone is delineated on a FIRM by the Limit of Moderate Wave Action (LiMWA) or if the community otherwise designates a Coastal A Zone. Communities may designate Coastal A Zones by specifying a distance inland from the Zone V boundary or by landmarks, such as seaward of a road or other geographic feature.

3.15 Existing Buildings

NFIP. The NFIP requires participating communities to review permit applications for work on existing buildings to determine if the work constitutes Substantial Improvement or repair of Substantial Damage. When such determinations are made, the communities must require that nonconforming buildings 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 more than 40 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. “Existing building” is generally used to mean a building that predates the community’s adoption of its first floodplain management regulations.

I-Codes. The I-Codes define an existing building as a “building erected prior to the adoption of this 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 permit in 2014 for work that renders the building noncompliant with the code in effect in 2003, unless the

pertinent requirements of the code have been subsequently modified. Similarly, it means that an owner who modifies a building in ways that render it noncompliant with the provisions of the code under which it was originally built (if any) is violating the terms of the original permit.

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 and communities that enforce the IEBC typically apply it to all buildings and structures, including dwellings.

IBC. The 2009 and earlier editions of IBC Section 1612, *Flood Loads*, define existing structures or existing construction as “any buildings and structures for which the start of construction commenced before the effective date of the community’s first flood plain management code, ordinance or standard.” (In 2012 IBC, all definitions are moved to Chapter 2.) This same definition is applicable when the IEBC is enforced because it references compliance with Section 1612 of the IBC if additions, alterations, or changes of occupancy are determined to constitute Substantial Improvement or if repairs are determined to constitute repair of Substantial Damage.

3.16 Historic Structures

NFIP. The NFIP definition of “historic structures” gives special consideration to the unique value of designated historic buildings and structures. Provided such structures retain their designations, they are not required to be brought into compliance when proposed work constitutes Substantial Improvement or repair of Substantial Damage. Nevertheless, many historic structure owners elect to incorporate flood damage-reduction measures when planning improvements and repairs. In addition, communities that issue variances for Substantial Improvement of historic structures are required to ensure that variances are the minimum necessary. As a result, those communities may require compliance with some flood reduction measures that do not affect historic designations.

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 under local programs that may not be certified by the Secretary of the Interior or by a certified State program. Thus, the I-Codes have a basic requirement that all historic buildings in SFHAs must be brought into compliance if proposed work is determined to be Substantial Improvement or repair of Substantial Damage. An exception to this requirement captures the NFIP consideration for historic structures: historic buildings do not need to be brought into compliance if the buildings meet what is essentially the equivalent of the NFIP definition for historic structures and they continue to be historic buildings after the work is completed.

3.17 Additions

NFIP. The NFIP regulations do not have an explicit requirement that specifies whether existing buildings must be brought into compliance when lateral additions are proposed. Some guidance documents refer to whether the common wall between an existing building and an addition is modified by “more than a doorway,” with the implication that such a minor modification does

not alter the load-bearing capacity of the existing building and the lateral addition has its own supporting foundation. Chapter 6 of FEMA P-758, *Substantial Improvement / Substantial Damage Desk Reference* (FEMA 2010), has specific descriptions of when additions must comply and when additions plus the base buildings must be brought into compliance.

Whether an addition is or is not structurally connected and whether a building predates the community's first adoption of floodplain management regulations 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 additions, alteration, movement, replacement, and repair. The code requires all new work to comply. 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 buildings in flood hazard areas must be brought into compliance when additions are proposed, other than the general statement that 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 code, even work on existing buildings. IBC Chapter 34 contains requirements applicable to existing buildings, including a section on additions. If an addition to a building in an SFHA is 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. Effective with the 2015 edition, however, Chapter 34 is removed, and existing buildings are required to comply with the IEBC.

IEBC. The IEBC has more specific provisions than the NFIP (and the IRC and IBC) for existing buildings in SFHAs, including provisions for horizontal additions, whether they are structurally connected or not, and for vertical additions. The condition for structural connection is equivalent to the NFIP guidance regarding the common wall between a building and an addition. The IEBC provisions are consistent with the guidance in FEMA P-758 (FEMA 2010).

3.18 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 are to be elevated on and anchored to an “adequately anchored foundation systems to resist floatation, collapse and lateral movement.” The minimum elevation requirements 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 at or above the BFE in Zone V. With one exception, the rules allow manufactured homes in existing manufactured home parks or subdivisions to be elevated such that the lowest floor of the home is at or above the BFE or the manufactured home chassis is supported by reinforced piers or foundation elements that are no less than 36 inches above grade. The exception applies to manufactured homes installed on sites where a home has incurred Substantial Damage caused by flooding, in which case the replacement homes must comply with the full elevation requirements.

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 community’s residential code). IRC Section R322.1.9 has requirements for manufactured homes, but does not include the NFIP provision that allows certain units to be installed on piers or foundation elements that are only 36 inches above grade.

IBC. IBC Appendix G requires manufactured home foundations to be designed in accordance with IBC Section 1612, 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. ASCE 24 does not have specific requirements for manufactured homes, thus, manufactured home foundations must meet all requirements depending on flood zone.

3.19 Registered Design Professional

NFIP. The NFIP regulations specify that designs for buildings in coastal high hazard areas (Zone V), and designs for non-residential buildings that are to be dry floodproofed, must be certified by either registered professional engineers or architects. The regulations also specify that certain analyses, such as for floodway encroachments, are to be performed in accordance with standard engineering practice. In addition, building elevations and ground elevations, relative to datums on FIRMs, are to be documented. The NFIP Elevation Certificate (FEMA Form 086-0-22) requires surveyed elevations to be certified by “a land surveyor, engineer, or architect authorized by law to certify elevation information.”

Each State establishes limits for the practice 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, any State limitation on such certifications governs. Similarly, while the NFIP identifies that engineers, architects, and land surveyors may certify elevations on Elevation Certificates, any State limitation on whether engineers and architects may perform land surveying governs.

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 of 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 that do not authorize engineers or architects to perform elevation and land surveys.

3.20 Building Official and Floodplain Administrator

NFIP. Communities that elect to participate in the NFIP initially pass resolutions making certain commitments in order to qualify for the program. Adoption of FISs and FIRMs, and adoption and enforcement of regulations, are among the commitments. Communities must also legislatively designate a single official or agency (commonly called the “floodplain administrator”) with the responsibility, authority, and means to implement a 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 as 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 small community may delegate some or all of its floodplain administrator duties to another community, the smaller community is still accountable to the NFIP for ensuring that the floodplain management regulations are enforced.

I-Codes. Building officials are charged with the administration and enforcement of building codes and 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 require building officials, plans examiners, inspectors, and related personnel to be licensed.

3.21 Inspections

NFIP. Communities that participate in the NFIP are required to ensure that all development, including new construction, Substantial Improvements, and existing buildings that have incurred Substantial Damage meet or exceed the minimum floodplain management requirements. Although the NFIP regulations do not explicitly call for inspections, the most effective way to ensure compliance is to conduct inspections during construction. Communities are required to obtain and maintain documentation of certain building elevations (e.g., elevation of the lowest floor). The FEMA Elevation Certificate (FEMA Form 086-0-22) is the most common format for documenting elevations; in addition, owners must have FEMA Elevation Certificates to obtain NFIP flood insurance.

I-Codes. The I-Codes specify required inspections, including “lowest floor inspections” (IBC) and “floodplain inspections” (IRC) to be conducted upon placement of the lowest floor and prior

to further vertical construction. At that time, permittees are to submit elevation documentation. Unlike many aspects of a building under construction that can be checked visually, it is not feasible to visually verify that 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 check 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 Elevation Certificate is completed.

The 2012 I-Codes (and later editions) specify, as part of the final inspection, that 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 a FEMA Elevation Certificate when they obtain an NFIP flood insurance policy. The FEMA Elevation Certificate provides more than just the surveyed elevation of the lowest floor—it documents the elevation of the lowest equipment and information about openings in the walls of enclosures. Having a FEMA Elevation Certificate completed before the final inspection helps officials verify compliance with flood requirements.

3.22 Keeping Permit Records

NFIP. The NFIP regulations explicitly require participating communities to “maintain for public inspection and furnish upon request ... any certificate 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 are to 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 their floodplain management regulations. FEMA and NFIP State Coordinators periodically conduct technical assistance visits 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. 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, a community's commitment to the NFIP is in addition to any specific State requirements and may supersede such requirements.

3.23 Substantial Improvement and Substantial Damage Determinations

NFIP. A minimum requirement of the NFIP is that buildings that meet the definitions for Substantial Improvement and Substantial Damage are to be brought into compliance with the requirements for new construction. Local officials are expected to determine whether proposed work meets the definitions. The requirements apply to buildings in all flood hazard areas except designated historic structures that meet the definition in the NFIP regulations (see Section 3.16).

To provide guidance to State and community officials and others, FEMA prepared FEMA P-758, *Substantial Improvement / Substantial Damage Desk Reference* (FEMA 2010).

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.

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, or any other cause, local officials are encouraged to conduct inspections to evaluate 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.

After major natural hazard events that damage a large number of buildings, such as floods, tornadoes, and earthquakes, some communities and States seek technical support from FEMA to evaluate flood damage. FEMA developed the *Substantial Damage Estimator* (FEMA P-784 CD, 2013d), a tool to assist State and local officials in determining Substantial Damage for residential and non-residential structures in accordance with a local regulation that meets or exceeds the NFIP requirements. The tool can be used to assess flood, wind, wildfire, seismic, and other forms of damage. It helps communities provide timely Substantial Damage determinations so that reconstruction can begin following a disaster.

Communities should contact their NFIP State Coordinator or FEMA Regional Office to learn about post-disaster assistance that may be available.

IBC and IEBC. 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 any explicit administrative provision 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 work proposed for existing buildings does or does not meet the definitions.

The 2015 IBC and IEBC have added Section 104.2.1 to require the building official to determine if proposed work on existing buildings constitutes Substantial Improvement or repair of Substantial Damage.

IRC. 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, which is 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.

In the 2015 IRC, the requirement to make Substantial Improvement and Substantial Damage determinations is removed from the board of appeals and added to the building official’s responsibilities for action on permits. Section R105.3.1.1 is modified to add the definition for Substantial Improvements.

3.24 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. A variance allows 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 is at variance to the minimum NFIP provisions, but NFIP flood insurance will still be rated according to risk and might be significantly higher than if the building met all of the minimum requirements. The NFIP regulations do not provide communities the authority to waive any of the minimum requirements.

Variances

Communities are encouraged to consult with the NFIP State Coordinator 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 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 building codes are to reduce damage and to 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 or increases the susceptibility of buildings to flood damage.

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.

IBC. The 2012 IBC and earlier editions have 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 the same provisions 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.

In the 2015 IBC, Section 104.2 outlines actions building officials take on applications and construction documents. New Section 104.2.1 was added to provide for “determination of substantially improved or substantially damaged existing building and structures.” The building official is charged with determining whether proposed work constitutes Substantial Improvement or repair of Substantial Damage. If proposed work is determined to constitute either of these, the building official must require buildings to comply with the requirement of Section 1612.

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

- Section R104.10, similar to the IBC (above), limits the authority of the building official to grant modifications without the granting of a variance by the board of appeals.
- Section R112.2.2, which is in the section that creates a board of appeals, specifies that variances are to be issued only after certain criteria are satisfied.

In the 2015 IRC, the criteria for issuance of variances in flood hazard areas is moved out of the section creating a board of appeals and put under Section R104.10 to parallel the organization of these provisions in the 2015 IBC. Many States and communities remove the IRC section creating a board of appeals, which also removes the provisions relating to variances in flood hazard areas.

3.25 Crawlspace and Under-Floor Space

NFIP. The NFIP regulations do not use the term “crawl space,” although it is used in various guidance documents to refer to a type of foundation in which solid, load-bearing perimeter walls support the building. The space between the ground and the floor system above is the crawl space. In SFHAs, elevated buildings are allowed to have the area underneath enclosed by walls, including perimeter walls. Certain requirements apply to walls of enclosures that extend

below the BFE, and those requirements vary based on the flood zone. Enclosures are permitted to be used only for parking of vehicles, storage, and building access. Perimeter foundations that form crawlspaces are permitted only in Zone A, provided the crawlspace is designed to comply with the requirements for enclosures.

I-Codes. The IBC and the IRC use, but do not define, the terms “crawlspace” and “under-floor space” and they appear to be 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 crawlspaces 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 crawlspace walls; examples include walls that support buildings elevated more than a few feet above grade and walls that are tall enough to enclose areas used for parking and storage.

3.26 Livable and Habitable

NFIP. The NFIP regulations do not use the terms “livable” and “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 living (or livable or habitable) space has to be elevated. This characterization, however, 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.” 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 definition are spaces used for occupancies that do not involve habitation, such as commercial, mercantile, industrial, etc.

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

While it is beneficial to adopt and rely on the flood provisions of the I-Codes to meet the NFIP minimum requirements, achieving those benefits can pose 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 their 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.

However, 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 of the I-Codes. One of the primary objectives of this guide is to provide State and local floodplain management officials with the tools to become familiar with the flood provisions in the I-Codes and identify differences from and similarities with floodplain management regulations. Achieving consistency with the NFIP and improving enforcement will help participating communities to fulfill their commitment to the NFIP.

To that end, this chapter identifies pertinent questions that should be answered in the context of each State's or community's existing statutes and codes. States and communities should also examine the other chapters of this guide to evaluate their options and make decisions about which approach will be most effective in their State or community. At least two decisions may result:

- A decision to develop a code-coordinated floodplain management ordinance, in which case the model code-coordinated floodplain management 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 to enforce the flood provisions of the building codes. In this case, the community must ensure coordination among departments involved in floodplain management so that differences are resolved on a case-by-case basis.

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

Some States have adopted 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:

1. State rules or regulations administered by a State agency that issues permits
2. Building codes enforced by local jurisdictions

3. Floodplain management regulations enforced by local jurisdictions

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).

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 an undue burden on both the regulated public and those charged with enforcing both instruments. While it is simple to state the premise that the “more restrictive prevails,” determining which is more restrictive may be difficult in practice.

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, this 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 code an explicit statement that the more restrictive of the building code or local floodplain management 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 permitting 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. In communities that assign floodplain management and building code responsibilities to different departments, it is possible that lack of coordination may lead to enforcement of a less restrictive requirement.

4.3 At What Level Are Building Codes Adopted?

Building codes may be adopted at the State level or at the local level. 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. In 2013, as part of a study requested by Congress, FEMA determined that every community in 22 States, the District of Columbia, Guam, Northern Marianas, Puerto Rico, and the U.S. Virgin Islands either enforce State-adopted codes based on the I-Codes or enforce the I-Codes (FEMA 2013c). The remaining States handle codes in a variety of ways, including:

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 that the codes should be referred to as the *New York State Uniform Code*.

- State does not require local jurisdictions to adopt a code, but specifies the code that local jurisdictions must adopt if they elect to do so.
- State is either expressly permissive or silent regarding building codes, allowing local jurisdictions 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.

An essential step in coordinating local floodplain management regulations with building codes is to determine whether the State adopts the code at the State level and whether local enforcement is mandated. If both apply, then each community will have a building official and an office that issues building permits.

If the State does not adopt the code at the State level and mandate local enforcement, then the specific requirements and limitations of each State must be examined for communities to know how best to proceed with adoption and enforcement at the local level.

Determining whether a State building code governs is also important because many States do not allow local amendments of the State codes or have specific requirements for local amendments. It is also necessary to find out whether the State code agency has determined if the building code prevails or if the more restrictive provisions of locally adopted floodplain management regulations prevail when there are differences between the two (see Section 4.2).

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; alternatively, a list of State code agencies can be accessed at <http://www.iccsafe.org/gr/Pages/adoptions.aspx>.

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 IEBC is adopted, many States delete IBC Chapter 34 (Existing Buildings). For additional information, refer also to Section 3.15.

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

In States where enforcement of codes is not mandated, each community determines which edition to adopt and when to adopt a more recent edition.

If the 2009 or later edition of the I-Codes is 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 building is also regulated. Because requirements for utilities and equipment 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.

While 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, to regulate all buildings, communities must also have complete floodplain management regulations that include provisions for buildings not within the scope of the adopted code. Based on a review of data reported to the International Code Council, however, it appears rare for States and communities to adopt only the IBC or only the IRC.

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” (IBC 2012).

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, requiring the granting of a variance, 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 the building elevations prior to the final inspection.

With respect to flood provisions, the most significant differences in Chapter 1 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.
- **Substantial Improvement and Substantial Damage determinations.** The 2012 and earlier editions of the IBC and IEBC rely on the definitions for Substantial Improvement and Substantial Damage; the Chapter 1 administrative provisions are silent about the building official making determinations. The 2015 editions of the IBC and IEBC, in Chapter 1, assign to the building official the specific duty to make Substantial Improvement and Substantial Damage 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. The 2015 edition of the IRC parallels the 2015 IBC and IEBC, specifically assigning the building official the duty to make Substantial Improvement and Substantial Damage determinations.

States that adopt the I-Codes 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.
- 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 the I-Code provisions). Communities that develop their own administrative provisions should review the provisions of 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.

4.6 Is Chapter 1 of the I-Codes Modified?

Another step in coordinating local floodplain management regulations with building codes involves examining Chapter 1, *Scope and Administration*. Chapter 1 of the IBC, IRC, and IEBC each contain provisions specific to flood hazard areas.

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

Some States and local jurisdictions adopt I-Codes with Chapter 1 and modify the administrative provisions. Examples of such modifications include:

- **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 5.6).
- **Removing certain provisions.** For a variety of reasons, some States remove certain provisions from the I-Code 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 such 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 that states 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 have a mechanism to review applications submitted with affidavits for 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 where designs are required to be prepared and sealed by a registered design professional. Some States remove requirements for such certifications. Because the NFIP requires designs for new construction and Substantially Improvements (including buildings that have incurred Substantial Damage) in coastal high hazard areas (Zone V) to be prepared and sealed by registered engineers or architects, communities must have a mechanism to require such certification.

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.

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 typically 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 and wastewater treatment facilities, chemical plants, and 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 minimum requirements for construction in SFHAs. States that enforce building codes based on the I-Codes fulfill that responsibility because of the consistency of the 2009 and later editions of I-Codes with the NFIP requirements for buildings and structures.

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 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. 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 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 to list the 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 building code simply 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 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 certain exempt buildings (such as accessory structures and temporary structures), and by specifying that buildings and structures exempt from the building code are subject to the requirements of ASCE 24. Section 5.6 illustrates how IBC Appendix G can be modified to recapture buildings exempt from the building code.

4.10 Which Code Covers Existing Buildings?

For communities to rely on building codes based on the I-Codes to meet the NFIP requirements for buildings and structures, the codes must govern work on existing buildings. If the codes are modified such that work on existing buildings is not regulated, then local floodplain management regulations must explicitly regulate existing buildings and, significantly, must establish and adopt specific 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).

One way to ensure the codes cover existing buildings is to 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. An alternative would be to incorporate all of the necessary requirements for existing buildings into local floodplain management regulations (in effect, this would require specifying all the NFIP requirements, essentially replicating the provisions of the codes).

The NFIP and Existing Buildings. The NFIP has requirements that apply to existing buildings. Communities are required to determine whether work on existing buildings constitutes Substantial Improvement or 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 consider any building built before the date a community adopted its first floodplain management ordinance to be an “existing” building and any building built on or after that date to be “new construction.” 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 regulations in effect at the time the permit was issued.

Pre-FIRM and **post-FIRM** are insurance terms that are tied to a community’s initial FIRM and are used for determining flood insurance rates.

It is, however, common—but misleading—for the terms “pre-FIRM” and “post-FIRM” to be used in distinguishing between new construction and buildings that predate when a community adopted its first floodplain management requirements. Since FEMA periodically revises FIRMs, which sometimes changes flood zones and BFEs, reliance on “pre-FIRM” and “post-FIRM” terminology can lead to incorrect interpretations.

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 Substantially 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 2012 and earlier editions of the IBC include provisions for existing buildings in Chapter 34.

The first edition of the IEBC was published in 2003, but its use was not widespread for many years. Between the 2006 and 2012 editions of the IBC, numerous changes to Chapter 34 were approved, bringing it somewhat in line with the IEBC. That evolution led to elimination of Chapter 34 in the 2015 IBC in favor of the IEBC.

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 Substantial Improvement and 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?

One step in coordinating local floodplain management regulations with building codes is determining how development other than buildings and structures will be regulated.

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. It includes requirements for modifications to watercourses; permits for development other than buildings and structures in flood hazard areas; conditions for the issuance of variances; subdivision planning; installation of manufactured homes, recreational vehicles, tanks, temporary structures and temporary storage; and Utility and Miscellaneous Group U structures (which are identified in IBC Section 312).

IBC Appendix G Consistent with NFIP

FEMA prepared a review checklist that demonstrates how all of the NFIP requirements are addressed by the I-Codes (including with Appendix G). The checklist for the 2012 I-Codes is in Appendix B of this guide.

The checklists for the 2009 and 2012 are available online under Building Code Resources: <http://www.fema.gov/building-science/building-code-resources>.

States and communities that adopt the 2009 or later I-Codes with IBC Appendix G without any modifications that weaken its requirements will meet the minimum requirements of NFIP. Modifications that add NFIP-consistent provisions or make provisions more stringent are acceptable.

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 a stand-alone floodplain management ordinance that contains both requirements for buildings and requirements similar to those in Appendix G. NFIP State Coordinators need to determine how communities should resolve differences. One option is to encourage communities to adopt regulations that are similar to Model Ordinance Version One that 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 Appendix G may be modified to assign it to another department.
- **Make IBC Appendix G available for adoption by communities.** Some States do not mandate enforcement of Appendix G, but allow its adoption by communities. When communities have this option, they should

Model Code-Coordinated Ordinances

A link to a document with three versions of the model code-coordinated ordinance prepared by FEMA is in Appendix C of this guide.

examine 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 the provisions in IBC Appendix G achieves consistency with the NFIP. Model Ordinance Version Two and Model Ordinance Version Three are specifically written for this purpose.

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 minimum requirements for buildings and structures. 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, which usually take the form of promulgated regulations. Most 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. Some States, however, make modifications that remove or weaken certain flood provisions. Some States remove all flood provisions and, instead, refer to local floodplain management regulations. In these cases, communities in those States cannot rely on the adopted codes to satisfy the NFIP minimum 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 if any provisions of 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 provisions of Appendix G that are required by the NFIP, communities may not be able to rely on it for administrative requirements and requirements for development other than buildings.

4.14 Does the State Permit Local Amendments?

The answer to this question is important for communities that adopt standards that exceed the NFIP minimum requirements for buildings and structures. Entwined with this question is whether higher standards 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 usually require that any such amendments be justified based on local conditions. Many specify that local amendments are to be reported to the State, and some States post local amendments online for ready access by the public. States handle local amendments in several ways; the most common 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, but have no authority to approve or deny.
- **Approval by the State code council is required.** In these States, communities have to follow specific steps and meet certain requirements to justify local amendments, and 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 floodprone areas not shown on FIRMs as long as the floodprone areas 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.

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 such due process requirements, thus permitting “automatic” adoption of revised FISs and FIRMs, while other States are silent. 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. It is important to note, however, that inclusion of the auto-adoption provision in the model code, even if adopted by a State, 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 and FIRMs prepared by FEMA must be adopted. Communities are expected to insert the effective date and name of the FIS (which includes the FIRMs). At a minimum, the FIS and FIRMs are adopted “along with any revisions thereto.”
- **IRC Section R301.2.2 and Table R301.3.2(1).** This table is set up for individual communities to insert their climatic and geographic data, including data on flood hazards. Footnote (g) of the table calls for 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 the local floodplain management regulations. The FIRMs accompany the FIS and are adopted when the FIS is adopted.

If the I-Codes are relied on to meet the NFIP minimum 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 a separate authority from the building code, usually by separate regulations administered by a transportation department or community development agency.

In 2007, HUD published an installation standard for new manufactured homes, *Model Manufactured Home Installation Standard* (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 have not been designed to address flood loads” (emphasis added). If the specifications are designed for flood resistance, the conditions of applicability are to be listed (velocities,

HUD Rules for State Programs

In 2008, HUD established 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, and
- Provide an “appropriate level” of inspection of installed homes.

Questions Related to Coordinating I-Codes and Floodplain Management Regulations

depths, or wave action), and the design must be certified by a registered professional engineer or architect. If flood loads are not addressed, the instructions are to direct the installer to “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 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 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 elevated to the same height as single-family homes (the NFIP’s option to allow certain replacement units to be installed on foundations that are only 36 inches above grade is not included). If located in a floodway, the foundation and anchorage must be in accordance with ASCE 24. Basically, the IRC specifies that foundations under manufactured homes have to meet the same requirements as foundations for single-family homes.
- **IRC Appendix E.** In addition to the rest of the provisions of the appendix, if a new or replacement manufactured home is to be installed in a flood hazard area, it must meet the requirements of R322. I-Code appendices must be specifically adopted by a State or community to apply.
- **IBC Appendix G.** Provisions for elevation, foundations, and anchoring of manufactured homes are included in this appendix. Sections with requirements for enclosures and equipment are included in the 2015 IBC Appendix G. I-Code appendices must be specifically adopted to apply.

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 also 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 ... 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 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 that are intended to help State and local officials understand, interpret, and enforce the requirements of the NFIP. Because the flood provisions of the I-Codes are consistent with the minimum requirements of the NFIP for buildings and structures, FEMA’s guidance documents are valuable resources for State and local building officials.

FEMA and the International Code Council encourage State and local officials to use FEMA’s guidance documents and contact their NFIP State Coordinator before rendering interpretations related to the flood provisions of the building codes. 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.

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Chapter Five Increasing Resistance to Flood Damage

The NFIP sets minimum floodplain management standards that apply to all communities that participate in the program, regardless of any unique characteristics of the community. For a number of reasons, States may require higher standards or communities may elect to adopt provisions that exceed the NFIP minimum requirements. Any floodplain management regulations adopted by a State or community that are more restrictive than the NFIP minimum requirements take precedence.

FEMA has long encouraged and endorsed the adoption of State and local requirements that exceed the NFIP minimum requirements. Such requirements, usually called “higher standards,” can significantly reduce exposure to future flooding, avoiding or minimizing the cost of recovery and the need for disaster assistance. In addition, compliance with some higher standards, notably additional elevation above the minimum required elevation (freeboard), means individual buildings will qualify for lower NFIP flood insurance premiums. Some States adopt higher standards, often in statutes other than the laws that govern building codes. Local officials should always check with their NFIP State Coordinator to determine if any State-adopted standards apply.

FEMA reports that buildings that at least meet the NFIP minimum requirements experience, on average, 80 percent less damage than buildings that predate enforcement of floodplain management regulations. Although a community can achieve a high level of flood protection by enforcing the NFIP minimum 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:

- Communities recognize that enforcing the NFIP minimum requirements may not provide their desired degree of long-term resilience against future flood events.
- Floods more severe than the estimated base flood can and do occur.
- Past flood events may have been more severe or more frequent than indicated by the 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.
- 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

Increasing Resistance to Flood Damage

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 the most 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 current and more detailed topographic data may be available. In addition, software advances in recent years have improved the modeling methods used to develop flood hazard mapping. FEMA is updating maps across the country using these new methods; however, the process will take many years to revise all maps.
- 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.

Many communities that adopt higher standards participate in the NFIP Community Rating System (CRS) so that individual properties owners can receive discounted flood insurance premiums. The CRS is summarized in Section 5.2.

Section 5.3 contains some suggested language to modify specific provisions of the I-Codes to incorporate several higher standards for buildings and structures, and Section 5.4 includes suggested language to modify specific sections of IBC Appendix G to incorporate several other higher standards.

Section 5.5 summarizes the International Green Construction Code (IgCC). The IgCC includes some higher standards as well as “electives” that communities and developers can select as additional higher standards. Communities that enforce the IgCC along with the other I-Codes should be aware of these differences between the rest of the I-Codes and the IgCC.

Section 5.6 shows how IBC Appendix G can be modified to recapture buildings that some States exempt from the building code.

5.1 Amending the I-Codes at the State and Local Levels

Many States that adopt the I-Codes at the State level undertake a formal process to consider, evaluate, and adopt State-specific amendments, while 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. As a consequence, those States that amend the I-Codes do so periodically when they adopt the codes

Communities located in States that do not adopt building codes at the State-level 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 requirements adopted by the State in different statutes or regulations or to replace the flood provisions of the I-Codes with reference to different authority.

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 some answers to 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 State NFIP 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 3.7 for a description of the minimum elevation requirements in the I-Codes). The following sections describe several higher standards and include sample language to modify the I-Codes, including IBC Appendix G:

- Section 5.3.1: Additional Height (Freeboard)
- Section 5.3.2: Prohibit Enclosures Below Elevated Buildings
- Section 5.3.3: Limit the Size of Enclosures Below Elevated Buildings
- Section 5.3.4: Require Nonconversion Agreements for Enclosures Below Elevated Buildings
- Section 5.3.5: Regulate Coastal A Zone Like Zone V
- Section 5.3.6: Cumulative Substantial Improvement
- Section 5.3.7: Repetitive Flood Damage (Substantial Damage)
- Section 5.3.8: Limitation on Use of Fill
- Section 5.3.9: Design Certification of All Foundations
- Section 5.3.10: Protection of Critical and Essential Facilities
- Section 5.3.11: Flood Hazard Map Other Than or in Addition to the FIRM
- Section 5.4.1: Designating the Floodplain Administrator
- Section 5.4.2: Manufactured Home Limitations
- Section 5.4.3: Flood Protection Setback Along Waterways
- Section 5.4.4: Subdivision Limitations
- Section 5.4.5: Compensatory Storage

Higher Standards

States and communities may identify other higher standards that can be incorporated to the I-Codes (or IBC Appendix G). Contact FEMA Regional Offices for assistance.

5.2 NFIP Community Rating System

Communities that participate in the NFIP recognize flood hazards in their planning, zoning, development, and construction decisions. Many communities have chosen to guide development toward areas of lower risk, and new buildings are often located out of harm's way. The NFIP requirements govern how development occurs, rather than explicitly guide development away from flood-risk areas. Until 1990, the NFIP had few incentives for communities to do more than administer the minimum NFIP requirements, and flood insurance rates were the same in every community, yet some elected to exceed the minimum requirements. The CRS was established to recognize that many communities elect to exceed the minimum requirements.

CRS Information

For more information on CRS, consult FEMA's FIA-15, *CRS Coordinator's Manual* (FEMA 2013), available at:

- www.CRResources.org
- www.fema.gov/national-flood-insurance-program-community-rating-system

In communities that participate in the CRS, flood insurance premiums are discounted to reflect community initiatives that meet the following CRS goals:

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

Discounted NFIP flood insurance premiums are only one of the rewards that 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 discount amount applied to flood insurance premiums is based on a community's CRS classification, which in turn is based on the total credit for the community's activities. Class 1 communities qualify for the maximum discount of 45 percent for policies on buildings in the SFHA (and 10 percent on buildings not in the SFHA and not covered by flood insurance policies called Preferred Risk Policies). Class 9 communities receive a 5 percent discount on all policies except those covered by Preferred Risk Policies. 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 Building Code Effectiveness Grading Schedule (BCEGS) classifications of 5 for residential/personal codes and 5 for non-residential codes.

The BCEGS classification is a measure of both the provisions in the adopted code as they relate to natural hazards and a community's administration of the code.

BCEGS Information
 For more information on BCEGS, see the Insurance Services Office's Web site: <http://www.isomitigation.com/bcegs/>.

Table 5-1 shows the maximum number of points for higher regulatory standards that can be adopted by modifying the I-Codes. Actual points are a function of several factors and are determined by FEMA based on the specific provisions of each community's program. Suggested language to incorporate some of these higher standards into the I-Codes (and IBC Appendix G or a companion ordinance) is shown in the rest of this chapter.

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

CRS Activity 430: Higher Regulatory Standards	Maximum CRS Credits
DL: Development limitations (in the SFHA)	
<ul style="list-style-type: none"> • Prohibition of fill 	280 points
<ul style="list-style-type: none"> • Prohibition of buildings 	1,000 points
<ul style="list-style-type: none"> • Prohibition of outdoor storage materials 	50 points
FRB: Freeboard (up to 3 feet above BFE); increased points if paired with prohibition on fill or requirement for compensatory storage	500 points
FDN: Foundation protection (fill compaction, engineered design)	80 points
CSI: Cumulative substantial improvements (over a specific period), including regulating repetitive loss to qualify for Increased Cost of Compliance insurance coverage	90 points
LSI: Lower substantial improvements (less than 50% threshold)	20 points
PCF: Protection of critical facilities (to 500-year flood level)	80 points
ENL: Enclosure limits (limit or prohibit); more points if nonconversion agreements are required	240 points
LDP: Local drainage protection (from shallow flooding)	120 points
MHP: Manufactured home parks (require full elevation regardless of location, i.e., eliminate 36-inch option)	15 points
CAZ: Coastal A Zones (regulated to Zone V standards)	650 points

Source: FIA-15, *CRS Coordinator's Manual* (FEMA 2013b)

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

The flood provisions of the 2009 and later editions of the I-Codes are consistent with the NFIP requirements for buildings and structures, and IBC Appendix G is consistent with NFIP administrative requirements and requirements for development other than buildings. The

The I-Codes are developed through a consensus process involving building officials, developers and builders, architects and engineers, and others who participate in the code development process. A description of the process is available online: www.iccsafe.org.

flood provisions of the I-Codes, in part by reference to the standard ASCE 24, *Flood Resistant Design and Construction*, exceed the NFIP minimums in certain respects, and they are more specific in other respects. For details on how specific provisions of the 2009 and 2012 I-Codes exceed the NFIP requirements, refer to Chapter 3 of this guide and *Flood Provisions of the International Codes: Higher Standards and More Specific Requirements than the Minimum Requirements of the National Flood Insurance Program* (FEMA 2013a). Those same provisions are in the later editions of the I-Codes.

The most significant I-Code requirement that exceeds the NFIP is the required minimum elevation:

- The IBC, by reference to ASCE 24, requires all buildings within the scope of the IBC to be elevated (or dry floodproofed) at least 1 foot above the minimum elevation required by the NFIP.
- The IRC requires some dwellings to be 1 foot higher than the NFIP minimum⁴. The 2015 IRC requires all dwellings to be elevated at least 1 foot higher than the NFIP minimum.

After community officials have considered the merits of higher standards and determined which are appropriate, the next step is to determine the best way to implement those standards. The following sections describe some of the higher standards that apply specifically to buildings and include sample language to amend the I-Codes.

5.3.1 Additional Height (Freeboard)

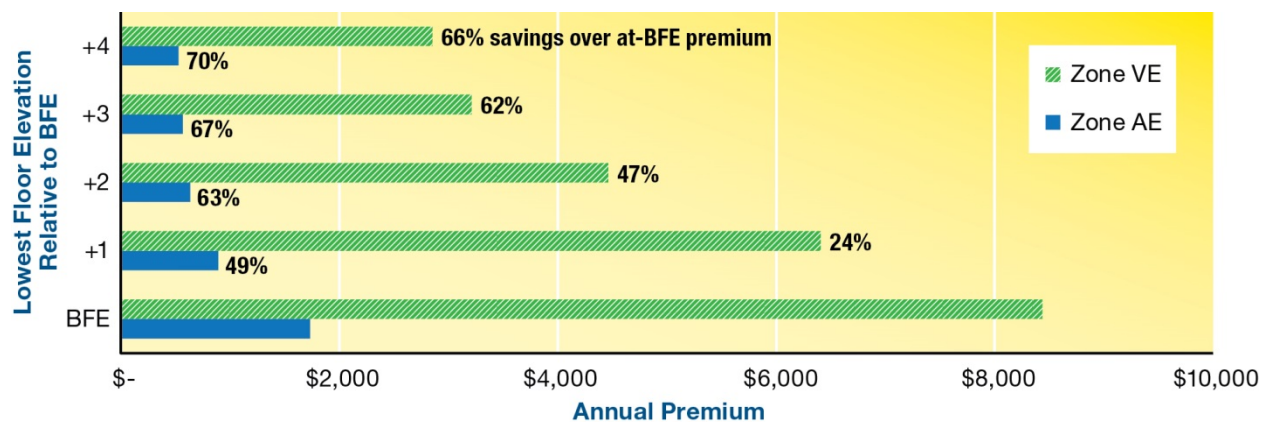
The term “freeboard” refers to additional height above a minimum level of protection, typically expressed in feet above the BFE. Freeboard provides a margin of safety against uncertainty and future conditions. Floods can and do rise higher than the elevations selected for regulatory purposes. For riverine 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 flood insurance.

A common argument opposing requirements to elevate buildings higher than the NFIP minimum is the additional cost of higher foundations. A report prepared for FEMA, *Evaluation of the*

⁴ The 2009 and 2012 IRC require an additional foot of elevation in two circumstances: if a Coastal A Zone has been designated and if, in Zone V, the lowest horizontal structural member is oriented perpendicular to the direction of wave approach.

National Flood Insurance Program’s Building Standards (American Institutes for Research 2006), examines the incremental costs and benefits of adding freeboard to different types of elevated foundations for single-family dwellings. Incremental costs of adding 1, 2, 3, or 4 feet to foundations ranged from 0.2 to 9.1 percent of the cost of building homes with lowest floors positioned at the BFE (higher costs are associated with use of fill to achieve elevation, allowed only in Zone A). The report documents that future avoided damage and lower-cost NFIP flood insurance premiums make it cost-effective to build higher, with the insurance savings alone enough to recover the added costs within several years. The report is online at <https://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-evaluation>.



Note: Annual premiums calculated using the *NFIP Flood Insurance Manual*, October 1, 2014, for a one-story single-family home with no basement, no enclosure, and full replacement coverage. Premiums are based on the maximum available coverage of building coverage of \$250,000 for building and \$100,000 for contents coverage. Zone V building is assumed to be free of obstructions.

Figure 5-1: Annual flood insurance premium costs based on lowest floor elevation

Freeboard in the IBC. The IBC requires freeboard by reference to ASCE 24 (see Tables 3-1 and 3-2 in Chapter 3). The amount of freeboard depends on the assigned Risk/Occupancy Category (if ASCE 24-05 is referenced) or the assigned Flood Design Class (if ASCE 24-14 is referenced). See Section 3.6 for the description of the Risk/Occupancy Categories and Flood Design Classes. The additional height requirement applies universally to lowest floors (Zone A), lowest horizontal structural members (Zone V), floodproofing, flood damage-resistant materials, and utilities and attendant equipment. ASCE does not require freeboard for certain minor buildings (referred to as Category I or Flood Design Class 1 structures).

Incorporating additional height requirements into the IBC requires modifying the code to add a provision that takes precedence over the elevations specified in ASCE 24.

IBC: Add a new Sec. 1612.4.1 as follows:

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high-velocity wave action, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Elevation requirements. The minimum elevation requirements shall be as specified in ASCE 24 or the base flood elevation plus **{insert additional height in feet or inches}**, whichever is higher.

Freeboard in the IRC. The IRC specifies minimum elevations as a function of flood zone. In Zone A (all zones that start with the letter “A”), the elevation of the lowest floor is specified (see R322.2.1). In Zone V (all zones that start with the letter “V”), the elevation of the bottom of the lowest horizontal structural member of the lowest floor is specified (see R322.3.2). IRC editions that predate 2015 include additional elevation in specific circumstances. The 2015 IRC requires elevation to a minimum of the BFE +1 foot (or the DFE, if higher).

To incorporate freeboard into the IRC editions that predate 2015, the best way to ensure that designers and builders are aware of the requirement is to amend the IRC in every section that cites the DFE.

IRC: For 2012 and earlier, modify Sec. R322.2.1 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 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 1 foot plus additional height in feet or inches}** 4 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 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.

IRC: For 2012 and earlier, modify Sec. R322.3.2 as follows:

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 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 1 foot plus 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.

Amending the 2015 IRC to require even more additional height is simply a matter of modifying every location where “base flood elevation plus 1 foot” appears to specify the desired additional height, such as “base flood elevation plus 2 feet.”

IRC: For 2015, modify Sec. R322.2.1 as follows:

R322.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, including flood hazard areas not designated as Coastal A Zones, shall have the lowest floors elevated to or above the base flood elevation plus **{insert 1 foot plus additional height in feet or inches}** 4-feet, 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}** 4-feet, or at least **{3 feet plus additional height in feet/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 1 foot plus additional height in feet or inches}** 4-feet, 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.

IRC: For 2015, modify Sec. R322.3.2 as follows:

R322.3.2 Elevation requirements.

1. All buildings and structures erected within coastal high-hazard areas 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 1 foot plus additional height in feet or inches** ~~4 feet~~ 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.

5.3.2 Prohibit Enclosures Below Elevated Buildings

Buildings located in flood hazard areas are subject to considerable forces that may be 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.

Some communities choose to prohibit enclosures altogether 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 such a prohibition are lower flood insurance premiums and reduced opportunity for owners to modify enclosures for uses other than those allowed.

IBC: Add a new subsection as follows:

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high-velocity wave action, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Enclosure limitations. Enclosures below the design flood elevation are not permitted.

IRC: For Zone A, modify Section R322.2.2 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 mm²) for each square foot (0.093 m²) 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.~~

IRC: For Zone V, modify Section R322.3.4 as follows:

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 by insect screening or open wood lattice and shall be used solely for parking of vehicles, building access or storage.

5.3.3 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 their 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, 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.

IBC: Add a new section as follows:

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high-velocity wave action, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Additional requirements for enclosed areas. Enclosed areas below the design flood elevation shall be not more than **{insert number}** sq ft in area.

IRC: For Zone A, modify R322.2.2 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:
 - 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 mm²) for each square foot (0.093 m²) 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.
3. Be not more than {insert number} sq ft in area, except for crawlspace foundations that have a wall height less than {insert number} feet.

IRC: For Zone V, modify Section R322.3.5 as follows:

R322.3.5 Enclosed areas below design flood elevation. Enclosed areas below the design flood elevation shall be not more than {insert number} sq ft in area and shall be used solely for parking of vehicles, building access or storage.

Alternative: to allow areas with insect screening or lattice to be larger:

R322.3.5 Enclosed areas below design flood elevation. Enclosed areas below the design flood elevation shall be not more than {insert number} sq ft in area and shall be used solely for parking of vehicles, building access or storage.

Exception: Areas enclosed by insect screening or open wood lattice that are used solely for parking of vehicles, building access or storage.

5.3.4 Require Nonconversion Agreements for Enclosures Below Elevated Buildings

Some communities elect to 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. Many communities report that owners convert enclosures for use as bedrooms, family rooms, bathrooms, workshops, and similar uses. Usually, nonconversion agreements are required to be recorded on property deeds to inform future owners of the use

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limitations. A sample nonconversion agreement is referenced in the *CRS Coordinator's Manual* (FEMA 2013b). As with all legal documents, communities should have the sample agreement reviewed for legal sufficiency.

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 the property deed in Official Records of the Clerk of Courts, for the owner to agree not to convert or modify enclosures below elevated buildings 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 is enclosed by walls.

5.3.5 Regulate Coastal A Zone Like Zone V

FIRMs for many coastal communities show flood hazard areas identified as Zone V and Zone A along open shorelines. Zone V areas, referred to as coastal high hazard areas, are subject to high-velocity wave action, where breaking wave heights are equal to or greater than 3 feet. Flood hazard areas immediately inland of Zone V (and inland of shorelines without Zone V) are labeled as Zone A. These areas experience some wind-driven waves, but the breaking wave heights are predicted to be less than 3 feet (see Figure 5-2). The NFIP minimum requirements for buildings do not recognize the risk of wave damage in areas where wave heights are less than 3 feet high.

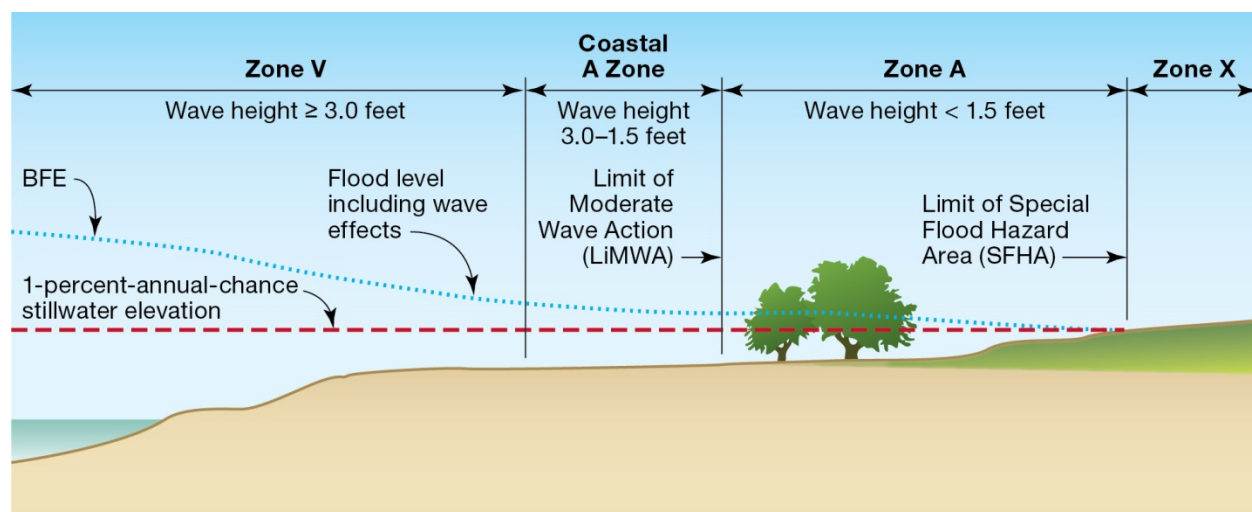


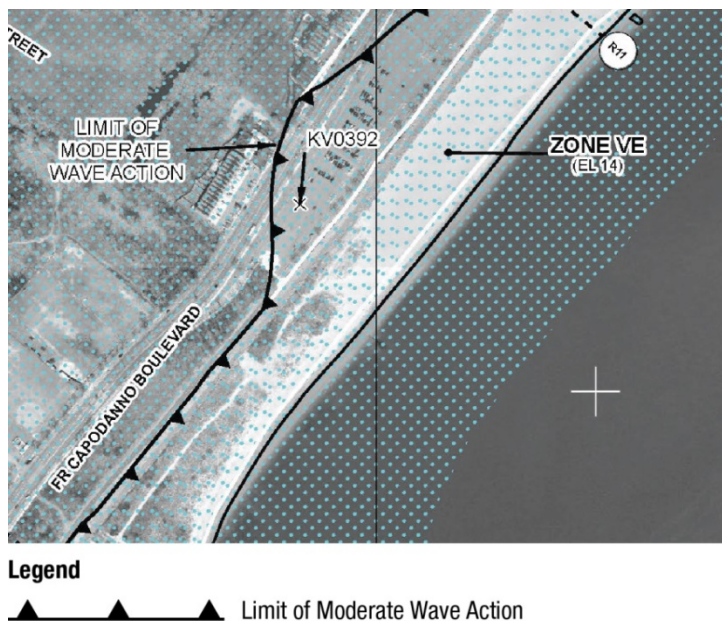
Figure 5-2: Coastal flood zones

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). The Coastal A Zone is the area between the LiMWA and the Zone V boundary (or shoreline if a Zone V is not present), although not labeled as such on FIRMs (see Figure 5-3).

Because LiMWAs are not delineated on all coastal FIRMs, the question of determining whether the required conditions are likely to occur at a site needs to be addressed. One way to do this is to determine the inland extent of the 1.9-foot stillwater depth and assume that breaking waves will develop (i.e., there are no obstructions that would damp waves). Alternatively, a site-specific determination can be made by looking at sites and their surroundings, the actual surveyed ground elevations, and the estimated wave heights, which can be calculated using predicted stillwater depths or derived from elevations shown on the FIRM.

Coastal A Zone in the IBC. Through reference to ASCE 24, the IBC (2012 edition and earlier) requires application of Zone V design requirements when Coastal A Zone-type waves are present. Engineers and architects are expected to examine individual construction sites to determine if such conditions are present. The 2015 IBC requires Coastal A Zones to be treated as Zone V only if the LiMWA is delineated or if the community designates a specific area as a Coastal A Zone.

Coastal A Zone in the IRC. The IRC requires 1 foot to be added to the elevation of lowest floors if areas subject to wave heights between 1.5 and 3.0 feet have been delineated, in which case the areas are designated as Coastal A Zone. The IRC (2012 edition and earlier) does not require dwellings in Coastal A Zones to meet the requirements for Zone V. If a LiMWA is delineated, or if a community designates an area as Coastal A Zone, then the 2015 IRC requires dwellings to



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 5-3: Sample FIRM with LiMWA

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meet the requirements for Zone V (while still requiring flood openings in walls below elevated dwellings).

The 2015 IRC includes the change to R106.1.3 shown below. In 2012 IRC and earlier, add 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 designated 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.

The 2015 IRC includes the change shown below. In 2012 IRC and earlier, modify as follows:

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.

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.

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.

5.3.6 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 be brought into compliance if improvements, including additions, are determined to be Substantial Improvement. If the cost of proposed improvements equals or exceeds 50 percent of the market value of the building before the improvements are started, then the building must be brought into compliance with the requirements for new construction. The IBC and IEBC have the same definition and requirements.

Communities can further reduce flood losses in the long term by adopting a requirement that all improvements and repairs be tracked over time and counted toward the Substantial Improvement determination. Adopting a “cumulative Substantial Improvement” requirement means that buildings would be brought into compliance sooner than if the community administered the minimum requirement, which applies to each separate application for improvements and repairs. 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.

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* (FEMA 2010).

IBC and IEBC, modify definitions:

SUBSTANTIAL IMPROVEMENT. Any combination of repair, reconstruction, rehabilitation, addition or 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). Also see FEMA P-758 to consider how changes in market value over time will be handled. Communities that adopt this provision should have written procedures.
- 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 has adopted a cumulative Substantial Improvement provision, insert the actual date of adoption.

5.3.7 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 building before the damage occurred. The IBC and IEBC have the same definition and requirements.

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 ICC coverage in flood insurance policies on buildings in SFHAs.

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.

Increasing Resistance to Flood Damage

Federal flood insurance includes coverage called Increased Cost of Compliance (ICC). NFIP-insured buildings in SFHAs that are determined to meet the basic definition of Substantial Damage due to damage by flooding are eligible to file an ICC claim for up to \$30,000 (as of 2014) 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 ICC 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* (FEMA 2003).

In communities that adopt specific language for “repetitive loss” structures, owners of such structures that are NFIP-insured may also be eligible to apply for ICC 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 provision on all buildings, not just those that are covered by NFIP flood insurance.

The best way to implement a repetitive-loss provision is to modify the definition of Substantial Damage. 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. Another way, described in FEMA 301 (FEMA 2003) but not shown here, is to adopt a new definition for “repetitive loss” and then modify the Substantial Improvement definition to include buildings that have sustained repetitive loss. That approach is not as intuitive as the approach shown below because the ICC coverage is triggered by flood damage and requires repetitively flooded buildings to be determined to have incurred Substantial Damage.

IBC and IEBC, modify definition:

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.

5.3.8 Limitation on Use of Fill

Structural fill is a common method of elevating buildings in flood hazard areas other than coastal high hazard areas (Zone V). However, 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 or 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 or require compensatory storage for filled areas (see Section 5.4.5 for information on compensatory storage).

IBC: Select Option 1 or Option 2.

Option 1 (prohibit use of earthen fill pads):

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high-velocity wave action, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Limitation on use of fill. Use of fill to elevate buildings and foundations shall not be permitted.

Option 2 (prohibit use of earthen fill pads and filled foundations):

1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high-velocity wave action, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

1612.4.1 Limitation on use of fill. Use of fill to elevate buildings and foundations, and use of earthen-filled stemwalls, shall not be permitted.

IRC: Select Option 1 or Option 2.

Option 1 (prohibit use of earthen fill pads):

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.

Option 2 (prohibit use of earthen fill pads and filled stemwall foundations):

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

5.3.9 Design Certification of All Foundations

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

The NFIP requires that a registered professional engineer or architect develop or review the structural design, specifications, and plans for the construction of foundations in Zone V, and requires the design professional to certify that the design and methods of construction meet NFIP requirements. The same requirement does not apply in Zone A, which means that either

Increasing Resistance to Flood Damage

foundations may be constructed without 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 a registered design professional. The IRC, like the NFIP, only requires certified designs in Zone V.

Requiring certification of foundation designs in all flood zones ensures that buildings 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 if 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 and add new Section R322.2.4 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.

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 4 feet (1219 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.~~

R322.2.4 Construction documents. The 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.

5.3.10 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

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.

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.

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 Risk/Occupancy Category (if ASCE 24-05 is referenced) or the assigned Flood Design Class (if ASCE 24-14 is referenced). See Section 3.6 for a description of the Risk/Occupancy Category and Flood Design Classes. Critical and essential facilities are assigned Categories III and IV and Flood Design Classes 3 and 4. ASCE 24 requires that such facilities be elevated or dry floodproofed to elevations higher than other buildings (see Tables 3-1 and 3-2).

Where feasible, critical and essential facilities are best protected if located outside of areas prone to flooding, preferable outside of the 0.2-percent-annual-chance (500-year) floodplain. Alternatively, some communities adopt regulations that allow new critical facilities in the SFHA, but set higher protection standards.

IBC Appendix G: Add a new definition and new Section G1002.1:

Critical Facility. Facilities that are assigned Risk Category III and Risk Category IV assigned pursuant to the building code or Flood Design Class 3 and 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.

G1002 CRITICAL FACILITIES

G1002.1 Location of Critical Facilities. New critical facilities shall, to the extent feasible, be located outside of the special flood hazard area and outside of the 0.2% annual chance flood hazard area (500-year floodplain). If documentation is provided that feasible sites outside of the special flood hazard area are not available that satisfy the objectives of a proposed critical facility, then the critical facility shall:

1. Have the lowest floor elevated to or above the 0.2% annual chance flood hazard area (500-year floodplain) elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher, and
2. Meet the applicable flood resistant requirements of the *International Building Code* and *ASCE 24*, and where elevation requirements are specified, the minimum elevation shall be the 0.2% annual chance flood hazard (500-year) elevation plus 1 foot (305 mm), or the design flood elevation, whichever is higher

5.3.11 Flood Hazard Map Other Than or in Addition to the FIRM

Virtually all communities that participate in the NFIP use FIRMs as the basis for enforcing floodplain management regulations and the flood provisions of building codes. The NFIP expects the FIRMs to be adopted, but 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 they show either floodprone areas that are larger than the SFHA or floodprone areas that are not identified on FIRMs. The FIRM shows the extent of the base flood (1-percent-annual-chance flood), which is the minimum basis for enforcing the floodplain management regulations. The NFIP defines and uses the terms “base flood” and “base flood elevation” (see Sections 3.3 and 3.4 of this guide).

The I-Codes and ASCE 24 define and use the terms “design flood” and “design flood elevation” 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 3.3 and 3.4). Most communities use FIRMs, and thus, when those communities enforce building codes based on the I-Codes, the DFE is equal to the BFE.

Communities may adopt different 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 either the FIS and FIRMs 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 either the FIS and FIRMs 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^g

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 is written to pair with the flood provisions of the I-Codes to meet the floodplain management and administrative requirements of 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).

The following sections illustrate options for amending IBC Appendix G for selected higher standards. Communities that do not use Appendix G can adopt similar provisions in their local floodplain management regulations (see Chapter 6 for model code-coordinated ordinances written for communities that do not use Appendix G).

5.4.1 Designating the Floodplain Administrator

When communities apply to become NFIP-participating communities, they must 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.

Increasing Resistance to Flood Damage

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 prescribe the authority of building officials so strictly that some building officials prefer this approach.

IBC Appendix G: Designate an official other than the building official.

Add a new section to Section G101 Administration:

G101.5 Designation of Floodplain Administrator. The {insert position title} is designated as the floodplain administrator. The floodplain administrator may delegate performance of certain duties to other employees.

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

G103.1 Permit Applications. The floodplain administrator ~~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, 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.

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, IRC Appendix E, and the manufactured home installation standard promulgated by HUD (42 CFR Section 3285) allow installation of manufactured homes in SFHAs. 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.

There are two differences between the NFIP minimum requirements and the provisions of IBC Appendix G for new and replacement manufactured homes and manufactured homes undergoing Substantial Improvement (also see Section 3.18):

- Appendix G requires foundations to be designed in accordance with IBC Section 1612, while the NFIP only requires foundations in Zone V to be designed and certified by a registered design professional.
- Appendix G requires all homes to be elevated to or above the DFE, while the NFIP regulations allow certain homes replaced on sites in existing manufactured home parks and subdivisions to be supported on piers or foundation elements that are no less than 36 inches above grade.

Post-flood investigations by FEMA and others document that manufactured homes, even if elevated to meet the minimum requirements, are more vulnerable to flood damage than conventional homes and modular homes that are constructed to have their 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. For these reasons, and to protect public health, safety, and welfare, some communities elect to prohibit the installation of new manufactured home units in one or more of these higher-risk flood hazard areas.

IBC Appendix G: Prohibit new installations of manufactured homes in floodways and Zone V and

SECTION G501 MANUFACTURED HOMES

G501.1 Limitation on installation in floodways and coastal high hazard areas (Zone V). ~~New installations of manufactured homes shall not be permitted in floodways and coastal high hazard areas (Zone V).~~

G501.2 ~~**G501.1 Elevation.** All new and replacement manufactured homes to be placed or~~ **New manufactured homes in flood hazard areas other than coastal high hazard areas 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 coastal high hazard areas 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 coastal high hazard areas 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 the IRC is 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 and in coastal high hazard areas (V 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). The anchor and tie-down requirements of the applicable state or federal requirements shall apply. The foundation and anchorage of 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:

AE101.1 General.

Text not shown

AE101.2 Flood hazard areas. ~~Exception:~~ New manufactured homes shall not be permitted in identified floodways and in coastal high hazard areas (V Zones). In addition to these provisions, ~~new and~~ replacement manufactured homes to be located in flood hazard areas other than identified floodways and coastal high hazard areas as established by Table R301.2(1) of the *International Residential Code* shall meet the applicable requirements of Section R322 of the *International Residential Code*.

5.4.3 Flood Protection Setback Along Waterways

In general, areas immediately adjacent to bodies of water tend to be where floodwater is deepest and where velocities and waves are more likely to be higher than farther away from the water's edge. 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 or limiting development within specified minimum distances from the 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 help preserve the natural and beneficial functions of the floodplain.

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.

Building codes specify how buildings are designed and built, but do not govern where buildings can be located. 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 water courses. 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; a common number for {insert B} is 50 to 100.

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.

The NFIP has one provision that applies to subdivisions in SFHAs where BFEs are not provided on FIRMs: for new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) that have more than 50 lots or involve more than 5 acres, whichever is the lesser, communities must require that applicants include BFEs in such proposals. IBC Appendix G requires that all subdivision proposals include DFEs on tentative and final plats. Neither the NFIP nor Appendix G specifies open space or lot layout requirements.

IBC Appendix G: Select Option 1 or Option 2.

Option 1: lot layout to put flood hazard areas in open space

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 assure that:

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. Flood hazard areas shall be restricted to open space uses and not included within individual platted lots; and
4. 3. Adequate drainage is provided to reduce exposure to flood hazards.

301.2 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 and areas subject to high velocity wave action, as appropriate, shall be delineated on tentative and final subdivision

plats; and

- ~~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; and~~
2. 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

301.2 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 and areas subject to high velocity wave action, 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; and
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.

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 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 unlikely 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.

Requiring the creation of floodplain storage capacity (hydraulically equivalent excavation) can compensate for the encroachment of development and placement of fill, 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 Section G104.2, and add a new definition and new Section G401.6 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:

1. Identify and describe the development to be covered by the permit.
2. Describe the land on which the proposed development is to be conducted by legal description, street address or similar description that will readily identify and definitely locate the site.
3. Include a site plan showing the delineation of flood hazard areas, floodway boundaries, flood zones, design flood elevations, ground elevations, proposed fill and excavation and drainage patterns and facilities.
4. Indicate the use and occupancy for which the proposed development is intended.
5. 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.
6. State the valuation of the proposed work.
7. Be signed by the applicant or the applicant's authorized agent.

COMPENSATORY STORAGE. Excavation within or directly contiguous to a flood hazard area, above the normal high groundwater table elevation and below the base 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 special flood hazard area and not be separated from by an open channel or closed conduit or culvert.

G401.6 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 may waive the requirement for compensatory storage if the applicant demonstrates that the development or fill will not increase the base flood elevation on adjacent properties.

{Note}

To require compensatory storage only for fill and grading, modify Section G401.6 by removing references to development.

5.5 International Green Construction Code

The IgCC is intended as an “overlay” that is administered with the IBC to reduce the negative impacts of the built environment on the natural environment. In addition to decreasing energy

Increasing Resistance to Flood Damage

usage and carbon footprints, it addresses many other issues related to both new and existing buildings including site development, land use, and the preservation of natural and material resources.

The IgCC applies to all buildings except one- and two-family dwellings, other residential buildings defined in the codes as R-2 and R-4 occupancies (if four stories or less in height), and R-3 occupancies. However, communities may elect to apply the IgCC to all or some of those residential buildings.

With respect to flood hazard areas, a minimum requirement of the IgCC is that new construction and Substantial Improvements in flood hazard areas are to be elevated or dry floodproofed to at least 1 foot above the minimum elevation required by the IBC and ASCE 24, or the elevation established by the community, whichever is higher.

A key feature of the IgCC is a section that permits communities to select among several “jurisdictional electives” to customize the code beyond its baseline provisions to focus on local priorities and conditions. As an example, one jurisdictional elective allows communities to impose a general preservation requirement that prohibits new buildings and structures, site disturbance, and development of land in all flood hazard areas. Another elective allows communities to apply those preservation requirements only in specific flood hazard areas established by the local land use authority. Thus, communities may use the IgCC to guide development away from all or some of their flood hazard areas.

The IgCC also allows property owners, developers, and designers to select among several “project electives,” which are design requirements and limitations in addition to those required by the community. With respect to flood hazard areas, three project electives are available:

- Flood hazard area preservation for sites where less than 25 percent of the parcel is in the flood hazard area. This option specifies that buildings and site improvements must be located on portions of sites that are outside of mapped flood hazard areas, with the limitation that sites must not be filled or regraded to raise the elevation of the site to remove it from the flood hazard area.
- Flood hazard area minimization for sites where more than 25 percent of the parcel is in the flood hazard area. This option specifies that buildings sited in the flood hazard area must be at least 1 foot above the elevation required by the IBC or the community, whichever is higher, with the limitation that the placement of fill shall not be used to achieve the required elevation.
- Flood hazard areas with existing buildings. This option specifies that if the cost of improvements proposed for an existing building equals or exceeds 40 percent of the market value of the building, the entire building must be brought into compliance with the IBC requirements for new construction.

5.6 Recapturing Buildings Exempt from the Building Code

Section 4.9 explains that the NFIP requires communities to regulate all development in SFHAs, including all buildings and structures. 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.

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.

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 in {insert reference to section in building code or statute where exempt buildings are specified, or insert a list here}

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*.

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Chapter Six 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). Instructions to download the model ordinances are included in Appendix C.

State and community 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 2009 and later editions of I-Codes and checklists that illustrate how the codes meet or exceed specific sections of the NFIP regulations are online: <http://www.fema.gov/building-code-resources>. The checklist for the 2012 I-Codes is included in Appendix B.

Table 6-1: Selecting an Applicable Code-Coordinated Model Ordinance

	I-Codes with Chapter 1 ⁽¹⁾	I-Codes without Chapter 1 ⁽²⁾
I-Codes with IBC Appendix G ⁽³⁾	Model Ordinance Version One	<i>[FEMA has not identified any States in this situation]</i>
I-Codes without IBC Appendix G ⁽⁴⁾	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, 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 some or all of the requirements in existing stand-alone floodplain management that apply to buildings and structures. 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. A suggested way to do this is described in Section 2.3 of this guide, which references two worksheets that may help communities ensure all NFIP requirements are addressed.

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 (see Appendix C). An overview of recommended steps to take to modify a community's

approach is described in Section 2.4 of this guide. 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, described in Chapter 5.

Appendix A
References and Resources

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Appendix A: References and Resources

References

- American Institutes for Research. 2006. *Evaluation of the National Flood Insurance Program's Building Standards*. October. Available at http://www.fema.gov/media-library-data/20130726-1602-20490-5110/nfip_eval_building_standards.pdf
- American Planning Association. 1997. *Subdivision Design in Flood Hazard Areas*. PAS 473. APA Planning Advisory Service.
- FEMA (Federal Emergency Management Agency). 2001. *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding*. NFIP Technical Bulletin 10-01. Washington, D.C., May. FIA-TB-01. Available at <http://www.fema.gov/media-library/assets/documents/3522>.
- FEMA. 2003. *Increased Cost of Compliance Coverage: Guidance for State and Local Officials*. FEMA 301. Washington D.C., September. Available at <http://www.fema.gov/media-library/assets/documents/1973>.
- FEMA. 2010. *Substantial Improvement /Substantial Damage Desk Reference*. FEMA P-758. Washington, D.C., May. Available at <https://www.fema.gov/media-library/assets/documents/18562>.
- FEMA. 2011. *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*. NFIP Technical Bulletin 11. Washington, D.C., November. Available at <https://www.fema.gov/media-library/assets/documents/3527>.
- FEMA. 2012. *Quick Reference Guide: Comparison of Select NFIP & Building Code Requirements for Special Flood Hazard Areas*. Washington, D.C., March. Available at http://www.fema.gov/media-library-data/20130726-1828-25045-8178/fema_quick_ref_guide_flood_areas_022713_508.pdf.
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- FEMA. 2013b. *National Flood Insurance Program Community Rating System: CRS Coordinator's Manual*. FIA-15. Available at <http://www.fema.gov/media-library/assets/documents/8768>.
- FEMA. 2013c. *Report to Congress: Including Building Codes in the National Flood Insurance Program*. Washington, D.C., November. Available at <http://www.fema.gov/media-library/assets/documents/85960>.
- FEMA. 2013d. *Substantial Damage Estimator*, FEMA P-784 CD. Available at <https://www.fema.gov/media-library/assets/documents/18692>.
- FEMA. 2014. *National Flood Insurance Program: Flood Insurance Manual*. Washington, D.C., June. Available at <http://www.fema.gov/flood-insurance-manual>.

Appendix A: References and Resources

Ingargiola, J. 2012b. “ASCE 24: Improving the Performance of Buildings and Structures in Flood Hazard Areas.” 2012 Conference on Advances in Hurricane Engineering. Available at <http://cedb.asce.org/cgi/WWWdisplay.cgi?298593>.

Ingargiola, J. 2012a. “Flood Provisions in the International Code Series and 2010 Florida Building Code.” 2012 Conference on Advances in Hurricane Engineering. Available at <http://ascelibrary.org/doi/abs/10.1061/9780784412626.007>.

Resources

FEMA NFIP Technical Bulletins are available at <http://www.fema.gov/media-library/resources-documents/collections/4>.

- Technical Bulletin 0. *User's Guide to NFIP Technical Bulletins* (2009)
- Technical Bulletin 1. *Openings in Foundation Walls and Walls of Enclosures* (2008)
- Technical Bulletin 2. *Flood Damage-Resistant Materials Requirements* (2008)
- Technical Bulletin 3. *Non-Residential Floodproofing - Requirements and Certification* (1993)
- Technical Bulletin 4. *Elevator Installation* (2010)
- Technical Bulletin 5. *Free-of-Obstruction Requirements* (2008)
- Technical Bulletin 6. *Below-Grade Parking Requirements* (1993)
- Technical Bulletin 7. *Wet Floodproofing Requirements* (1993)
- Technical Bulletin 8. *Corrosion Protection of Metal Connectors in Coastal Areas* (1996)
- Technical Bulletin 9. *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings* (2008)
- Technical Bulletin 10. *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas are Reasonably Safe From Flooding* (2001)
- Technical Bulletin 11. *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas* (2001)

Codes and Standards

American Society of Civil Engineers (ASCE) publications can be purchased online at <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 (ICC), International Codes[®] can be purchased online <http://shop.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)

Useful Web Links

Building Code Effectiveness Grading Schedule (BCEGS)	http://www.isomitigation.com/bcegs/
FEMA Building Science	http://www.fema.gov/building-code-resources
FEMA Regional Offices	http://www.fema.gov/regional-operations
National Flood Insurance Program (NFIP)	www.floodsmart.gov
NFIP Community Rating System (CRS)	http://www.fema.gov/national-flood-insurance-program-community-rating-system www.CRSresources.org
State Code Agencies	http://www.iccsafe.org/gr/Pages/adoptions.aspx

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Appendix B
NFIP, 2012 I-Codes, and ASCE 24 Checklist

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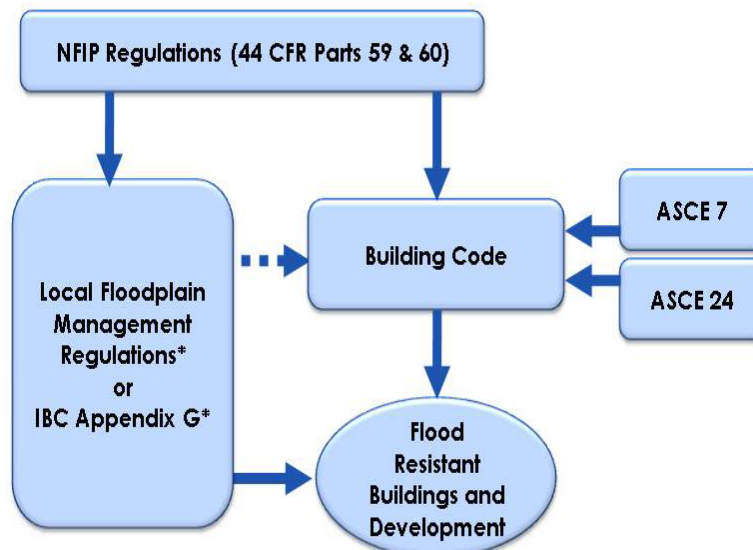
NFIP- 2012 I-Codes and ASCE 24 Checklist

IBC (and Appendix G), IMC, IPC, IFGC, IRC, and IEBC

Purpose of this Checklist. This checklist will guide floodplain managers, building officials and designers as they compare the requirements of the National Flood Insurance Program (NFIP) to the flood provisions of the *International Building Code (IBC)*, the *International Mechanical Code (IMC)*, the *International Plumbing Code (IPC)*, the *International Fuel Gas Code (IFGC)*, the *International Residential Code (IRC)*, the *International Existing Building Code (IEBC)*, and the referenced standard, *ASCE 24-05 Flood Resistant Design and Construction*. Most states adopt the IMC, IPC, and IFGC either separately or by reference in the IBC; some states adopt the Uniform Mechanical Code and the Uniform Plumbing Code (published by IAPMO). Although the model codes are not available in view-only form online, many states make their building codes available online.

This checklist is based on the standard checklist used by FEMA and states to review local floodplain management regulations/ordinances to determine whether such regulations and ordinances are complete for the purpose of participating in the NFIP. Pertinent Federal regulations are in [44 CFR Part 60](#) (criteria for land management and use) and [44 CFR Section 59.1](#) (definitions).

Floodplain Management and Building Codes. With the inclusion of NFIP-consistent provisions in the International Code Series® (I-Codes®), states and communities have two primary tools to regulate development in flood hazard areas: (1) building codes that govern the design and construction of buildings and structures; and (2) either IBC Appendix G or separate, but coordinated, local floodplain management regulations. These tools are designed to work together to result in buildings and structures, and all other development, that are resistant to flood loads and flood damage.



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

Relationship between the I-Codes and Local Floodplain Management Regulations or IBC Appendix G.

When states and communities adopt and enforce the flood provisions of the I-Codes, they must ensure full consistency with the NFIP requirements for buildings and structures. Of particular note, care must be taken to ensure that:

1. Work on existing buildings and structures is regulated (see notes below);
2. Buildings, structures and facilities that a state may specify are exempt from the requirements of the code (most common are agricultural structures) and work that is explicitly exempt from the requirement to obtain a permit (see IBC 105.2 and IRC 105.2) are still required to be regulated in accordance with the NFIP if located in flood hazard areas. Buildings, structures, and facilities exempt from the requirements of the code must either be addressed by local regulations or by amending Appendix G. One way to effectively address this shortfall is to specify in local regulations or in Appendix G that buildings and structures in flood hazard areas that are exempt from the code shall comply with ASCE 24;
3. State or local amendments, if any, do not weaken the flood provisions of the model codes;
4. If Chapter 1 of IBC and Chapter 1 of IRC are not adopted by the state or local jurisdiction, then the administrative provisions related to flood hazard areas contained therein must be incorporated in locally-adopted administrative provisions or by ensuring that all necessary administrative provisions are contained in IBC Appendix G; and
5. If IBC Appendix G is not adopted, requirements comparable to those in Appendix G are adopted in local floodplain management regulations.

With the caveat that the above-listed items need to be examined to ensure full consistency with the NFIP, there are three ways that the I-Codes are used to meet the requirements for participation in the NFIP:

1. Adopt the IBC with Appendix G and IRC, and for existing buildings, either retain IBC Chapter 34 or adopt the IEBC.
2. Adopt code-coordinated companion floodplain management regulations and adopt the IBC (without Appendix G) and IRC, and for existing buildings, either retain IBC Chapter 34 or adopt the IEBC.
3. Adopt one or more of the I-Codes and continue to use NFIP-compliant, locally-adopted "stand-alone" floodplain management regulations, allowing the "more restrictive prevails" concept to apply. The caution is that having two regulatory instruments govern the same activities can result in conflicting provisions and perpetuate confusion. States need to determine if this is acceptable, especially those states that specify that only the building code governs the design and construction of buildings which may effectively void building requirements in local floodplain management regulations. Communities with higher standards, especially communities that participate in the NFIP Community Rating System, should determine if a conflict between the requirements of the building codes would effectively void locally-adopted higher standards. In general, allowing known conflicts to remain unresolved is discouraged because it could result in regulations that are unenforceable.

Notes on Existing Buildings. The IBC includes Chapter 34, Existing Buildings. Some states and communities rely on this chapter to regulate work on existing buildings and do not adopt the IEBC. Some states and communities adopt IEBC while also retaining IBC Chapter 34, and other states and communities adopt IEBC and delete IBC Chapter 34. The IRC applies to the construction of new dwellings as well as work on existing dwellings, including “alteration, movement, enlargement, replacement, repair, equipment, use and occupancy, location, removal and demolition” (R101.2 Scope). For completeness, the checklist includes citations from both IBC Chapter 34 and IEBC.

Relationship between the I-Codes and ASCE 24. ASCE 24-05 is a consensus standard that has been referenced by the I-Codes since 2006 (an earlier edition of ASCE 24 was referenced by the 2000 and 2003 I-Codes). ASCE 24 is referenced by the IRC. Dwellings in floodways are required to comply with ASCE 24 and design professionals may use ASCE 24 as an alternative to the specific IRC provisions for dwellings in coastal high hazard areas. FEMA prepared “[Highlights of ASCE 24-05](#),” a summary of the provisions in the standard. The next edition of ASCE 24 is due in late 2013 and will be referenced by the 2015 I-Codes. ASCE 24 is not available in view-only form.

Revisions of ASCE 24 are developed by a balanced committee that includes design professionals, building professionals, manufacturers, government officials, and academic representatives. The committee is not required to mimic NFIP requirements for buildings and structures and thus has incorporated a number of provisions that are “higher standards.” Many provisions are more detailed and specific than NFIP requirements, while some exceed the minimum NFIP requirements to achieve the desired building performance when exposed to flooding. The committee takes care not to reduce the requirements below the NFIP minimums.

The IBC Section 1612 does not contain the specific requirements for buildings and structures in flood hazard area. Rather, Section 1612.4 references ASCE 24 and ASCE 24 contains the specific design and construction requirements for buildings and structures in flood hazard areas.

Some states and communities use IBC Chapter 34 to regulate work on existing buildings, including alteration, repair, addition, and change of occupancy. Other states and communities adopt IEBC to regulate work on existing buildings. In both IEBC and Chapter 34, specific sections apply in flood hazard areas and specify that if the work constitutes substantial improvement or repair of substantial damage, the work shall comply with the flood design requirements for new construction and all aspects of existing buildings shall be brought into compliance with the requirements for new construction. The scope IRC includes work that can only be performed on existing dwellings (i.e., additions, alterations, repairs). The IBC flood design requirements for new construction are in Section 1612, which refers to ASCE 24 for the specific requirements; in the IRC, the requirements for new construction are primarily in Section R322..

ASCE 24 does not contain administrative provisions. Such provisions are found in IBC Chapter 1 (and IBC Appendix G, if adopted), IRC Chapter 1 and locally-adopted floodplain management regulations (especially if IBC Appendix G is not adopted). Administrative provisions include such matters as duties and powers of the floodplain administrator/code official, determination of substantial improvement/substantial damage, adoption of maps and studies, variances, contents of site plans and construction documents, inspections, identification of flood hazard areas and design flood elevations, evaluations related to encroachment in floodways and flood hazard areas with BFEs but without floodways. IBC Appendix G or the local floodplain management regulations will specify requirements for development that is not within the scope of the codes, such as subdivisions, site improvements, manufactured homes, recreational vehicles, tanks, other building work, temporary structures and storage, and utility and miscellaneous structures.

Other Information Sources. The following resource documents were prepared by FEMA and are available at <http://www.fema.gov/building-science/building-code-resources>:

- Flood Resistant Provisions of the 2009 and 2012 International Code Series (excerpts of the flood provisions)
- Highlights of ASCE 24-05, Flood Resistant Design and Construction
- Provisions of the 2009 I-Codes and ASCE 24 Compared to the NFIP (summarizes where the codes/ASCE 24 have higher and more specific requirements)
- Higher Standards and More Specific Requirements than the Minimum Requirements of the NFIP, a paper that summarizes the provisions of the I-Codes that are more detailed or that exceed the NFIP minimums
- [Reducing Flood Losses Through the International Code Series](#). The 4th edition (in development) will include detailed description of the step-by-step process to coordinate local floodplain management regulations with the I-Codes.

Organization of the Checklist: The checklist has two parts. Definitions start on page 16. With respect to the NFIP Requirements:

- The left column of the checklist shows short statements of the NFIP requirements, with the specific citations (for complete provisions, refer to the actual language in 44 CFR 59 and 60).
- The middle column of the checklist shows the I-Code sections that include requirements to meet or exceed the NFIP requirements.
- The right column of the checklist shows the provisions of ASCE 24-05 that include requirements to meet or exceed the NFIP requirements for buildings and structures.
- The note “See ordinance/code” means the provision needs to be included in local floodplain management regulations, in the administrative provisions of the codes, and/or in IBC Appendix G (if adopted).

NFIP- 2012 I-Codes and ASCE 24 Checklist – NFIP Requirements

IBC (and Appendix G), IMC, IPC, IFGC, IRC, and IEBC

Required provisions [NFIP citations]	2012 I-Codes (IBC & Appendix G, IMC, IPC, IFGC, IRC, and IEBC)	ASCE 24-05
1. Citation of Statutory Authorization. [59.22(a)(2)]	<i>In state authorizing/adoption or community's adopting ordinance</i>	ASCE 24 does not include administrative provisions
2. Purpose section citing health, safety, and welfare reasons for adoption. [59.22(a)(1)]	101.3 G101.2 R101.3 EB101.3	ASCE 24 does not include administrative provisions
3. Definitions [59.1]	See page 15, below	See page 15, below
4. Adopt or reference correct Flood Insurance Rate Map (and where applicable, Flood Boundary Floodway Map) and date. [60.2(h)]	1612.3 Table R301.2(1) Note: both reference revisions of FIS and FIRMs; this provision does not override individual state limitations on "auto-adoption" of maps.	ASCE 24 does not include administrative provisions
5. Adopt or reference correct Flood Insurance Study and date. [60.2(h)]	1612.3 G102.2 Table R301.2(1)	ASCE 24 does not include administrative provisions
7. Adequate enforcement provisions including a violations/penalty section specifying community actions to assure compliance. [60.2(e)]	114 G101.4 R113	ASCE 24 does not include administrative provisions
8. Abrogation and Greater Restriction section (provide that floodplain management regulations take precedence over any less restrictive conflicting local laws, ordinances or codes). [60.1(b)]	<i>In community's adopting ordinance</i>	ASCE 24 does not include administrative provisions
9. Disclaimer of Liability (Degree of flood protection required by the ordinance is considered reasonable but does not imply total flood protection.)	<i>In community's adopting ordinance</i>	ASCE 24 does not include administrative provisions

Required provisions [NFIP citations]	2012 I-Codes (IBC & Appendix G, IMC, IPC, IFGC, IRC, and IEBC)	ASCE 24-05
10. Severability section. (If any section, provision or portion of the ordinance is deemed unconstitutional or invalid by a court, the remainder of the ordinance shall be effective.)	<i>In community's adopting ordinance</i>	ASCE 24 does not include administrative provisions
11. Framework for administering the ordinance (permit system, establish office for administering the ordinance, <i>recordkeeping</i> , etc.) [59.22(b)(1)]	IBC Chapter 1 G103; G104 IRC Chapter 1; R104 IEBC Chapter 1; EB104	ASCE 24 does not include administrative provisions
12. Designate title of community Floodplain Administrator [59.22 (b)]	104.1 G103.1 R104.1 <i>In community's adopting ordinance if other than the Building Official</i>	ASCE 24 does not include administrative provisions
13. Requirement to submit new technical data: within 6 months, notify FEMA of changes in the base flood elevation by submitting technical or scientific data so insurance & floodplain management can be based on current data. [65.3]	See ordinance	ASCE 24 does not include administrative provisions
14. Variance section with evaluation criteria & insurance notice. [60.6(a)]	104.10.1 G105 R104.10; R112.2.2 EB104.10.1	ASCE 24 does not include administrative provisions
15. For adopted ordinance: Signature of Appropriate Official & Certification. [59.22(3)] Date ordinance adopted: __ <i>Effective Date</i> __ Ord. # _____	<i>In community's adopting ordinance</i>	ASCE 24 does not include administrative provisions

60.3(a) When no SFHA's have been identified, no water surface elevation data has been provided, and floodways and coastal high hazards areas have not been identified and the community applies for participation in the NFIP, the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
16. Require permits for all proposed construction or other development including placement of manufactured homes. [60.3(a)(1)]	101.2; 105.1; 105.2 G101.3; G104.1; G301 (subdivisions); G401 (site improvement); G501 (manufactured homes); G601 (recreational vehicles); G701 (tanks); G801 (accessory strs & other); G901 (temp strs/storage); G1001 (utility & misc use group U) R101.2; R102.7; R105.1; R105.2; R105.3.1.1; R106.1.3; R301.2.4; R322 EB101.2; EB105.1	ASCE 24 does not include administrative provisions
17. Assure that all other State and Federal permits are obtained. [60.3(a)(2)]	102.2 G103.2 R102.2	ASCE 24 does not include administrative provisions

60.3(a) When no SFHA's have been identified, no water surface elevation data has been provided, and floodways and coastal high hazards areas have not been identified and the community applies for participation in the NFIP, the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
18. Review permits to assure sites are reasonably safe from flooding and require performance for new construction and substantial improvements in flood-prone areas: [60.3(a)(3)]	107.2.5; 1612.1; 1804.4(1); 3403.1; 3403.2; 3404.2; 3404.5; 3409.2 G101.2; G101.3; G103.1; G104.2 R106.1.3; R301.1; R301.2.4; R322 EB501.3; EB506.2.4; EB601.3; EB701.2; EB801.3; EB1003.5; EB1101.3.5; EB1202.6; EB1301.3.3 (all by reference to 1612)	ASCE 24 does not include administrative provisions
(a) Anchoring (including manufactured homes) to prevent floatation, collapse, or lateral movement. [60.3(a)(3)(i)]	1603.1; 1603.1.7; 1605.2.2; 1605.3.1.2; 16.2.1; 1612.4 (ASCE 24) G501.2; G701.2; G801.1; G901; G1001.2 R301.1; R301.2.4; R322.1.2; R322.1.9; R322.2; R322.3 EB: by reference to 1612 (see sections listed in Row 18)	1.5.1; 1.5.3; 1.5.5; 1.6; 2.4; 2.5; 4.5.1; 4.5.7; 4.8; 7.4.1; 9.6
(b) Use of flood-resistant materials. [60.3(a)(3)(ii)]	801.5; 1403.5; 1612.4 (ASCE 24) G103 R322.1.8 EB: by reference to 1612 (see sections listed in Row 18)	Section 5; 6.2; 6.3; 7.5; 8.1; 9.1
(c) Construction methods/practices that minimize flood damage. [60.3(a)(3)(iii)]	1612.1. 1612.4 (ASCE 24) R322.1.3 EB: by reference to 1612 (see sections listed in Row 18)	ASCE 24 as a whole

60.3(a) When no SFHA's have been identified, no water surface elevation data has been provided, and floodways and coastal high hazards areas have not been identified and the community applies for participation in the NFIP, the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
(d) Electrical, heating, ventilation, plumbing, air conditioning equipment, and other service facilities designed and/or located to prevent water entry or accumulation. [60.3(a)(3)(iv)]	1612.4 (ASCE 24); 3001.2; also see IMC, IPC, IFGC R322.1.6; RM1301.1.1; RM1401.5; RM1601.4.9; RM1701.2; RM2001.4; RM2201.6; RG2404.7; RP2601.3; RP2705.1; RP3001.3; RP3101.5 EB: by reference to 1612 (see sections listed in Row 18)	4.6.1; Section 7
19. Review subdivision proposals and development proposals to assure that: (a) Such proposals minimize flood damage. [60.3(a)(4)(i)]	G301.1; G301.2 (subdivisions)	Not within the scope of ASCE 24.
(b) Public utilities and facilities are located & constructed so as to minimize flood damage. [60.3(a)(4)(ii)]	G301.1 (subdivisions); G401 (site improvement)	Chapter 7
(c) Adequate drainage is provided. [60.3(a)(4)(iii)]	1804.3 G301.1 (subdivisions); G401.5 R401.3	1.4.2; 4.5.4
20. Require new and replacement water supply and sanitary sewer systems to be designed to minimize or eliminate infiltration. [60.3(a)(5) & (6)]	G301.1 (subdivisions); G401.3; G401.4 R322.1.7; RP2602.2(1)	7.3
21. Require on-site waste disposal systems be located to avoid impairment or contamination. [60.3(a)(6)(ii)]	G301.1 (subdivisions); G401.3 R322.1.7; RP2602.2(2)	7.3.4

60.3(b) When SFHA's are identified by the publication of a community's FHBM or FIRM, but water surface elevation data have not been provided or a floodway or coastal high hazard area has not been identified, then all the above ordinance provisions for 60.3(a) and the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
22. Require permits for all proposed construction and other development within SFHAs on the FIRM. [60.3(b)(1)]	Buildings only: 101.2 (see exemptions); 105.1; 1612.1 Other Development: G101.3; G104.1 1- & 2-family homes and townhomes only: R101.2; R322.1 EB101.2	ASCE 24 does not include administrative provisions
23. Require base flood elevation data for subdivision proposals or other developments greater than 50 lots or 5 acres. [60.3(b)(3)]	G301.2 (subdivisions regardless of size)	ASCE 24 does not include administrative provisions.
24. In A Zones, in the absence of FEMA BFE data and floodway data, obtain, review and reasonably utilize base flood elevation and floodway data available from available from a Federal, State, or other source as criteria for requiring new construction, substantial improvements, or other development in Zone A as the basis for elevating residential structures to or above base flood level, for floodproofing or elevating nonresidential structures to or above base flood level, and for prohibiting encroachments in floodways. [60.3(b)(4)]	1612.3.1; 1612.3.2 G103.3 R106.3.1.1; R322.1.4.1	ASCE 24 does not include administrative provisions.
25. Where BFE data are utilized, obtain and maintain records of lowest floor and floodproofing elevations for new construction and substantial improvements. [60.3(b)(5)]	104.7; 110.3.3; 110.3.10.1; 1612.5(1.1), (1.3) and (2.1) G103.3; G103.8 R104.7; R106.1.3(4); R109.1.3; R109.1.6.1; R322.1.10 EB104.7; EB109.3.3	ASCE 24 does not include administrative provisions.
26. <i>In riverine areas</i> , notify neighboring communities of watercourse alterations or relocations. [60.3(b)(6)]	G103.6	ASCE 24 does not include administrative provisions.
27. Maintain flood carrying capacity of altered or relocated watercourse. [60.3(b)(7)]	G103.6.1	ASCE 24 does not include administrative provisions.

<p>60.3(b) When SFHA's are identified by the publication of a community's FHBM or FIRM, but water surface elevation data have not been provided or a floodway or coastal high hazard area has not been identified, then all the above ordinance provisions for 60.3(a) and the following are required:</p>	<p>2012 I-Codes (IBC & Appendix G, IRC, and IEBC)</p>	<p>ASCE 24-05</p>
<p>28. Require all manufactured homes to be elevated and anchored to resist flotation, collapse, or lateral movement. [60.3(b)(8)]</p>	<p>G501 R322.1.9</p>	<p>Permanent foundations are structures that may be subject to ASCE 24.</p>
<p>60.3(c) When final flood elevations, but no floodways or coastal high hazard areas have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a) & 60.3(b) and the following are required:</p>	<p>2012 I-Codes (IBC & Appendix G, IRC, and IEBC)</p>	<p>ASCE 24-05</p>
<p>29. Require all new and substantially improved <u>residential</u> structures within A1-30, AE, and AH Zones have their lowest floor (including basement) elevated to or above the BFE. [60.3(c)(2)]</p>	<p>Dfn DFE; 1612.1; 1612.4 (ASCE 24); 1612.5(1.1); 1804.4(1); 3403.1; 3403.2; 3404.2; 3405.5; 3409.2</p>	<p>1.5.2; 2.3 (specification of flood depth in ordinance/code)</p>
<p>30. In AO Zones, require that new and substantially improved <u>residential</u> structures have their lowest floor (including basement) at or above the highest adjacent grade at least as high as the FIRM's depth number. [60.3(c)(7)]</p>	<p>R105.3.1.1; R301.2.4; R322.1.5; R322.1.10; R322.2.1; R322.2.1(3); R408.7 EB: by reference to 1612 (see sections listed in Row 18)</p>	
<p>31. Require that new and substantially improved <u>nonresidential</u> structures within A1-30, AE, and AH Zones have their lowest floor elevated or floodproofed to or above the base flood elevation. [60.3(c)(3)]</p>	<p>Dfn DFE; 1612.1; 1612.4 (ASCE 24); 1612.5(1.3); 3403.1; 3403.2; 3404.2; 3404.5; 3409.2</p>	<p>1.5.2; 2.3; Section 6 (specification of flood depth is done in administrative provisions)</p>
<p>32. In AO Zones, require new and substantially improved <u>nonresidential</u> structures have their lowest floor elevated or completely floodproofed above the highest adjacent grade to at least as high as the depth number on the FIRM. [60.3(c)(8)]</p>	<p>EB: by reference to 1612 (see sections listed in Row 18)</p>	
<p>33. Require that, for floodproofed <u>nonresidential structures</u>, a registered professional/architect certify that the design and methods of construction meet requirements at (c) (3) (ii) or (c)(8)(ii). [60.3(c)(4)]</p>	<p>1612.5(1.3) EB: by reference to 1612</p>	<p>ASCE 24 does not include administrative provisions.</p>
<p>34. Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage have permanent openings designed to allow the entry and exit of flood waters in accordance with specifications of 60.3(c)(5).</p>	<p>1612.4 (ASCE 24); 1612.5(1.2) (engineered openings) R309.3; R322.2.2; R408.7 EB: by reference to 1612 (see sections listed in Row 18)</p>	<p>1.5.2; 2.6</p>

60.3(c) When final flood elevations, but no floodways or coastal high hazard areas have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a) & 60.3(b) and the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
35. Within Zones A1-30 and AE without a designated floodway, new development shall not be permitted unless it is demonstrated that the cumulative effect of all past and projected development will not increase the BFE by more than 1 foot. [60.3(c)(10)]	1612.3.2; 1804.4(4) G103.4 R106.1.3; R322.1.4.2	2.2
36. In Zones AO and AH, require drainage paths around structures on slopes to guide water away from structures. [60.3(c)(11)]	1804.4 G401.5 R401.3	Not within the scope of ASCE 24.
37. Require that manufactured homes placed or substantially improved within A1-30, AH, and AE Zones, which meet one of the following location criteria, to be elevated such that the lowest floor is at or above the BFE and be securely anchored: i. outside a manufactured home park or subdivision; ii. in a new manufactured home park or subdivision; iii. in an expansion to an existing manufactured home park or subdivision; iv. on a site in an existing park which a manufactured home has incurred substantial damage as a result of flood. [60.3(c)(6)]	G501 R322.1.9	If the foundation for MFH unit is subject to ASCE 24, it would be subject to same elevation, foundation and enclosure requirements as any residential/Category II structure.
38. In A1-30, AH, and AE Zones, require that manufactured homes to be placed or substantially improved in an <u>existing</u> manufactured home park to be elevated so that: i. the lowest floor is at or above the BFE <u>or</u> ii. the chassis is supported by reinforced piers no less than 36 inches above grade and securely anchored. [60.3(c)(12)]	G501 (36" option not provided) R322.1.9 (36" option not provided; per ASCE 24 if in floodway)	If the foundation for MFH unit is subject to ASCE 24, it would be subject to same elevation, foundation and enclosure requirements as any residential/Category II structure.
39. In A1-30, AH, and AE Zones, all recreational vehicles to be placed on a site must be elevated and anchored <u>or</u> be on the site for less than 180 consecutive days <u>or</u> be fully licensed and highway ready. [60.3(c)(14)]	G601.1 (not authorized in floodways)	Not within the scope of ASCE 24.

60.3(d) When final flood elevations and floodway delineations have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a), 60.3(b) & 60.3(c) and the following are required:	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
40. In a regulatory floodway, prohibit any encroachment which would cause any increase in the base flood level unless hydrologic and hydraulic analyses prove that the proposed encroachment would not increase flood levels during the base flood discharge. [60.3(d)(3)]	1612.4 (ASCE 24); 1804.4(2) G103.5; G103.5.1; G401.1; G801.2 (fences); G801.5 (pre-fab pools); J101.2 (grading) R106.1.3; R301.2.4; R322.1 (per ASCE 24)	2.2
60.3(e) When final flood elevations & coastal high hazard areas have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a), 60.3(b) & 60.3(c) & the following are required: NOTE: If a community has both floodways & coastal high hazard areas, it must meet the requirements of both 60.3(d) & (e).	2012 I-Codes (IBC & Appendix G, IRC, and IEBC)	ASCE 24-05
41. In V1-30, VE, and V Zones, obtain and maintain the elevation of the bottom of the lowest <i>horizontal</i> structural member of the lowest floor of all new and substantially improved structures. [60.3(e)(2)]	110.3.3; 110.3.10.1; 104.7; 1612.5(2.1) R104.7; R109.1.3; R109.1.6.1; R322.1.10 EB: by reference to 1612 (see sections listed in Row 18)	ASCE 24 does not include administrative provisions.
42. In V1-30, VE, and V Zones, require that all new construction and substantial improvements: (a) Are elevated on pilings/columns so that the bottom of the lowest horizontal structural member is at or above the BFE and the piles/column foundation/structure are anchored to resist flotation, collapse & lateral movement due to the effects of wind and water loads acting simultaneously. [60.3(e)(4)]	1612.1; 1612.4 (ASCE 24) R322.3; R322.3.2; R322.3.3 EB: by reference to 1612 (see sections listed in Row 18)	1.5.1; 1.5.2; 1.5.3; 1.6; 4.2; 4.4; 4.5; 4.8
(b) A registered professional engineer/architect shall develop/ review structural design, specs & plans; and shall certify that the design and methods of construction meet elevation and anchoring requirements at (e)(4)(i) and (ii). [60.3(e)(4)]	1612.5(2.2) R322.3.3; R322.3.6 EB: by reference to 1612	ASCE 24 does not include administrative provisions.

<p>60.3(e) When final flood elevations & coastal high hazard areas have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a), 60.3(b) & 60.3(c) & the following are required: NOTE: If a community has both floodways & coastal high hazard areas, it must meet the requirements of both 60.3(d) & (e).</p>	<p>2012 I-Codes (IBC & Appendix G, IRC, and IEBC)</p>	<p>ASCE 24-05</p>
<p>(c) Have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls. Such enclosed space shall be useable solely for parking, building access, or storage. [60.3(e)(5)]</p>	<p>1403.6; 1612.4 (ASCE 24); 1612.5(2.3); 1804.4(3) R322.3.2; R322.3.4; R322.3.5 EB: by reference to 1612 (see sections listed in Row 18)</p>	<p>4.5.1; 4.5.4; 4.6</p>
<p>(d) All new construction is landward of the reach of mean high tide. [60.3(e)(3)]</p>	<p>1612.4 (ASCE 24) G401.2 R322.3.1(1)</p>	<p>4.3(1)</p>
<p>(e) Prohibit use of fill for structural support. [60.3(e)(6)]</p>	<p>1612.4 (ASCE 24) G401.2 R322.3.2(3) EB: by reference to 1612</p>	<p>4.5.4</p>
<p>(f) Prohibit alteration of sand dunes and mangrove stands which would increase potential flood damage. [60.3(e)(7)]</p>	<p>1612.4 (ASCE 24) G103.7 R322.3.1(2)</p>	<p>4.3(3); 4.5.4</p>
<p>43. Require that manufactured homes placed or substantially improved within V1-30, VE, and V Zones, which meet one of the following location criteria, meet the V Zone standards in 60.3(e)(2) through (e)(7): i. outside a manufactured home park or subdivision; ii. in a new manufactured home park or subdivision; iii. in an expansion to an existing manufactured home park or subdivision; iv. on a site in an existing park which a manufactured home has incurred substantial damage as a result of flood. [60.3(e)(8)]</p>	<p>G501 R322.1.9</p>	<p>If the foundation for MFH unit is subject to ASCE 24, it would be subject to same elevation, foundation and enclosure requirements as any residential/Category II structure.</p>

<p>60.3(e) When final flood elevations & coastal high hazard areas have been provided on a community's FIRM, then all the above ordinance provisions for 60.3(a), 60.3(b) & 60.3(c) & the following are required: <u>NOTE:</u> If a community has both floodways & coastal high hazard areas, it must meet the requirements of both 60.3(d) & (e).</p>	<p>2012 I-Codes (IBC & Appendix G, IRC, and IEBC)</p>	<p>ASCE 24-05</p>
<p>44. In V1-30, VE and V Zones, require that manufactured homes to be placed or substantially improved in an <u>existing</u> manufactured home park to be elevated so that:</p> <ul style="list-style-type: none"> i. the lowest floor is at or above the BFE, <u>or</u> ii. the chassis is supported by reinforced piers no less than 36 inches above grade and securely anchored. [60.3(e)(8)(iv); 60.3(c)(12)] 	<p>G501 (36" option not provided) R322.1.9 (36" option not provided)</p>	<p>If the foundation for MFH unit is subject to ASCE 24, it would be subject to same elevation, foundation and enclosure requirements as any residential/Category II structure.</p>
<p>45. In V1-30, VE, and V Zones, all recreational vehicles to be placed on a site must be elevated and anchored <u>or</u> be on the site for less than 180 consecutive days <u>or</u> be fully licensed & highway ready. [60.3(e)(9)]</p>	<p>G601.1 (not permitted in Zone V)</p>	<p>Recreational vehicles are not within the scope of ASCE 24.</p>

NFIP- 2012 I-Codes and ASCE 24 Checklist - Definitions

IBC (and Appendix G), IMC, IPC, IFGC, IRC, and IEBC

IBC 201.3 states that terms not defined in the IBC may be defined in the IFGC, IFC, IMC, or IPC; and IBC 201.4 states that terms not defined “shall have ordinarily accepted meanings such as the context implies.”

The IRC “defines” many terms where they are used, rather than separate definitions in Section 202. Also, IRC R201.3 specifies that terms not defined in IRC have meaning in other codes (i.e., IBC); and IRC R201.4 which repeats that terms not defined in IRC or other codes “shall have ordinarily accepted meanings such as the context implies.”

The IEBC also defines addition, alteration, change of occupancy, rehabilitation, repair—some of those terms (and others) are used in the definition of substantial improvement.

Definitions Pertinent to Regulating FHAs	In 44 CFR §59.1?	IBC/24 section ¹	IRC section	IEBC section ²	Notes
BASE FLOOD	Y	1612.2 A1.2	N/A	N/A	
BASE FLOOD ELEVATION	N	1612.2 A1.2	R322.1.4	N/A	
BASEMENT	Y	1612.2 A1.2	R322.2.1	N/A	IRC usage conveys definition
COASTAL HIGH HAZARD AREA (see note)	Y	1612.2 A1.2	R322.3	N/A	IBC (see Flood Hazard Area Subject to High Velocity Wave Action)
DESIGN FLOOD	N	1612.2 A1.2	R322.1.4	N/A	
DESIGN FLOOD ELEVATION	N	1612.2 A1.2	R322.1.4	N/A	
DEVELOPED AREA	Y	See note	See note	N/A	used in NFIP only in A99 zones

¹ ASCE 24-05 definitions are in Sec. 1.2 (shown “A1.2”); this chart does not show all definitions in ASCE 24-05.

² The IEBC refers generally to IBC for flood resistant provisions for compliance; thus, this checklist includes only definitions used to make that reference.

Definitions Pertinent to Regulating FHAs	In 44 CFR §59.1?	IBC/24 section ¹	IRC section	IEBC section ²	Notes
DEVELOPMENT	Y	App G201	N/A	N/A	
DRY FLOOD-PROOFING (see FLOODPROOFING)	N See note	1612.2 A1.2	N/A	N/A	The definition for “dry floodproofing” (IBC and ASCE 24) is equivalent to NFIP definition “floodproofing.”
EXISTING CONSTRUCTION (see EXISTING STRUCTURE)	Y	202; 1612.2	See note	See note	IBC and IEBC define “Existing Building. A building erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.” IRC uses the term (R102.7, R105.3.1.1, R112.2.1, AJ102.5)
EXISTING MANUFACTURED HOME PARK OR SUBDIVISION	Y	See note	See note	N/A	IBC Appendix G and IRC treat all MFH the same, regardless of location (does not have the 36” option)
EXPANSION TO AN EXISTING MANUFACTURED HOME PARK OR SUBDIVISION	Y	See note	See note	N/A	IBC Appendix G and IRC treat all MFH the same, regardless of location (does not have the 36” option)
EXISTING STRUCTURE (see EXISTING CONSTRUCTION)	N	1612.2	R101.2 See note	EB202	IBC definition does not mean “pre-FIRM.” See notes for “Existing Construction.” IRC scope includes work on existing buildings.
FLOOD or FLOODING	Y	1612.2 A1.2	See note	N/A	IRC does not use the term “flood” as a noun.
FLOOD DAMAGE-RESISTANT MATERIALS	N	1612.2 A1.2	R322.1.8	N/A	
FLOOD HAZARD AREA	N	1612.2 A1.2	R106.1.3; Table R301.2(1)	EB202	IBC (synonymous with SFHA if DFE = BFE)
FLOOD HAZARD AREA SUBJECT TO HIGH-VELOCITY WAVE ACTION (see CHHA)	N	1612.2 See note	R322.3 (Coastal High Hazard Area)	N/A	IBC (synonymous with “Coastal High Hazard Area”)

Definitions Pertinent to Regulating FHAs	In 44 CFR §59.1?	IBC/24 section ¹	IRC section	IEBC section ²	Notes
FLOOD HAZARD BOUNDARY MAP (FHBM)	Y	See note	See note	N/A	Through adoption of maps.
FLOOD INSURANCE RATE MAP (FIRM)	Y	1612.2 A1.2	Table R301.2(1)	N/A	
FLOOD INSURANCE STUDY	Y See note	1612.2 A1.2	Table R301.2(1)	N/A	44 CFR 59.1 defines “Flood elevation study” and Flood Insurance Study is equivalent.
FLOOD PROOFING (see DRY FLOOD-PROOFING)	Y See note	1612.2 A1.2	N/A	N/A	The definition for “dry floodproofing” (IBC and ASCE 24) is equivalent to NFIP definition “floodproofing.”
FLOODWAY	Y	1612.2 A1.2	See note	N/A	IRC uses the term and requires compliance with ASCE 24.
FREEBOARD	Y See note	See note	See note	N/A	As used in NFIP regulations, this term is related to protection level of levees. IBC and ASCE 24 do not use the term, although additional height above minimum is built into the elevation tables. IRC does not use the term; calls for additional 1-ft if CAZ designated and in Zone V depending orientation of LHSM.
FUNCTIONALLY DEPENDENT FACILITY	N	App G201	See note	N/A	IRC scope includes only 1- and 2-family dwellings and certain townhomes.
HIGHEST ADJACENT GRADE	Y	A1.2	R322.2.1	N/A	
HISTORIC STRUCTURES	Y	202 A1.2	R112.2.1	N/A	The IBC general definition in 202 refers to 3409 and 3411.9; and 3409.2 Flood hazard areas, has language similar to 59.1.
LOWEST FLOOR	Y	1612.2	R322.1.5	N/A	
MANUFACTURED HOME	Y	App G201	R202, R322.1.9	N/A	See IBC Appendix G. 59.1 states “not a ‘recreational vehicle’ which is not in IBC Appendix G.
MANUFACTURED HOME PARK OR SUBDIVISION	Y	App G201	See note	N/A	IBC Appendix G and IRC treat all MFH the same, regardless of location (does not have the 36” option
MUDSLIDE (mud flood, mudflow)	Y	A1.2	See note	N/A	I-Code flood provisions apply in FHAs on adopted maps; FEMA has not delineated mudslide areas.

Definitions Pertinent to Regulating FHAs	In 44 CFR §59.1?	IBC/24 section ¹	IRC section	IEBC section ²	Notes
NEW MANUFACTURED HOME PARK	Y	See note	See note	N/A	IBC Appendix G and IRC treat all MFH the same, regardless of location (does not have the 36" option).
PROLONGED CONTACT WITH FLOODWATERS	N	A1.2	See note	N/A	IRC R322.1.8 refers to specific species of wood and TB-2.
RECREATION VEHICLE	Y	App G201	N/A	N/A	IBC Appendix G definition expands on 59.1 definition.
SPECIAL FLOOD HAZARD AREA	Y	1612.2 A1.2	Table R301.1(2)	N/A	Definition in 1612.2 omits mudslide.
START OF CONSTRUCTION	Y	1612.2 A1.2	N/A	N/A	Premise of the codes is that work on an existing building shall not alter any aspect of the building that was required to comply with the requirements at the time it was built.
STRUCTURE	Y	202 A1.2	R202	N/A	Definition in 59.1 defines it for flood purposes whereas IBC has very simple generic definition.
SUBSTANTIAL DAMAGE	Y	1612.2 A1.2	R105.3.1.1	EB202	
SUBSTANTIAL IMPROVEMENT	Y	1612 A1.2	R105.3.1.1	EB202	
VARIANCE	Y	App G201	See note	N/A	Used in R112.2.2
VIOLATION	Y	114 App G201	R113	EB113	

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Appendix C
Link to Model Code–Coordinated Ordinances

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Appendix C Link to Model Code-Coordinated Ordinances

This document provides three versions of a model floodplain management ordinance that is explicitly written to coordinate with the International Codes®.

The document “Model Code-Coordinated Ordinances” can be downloaded from FEMA’s library online: [<http://www.fema.gov/media-library/assets/documents/96224>.]

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Appendix D
Sample Plan Review and Inspection Checklists

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Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – ZONE A

Terms: BFE = Base Flood Elevation; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	Is proposed development consistent with zoning? <input type="checkbox"/> NO, Applicant to request a zoning amendment. <input type="checkbox"/> YES, proceed with review.
FIRM Panel # and date _____ Flood Zone: _____ BFE / DFE: _____ 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. All residential structures (including Manufactured Housing units) in floodways to comply with ASCE 24. <input type="checkbox"/> YES, FLOODWAY. Require engineer's "no rise" analysis and supporting hydraulic data in file before continuing review. <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 DFE. 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; refer to V Zone Checklist if Zone V requirements are applied or if 2015 IRC enforced). <input type="checkbox"/> YES, in 500-year floodplain. Floodplain review not required; flood-resistance encouraged.
	Site plan shows nature of development proposal, location, dimensions, wetlands, floodplain / floodway boundaries, and ground elevations. <input type="checkbox"/> YES, continue 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 make recommendations to modify proposal to minimize flood hazards and damage potential. <input type="checkbox"/> NO, but can impacts be further minimized? Reduce fill? Site 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 to contact. <input type="checkbox"/> YES, require copies for the file.
	Will a watercourse be altered? <input type="checkbox"/> NO, continue review. <input type="checkbox"/> YES, Applicant to provide copies of notices to adjacent communities, federal agencies, and the NFIP State Coordinator. <input type="checkbox"/> YES, engineer's analysis required to show same flood carrying capacity; method of maintenance specified.
	Is fill proposed? Compacted? Side-slopes are no steeper than 2H:1V? Protected from erosion? <input type="checkbox"/> NO fill, continue 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: _____

Plan Review Checklist
FLOOD HAZARD AREA APPLICATION REVIEW – ZONE A

Initials and Date	Review Steps
	Is the application for repair, alteration, improvement or addition to an existing building? <ul style="list-style-type: none"> <input type="checkbox"/> YES, existing building compliant with flood provisions; work required to comply. <input type="checkbox"/> YES, but documentation in file it's "historic structure" and proposed work will not change historic designation; encourage flood resistance. <input type="checkbox"/> YES, costs of work are documented and compared to market value of building. <ul style="list-style-type: none"> <input type="checkbox"/> If costs equal or exceed 50% of market value of building (SI / SD), require compliance <input type="checkbox"/> Proposed work is not SI / SD, flood hazard review not required.
	Are new structures proposed to be elevated (new residential or non-residential buildings, storage tanks, manufactured homes)? Give applicant a blank FEMA Elevation Certificate. <ul style="list-style-type: none"> <input type="checkbox"/> NO – STOP! A permit cannot be issued for non-elevated residential buildings. <input type="checkbox"/> NO, non-residential buildings may be floodproofed (see design documentation requirements) <input type="checkbox"/> YES, on fill. Basements into fill are <u>not</u> allowed. <input type="checkbox"/> YES, on piers, pilings, or columns. <input type="checkbox"/> YES, on solid foundation walls (see Enclosed areas below DFE).
	Check the following for Manufactured Homes: <ul style="list-style-type: none"> <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 frame at / above the DFE?
	Check the following for utility support systems: <ul style="list-style-type: none"> <input type="checkbox"/> Electrical, mechanical, plumbing, heating / air conditioning components elevated? <input type="checkbox"/> Septic designed to minimize inflow / discharge under flood conditions? <input type="checkbox"/> On-site water supply designed to minimize inflow under flood conditions? <input type="checkbox"/> Above-ground tanks are anchored / elevated? <input type="checkbox"/> Below-ground tanks are designed to resist flotation?
	If new, non-residential structure is not elevated, will it be dry floodproofed? <ul style="list-style-type: none"> <input type="checkbox"/> YES, non-residential building will be dry floodproofed per ASCE 24, and signed and sealed design documentation is in file. <input type="checkbox"/> YES, agricultural building to be wet floodproofed (see FEMA Technical Bulletin 7). <input type="checkbox"/> NO, permit shall not be approved.
	Enclosed areas below BFE / DFE (stairwells, garages, storage areas, crawl spaces, sheds)? <ul style="list-style-type: none"> <input type="checkbox"/> NO, continue review. <input type="checkbox"/> YES, number, total net open area (or engineered openings) and location of flood openings shown on plan. <input type="checkbox"/> YES, plan shows acceptable use (parking, limited storage, and access). <input type="checkbox"/> YES, flood damage-resistant materials specified. <input type="checkbox"/> YES, utilities, if any, elevated at / above lowest floor.
	<ul style="list-style-type: none"> <input type="checkbox"/> Record permit in log of floodplain permits. <input type="checkbox"/> Make sure that 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: _____

SAMPLE

Permit #: _____

Date: _____

Applicant: _____

Inspection Checklist

FLOOD HAZARD AREA INSPECTIONS – ZONE A

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: <input type="checkbox"/> REVIEW permit file before going in the field. <input type="checkbox"/> ASK permit reviewer questions to understand requirements.
	Measure stake out distances from waterway or landmark. Is development in the right place? Is fill the specified distance from waterway or landmark? <input type="checkbox"/> NO, take enforcement action to correct problems.
	Foundation / Lowest Floor Inspection: Permittee submitted Elevation Certificate? <input type="checkbox"/> YES, elevation of lowest floor checked during framing or foundation inspection after lowest floor is in place and prior to further vertical construction. <input type="checkbox"/> NO, require permittee to submit Elevation Certificate.
	Electrical, mechanical, plumbing, heating / air conditioning components elevated? <input type="checkbox"/> YES. <input type="checkbox"/> NO, take enforcement action to correct problems.
	For enclosures below the BFE / DFE (including crawl spaces): Is enclosure at or above grade on at least one entire side? Are flood damage-resistant materials used? Does use of enclosure appear to be limited to parking, building access, or limited storage (and crawlspace)? Are flood openings no more than 12" above interior / exterior grade? Are there enough flood openings (based on net open area provided by the flood openings or certification of engineered openings), are the openings on at least two sides and do they allow automatic entry / exit of floodwater (air vents disabled in open position and not designed for seasonal covers)? <input type="checkbox"/> YES. <input type="checkbox"/> Building does not have enclosure below the lowest floor. <input type="checkbox"/> NO, take enforcement action to correct problems.
	Final Inspection: Permittee submitted as-built Elevation Certificate? <input type="checkbox"/> YES, perform final inspection; maintain copy of documentation of final elevations in permanent records. <input type="checkbox"/> NO, require permittee to submit as-built Elevation Certificate and perform final inspection.
	Other Notes Based on Inspection:
	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: _____

Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – ZONE V

Terms: BFE = Base Flood Elevation; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps <i>NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.</i>
	Is proposed development consistent with zoning? <input type="checkbox"/> NO, Applicant to request a zoning amendment. <input type="checkbox"/> YES, proceed with review.
	Is proposal in Coastal Barrier Resources Area (CoBRA) or Otherwise Protected Area? <input type="checkbox"/> NO, continue review. <input type="checkbox"/> YES, advise applicant that Federal flood insurance is not available, document to file, continue review (must comply with flood provisions).
FIRM Panel # and date _____ Flood Zone: _____ BFE / DFE: _____	Check FIRM, floodplain and zone boundaries, base flood elevations, and map revisions or LOMRs issued by FEMA. Is proposal in the Coastal Flood Hazard Area (Zone V)? <input type="checkbox"/> NO, in "Coastal A Zone" (seaward of LiMWA or in area designated CAZ); refer to Zone A checklist if community does not regulate CAZ like Zone or pre-2015 IRC enforced). <input type="checkbox"/> NO, in Zone A inland of Zone V or riverine Zone A - use Zone A checklist. <input type="checkbox"/> YES, in Zone V, must comply with flood resistant provisions of the code.
	Site plan shows development proposal, location, dimensions, wetlands, SFHA / Zone V boundaries, BFE / DFE, and ground elevations. <input type="checkbox"/> YES, continue review. <input type="checkbox"/> NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid SFHA / Zone V or minimize exposure? <input type="checkbox"/> YES, explain flood hazards to applicant and make recommendations to modify proposal to minimize flood hazards and damage potential. <input type="checkbox"/> NO, can flood impacts be further minimized? Maximize setback from the water? Site on higher ground?
	Has the applicant provided copies of all necessary State and federal permits, e.g., wetlands, coastal zone consistency? <input type="checkbox"/> NO, advise applicant which agencies to contact. <input type="checkbox"/> YES, require copies in the file.
	Will dunes or mangrove stands be altered? <input type="checkbox"/> NO, continue review. <input type="checkbox"/> YES, if applicable, require coastal zone consistency / State approval before continuing. <input type="checkbox"/> YES, require analysis that alteration will not increase potential flood damage.
	Is a pool proposed? <input type="checkbox"/> NO, continue review. <input type="checkbox"/> YES, not attached to the building; continue review. <input type="checkbox"/> YES, attached to the building. Continue review only if included in foundation design.

**Plan Review Checklist
FLOOD HAZARD AREA APPLICATION REVIEW – ZONE V**

Initials and Date	Review Steps
	Is the application for repair, alteration, improvement or addition to an existing building? <ul style="list-style-type: none"> <input type="checkbox"/> YES, existing building compliant with flood provisions; work required to comply. <input type="checkbox"/> YES, but building documented in file as a “historic structure” and proposed work will not change historic designation; encourage flood resistance. <input type="checkbox"/> YES, costs of work are documented and compared to market value of building. <ul style="list-style-type: none"> <input type="checkbox"/> If costs equal or exceed 50% of market value of building (SI / SD), require compliance <input type="checkbox"/> Proposed work is not SI / SD, flood hazard review not required.
	Are new buildings proposed to be elevated? Give applicant a blank FEMA Elevation Certificate. <ul style="list-style-type: none"> <input type="checkbox"/> NO – STOP! A permit cannot be issued for non-elevated buildings. <input type="checkbox"/> YES, on fill. STOP! Structural fill not allowed in Zone V, require redesign. <input type="checkbox"/> YES, on pilings or columns; signed and sealed design certification submitted? <input type="checkbox"/> YES, on parallel shear walls (high-rise only if required for lateral loads; parallel to expected direction of flow?); signed and sealed design certification submitted?
	Check the following for utility support systems: <ul style="list-style-type: none"> <input type="checkbox"/> Electrical, mechanical, plumbing, heating / air conditioning components elevated? <input type="checkbox"/> Septic designed to minimize inflow / discharge under flood conditions? <input type="checkbox"/> On-site water supply designed to minimize inflow under flood conditions? <input type="checkbox"/> Above-ground storage tanks are elevated? <input type="checkbox"/> Below-ground storage tanks are designed to resist flotation / erosion?
	Enclosed area below DFE proposed (stairwells, garages, storage areas)? <ul style="list-style-type: none"> <input type="checkbox"/> NO, area is free of obstructions; continue review. <input type="checkbox"/> YES, enclosed by insect screening or lattice. <input type="checkbox"/> YES, applicant has provided signed and sealed documentation of breakaway wall design. <input type="checkbox"/> YES, design not documented. Advise applicant to obtain signed and sealed documentation of breakaway wall design from registered design professional. <input type="checkbox"/> YES, flood damage-resistant materials specified. <input type="checkbox"/> YES, utilities <u>not</u> penetrating or attached to breakaway walls.
	<ul style="list-style-type: none"> <input type="checkbox"/> Record permit in log of floodplain permits. <input type="checkbox"/> Make sure that 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: _____

Permit #: _____

Date: _____

Applicant: _____

Inspection Checklist
FLOOD HAZARD AREA INSPECTIONS – ZONE V

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: <input type="checkbox"/> REVIEW permit file before going in the field. <input type="checkbox"/> ASK permit reviewer questions to understand requirements.
	Measure stake out distances from landmark. Is development in the right place? <input type="checkbox"/> NO, take enforcement action to correct problems. <input type="checkbox"/> YES.
	Foundation / Lowest Floor Inspection: Permittee submitted Elevation Certificate? <input type="checkbox"/> YES, elevation of the bottom of the lowest horizontal structural member of the lowest floor checked during framing or foundation inspection after lowest floor is in place and prior to further vertical construction. <input type="checkbox"/> NO, require permittee to submit Elevation Certificate.
	For enclosures below BFE / DFE: Are walls insect screening or lattice? Are walls breakaway, and no utilities attached to or penetrate breakaway walls? Are flood damage-resistant materials used? Does use of enclosure appear to be limited to parking, building access, or limited storage? <input type="checkbox"/> YES. <input type="checkbox"/> Building does not have enclosures. <input type="checkbox"/> NO, take enforcement action to correct problems.
	Final Inspection: Permittee submitted as-built Elevation Certificate? <input type="checkbox"/> YES, perform final inspection; maintain copy of documentation of final elevations in permanent records. <input type="checkbox"/> NO, require permittee to submit as-built Elevation Certificate and perform final inspection.
	Other Notes Based on Inspection:
	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: _____