Reducing Flood Losses Through the International Codes®

Meeting the Requirements of the National Flood Insurance Program

3rd Edition, 2008

ICC INTERNATIONAL CODE COUNCIL®

in cooperation with the Federal Emergency Management Agency

Reducing Flood Losses Through the *International Codes*®:

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This guide is based on the 2006 editions of the *International Codes*® (I-Codes®) and the 2007 *Supplement to the International Codes*®

Table of Contents

List of Tables, Figures, and Worksheets

Appendices

Executive Summary

For more than 30 years, most local jurisdictions have participated in the National Flood Insurance Program (NFIP) by adopting and enforcing floodplain management ordinances or regulations. The NFIP was created as a partnership: The federal government makes NFIP flood insurance and other federal assistance available to residents and businesses, and communities agree to regulate mapped flood hazard areas to reduce future flood damage.

With the publication of the *International Building Code*® (IBC®), the *International Residential Code*® (IRC®), the *International Existing Building Code*® (IEBC®), and the rest of the *International Codes*® (I-Codes®), the opportunity exists for communities to integrate building safety and floodplain management. This guide, *Reducing Flood Losses Through the International Codes®: Meeting the Requirements of the National Flood Insurance Program*, will help communities decide how best to accomplish that integration in order to initiate or continue participation in the NFIP.

The 2003 and 2006 editions of the I-Codes contain provisions that are consistent with the minimum flood-resistant design and construction requirements of the NFIP. It is important to note, however, that adoption of one or more of the codes, by themselves, may not address all NFIP requirements. Crosswalks of the NFIP regulations and the I-Codes, including Appendix G of the IBC, have been prepared and included in this guide. This guide references the 2006 I-Codes (the crosswalks are annotated to show amendments approved in 2007).

The flood-resistant provisions in the I-Codes stem from cooperative efforts among the Federal Emergency Management Agency (FEMA), the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE), and other individuals and organizations. These efforts began in 1991 with the development of flood load provisions. Those load provisions became part of ASCE 7 in 1995, were expanded in the 1998 edition of ASCE 7, and were further amended in ASCE/SEI 7-02. This guide references ASCE/SEI 7-05.

Cooperative efforts continued with the development of ASCE 24-98, a standard for minimum requirements for flood-resistant design and construction of buildings and structures in flood hazard areas. ASCE/SEI 24-05 is referenced in this guide.

Chapter 1 presents a brief overview of the NFIP, including the benefits of participation and the implications of choosing not to participate. The NFIP is a voluntary program, but its benefits are far-reaching. Responsibilities of participating communities extend beyond issuance of building permits, and include administrative and map-related functions. Technical assistance and support are available from NFIP State Coordinating Agencies and FEMA regional offices.

Chapter 2 outlines some broad approaches to managing flood hazard areas. Integrating a community's approach with the I-Codes involves careful consideration and planning to reduce overlap of regulations, duplication of effort, and conflicts. Advantages of using the building code to satisfy certain floodplain requirements are outlined.

Chapter 3 is a collection of topics on the implications of adopting the I-Codes for participation in the NFIP:

- *Section 3.1* reviews the NFIP definition of "development" because the NFIP requires that communities regulate all development in flood hazard areas, not just buildings and structures.
- *Section 3.2* summarizes how the utility-related I-Codes address provisions to protect building utility systems.
- *Section 3.3* briefly outlines the NFIP's Community Rating System, which provides discounts on the cost of flood insurance within communities that adopt regulations that exceed the minimum requirements of the NFIP.
- *Section 3.4* includes brief explanations for consideration by communities that may elect to adopt certain standards that are higher than the minimum requirements of the NFIP.
- *Section 3.5* offers sample building code text amendments language to implement higher standards.
- *Section 3.6* describes the Coastal A Zone, an area where flood conditions include waves that are less than required for the NFIP to designate the area a V Zone, but that field research has identified as sufficient to cause building damage.

- *Section 3.7* summarizes the NFIP requirements pertaining to substantial improvements and repair of substantial damage; both concepts are particularly important when dealing with older buildings.
- *Section 3.8* summarizes how the codes address certain historic structures and describes two options: issue permit or approve by variance.
- *Section 3.9* describes critical and essential facilities and notes that the IBC, ASCE 7, and ASCE 24 include provisions that apply to such facilities.
- *Section 3.10* is a brief explanation of a part of the standard coverage provided by NFIP flood insurance. Under specific circumstances, notably if a flood causes substantial damage, this coverage provides the owner with an additional payment towards the cost of bringing the building into compliance with the flood-resistant provisions.

Chapter 4 outlines certain responsibilities that communities assume when they participate in the NFIP. While many responsibilities are incorporated into the I-Codes, a number of others should be reviewed to make sure that they are assigned or captured in a companion floodplain management ordinance.

Chapter 5 addresses several important considerations related to state requirements. States that adopt the I-Codes at the state level may have made amendments or may require that local amendments be approved by the state. Some states have specific requirements for flood hazard area development and some issue floodplain permits. Others exempt certain activities or types of buildings from the requirement to obtain a building permit, while some states may issue building permits for some activities. And, notably, if the code is adopted at the state level, then the matter of references to community flood hazard maps must be addressed.

Chapter 6 outlines a straightforward process, using worksheets, to help communities assess how their current approaches to regulating development in flood hazard areas and building permits compare with the NFIP requirements. Also, a review process is outlined to facilitate decisions about appropriate modifications to processes and regulations.

Appendices include references and online resources (Appendix A), crosswalks of the NFIP requirements with the IBC (Appendix B) and the IRC (Appendix C), the flood resistant provisions of the IMC, IPC, IFGC, IPSDC and the IEBC (Appendix D), contact information for FEMA and state offices (Appendix E), and sample plan review and inspection checklists (Appendix F).

Acknowledgments

The original edition of this guide was prepared by the American Society of Civil Engineers (ASCE). This third edition was prepared with financial support provided by the Mitigation Directorate of the U. S. Department of Homeland Security (DHS/FEMA). The early contributions of the following reviewers are appreciated:

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Lois Forster, DHS/FEMA

John Ingargiola, DHS/FEMA

Trudie Johnson, CFM, City of Hilton Head, South Carolina, representing the Association of State Floodplain Managers, Inc.

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Kimberly Paarlberg, International Code Council, Inc.

Laura Pfister, Montana Floodplain Management Program

Rebecca C. Quinn, CFM, RCQuinn Consulting, Inc.

Michael Robinson, DHS/FEMA

1. Introduction

1.1 Purpose of This Guide

This guide is intended to help community officials decide how to integrate the *International Codes*® (I-Codes®) into their current floodplain development and regulatory processes in order to meet the requirements to participate in the National Flood Insurance Program (NFIP). Careful attention is required to ensure that all requirements of the NFIP are addressed by communities through a combination of building codes and other ordinances or regulations. Adoption of one or more of the I-Codes, by itself, does not necessarily meet those requirements.

This guide is not intended as an endorsement of any specific approach for achieving effective management of flood hazards, nor does it explain the NFIP requirements and how to administer them. References and online resources are listed in Appendix A.

This guide is based on the 2006 editions of the I-Codes. Appendices B, C and D contain crosswalks of the NFIP regulations and the flood provisions of the I-Codes. The I-Code texts are annotated to show code changes approved in the 2006/2007 cycle and published in the 2007 *Supplement.*

1.2 The I-Codes and the NFIP

This guide covers the family of codes known as the I-Codes that were developed under the auspices of the International Code Council® (ICC®). Each code in the series either meets or exceeds the minimum requirements of the NFIP with respect to the scope of each code:

- The 2006 and 2003 editions of the *International Building Codes* meet the minimum design and construction requirements of the NFIP for all buildings and structures, including, by reference, one- and two-family dwellings. Appendix G addresses other NFIP requirements such as map-related duties, subdivisions, site work, manufactured homes, recreational vehicles, underground and above-ground storage tanks, and variances.
- The 2006 and 2003 editions of the *International Residential Codes* meet the minimum requirements for flood-resistant design and construction of one- and two-family dwellings. For construction in the floodway, the IRC refers to the IBC.
- The 2006 and 2003 editions of the *International Plumbing Code*® (IPC®) meet the minimum requirements for flood-resistant design and construction of plumbing systems.
- The *2006* and *2003 editions of the International Mechanical Code*® (IMC®) meet the minimum requirements for flood-resistant design and construction of mechanical systems.

When the IBC is adopted, the IRC is adopted by reference. If a state or community chooses not to regulate one- and two-family dwellings through the IRC, it must specifically exclude the IRC in its Ordinance for Adoption. In this case, for the purpose of NFIP participation, the activities regulated by the IRC must be covered in a companion floodplain management ordinance or regulation.

- The 2006 and 2003 editions of the *International Fuel Gas Code*® (IFGC®) meet the minimum requirements for flood-resistant design and construction of fuel gas systems.
- The 2006 and 2003 editions of the *International Private Sewage Disposal Code*® (IPSDC®) meet the minimum requirements for flood-resistant design and construction of private sewage disposal systems.
- The 2006 and 2003 editions of the *International Existing Building Code*® (IEBC®) meet the minimum requirements for flood-resistant design and construction for existing buildings by reference to the requirements of the IBC.
- The 2006 and 2003 editions of the *3 International Code Council Performance Code*® (ICC PC®) provide performance-based standards to provide resistance to flood loads and damage.

Table 1-1, starting on page 1-13, lists key provisions of the NFIP that pertain to buildings. These provisions are cross-referenced to specific sections of the IBC and IRC, related standards, and NFIP resource documents. Appendices B and C contain crosswalks of the complete text of the NFIP regulations and the pertinent sections from the 2006 IBC and 2006 IRC, respectively (annotated with code changes approved in 2007). Appendix D summarizes the flood-resistant provisions of the 2006 editions of the IMC, IPC, IFGC, IPSDC and the IEBC.

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

1.3 Intended Audience

This guide is intended for officials of any unit of government who are responsible for regulating land development and building processes. It is designed specifically to help those whose agencies are responsible for regulating floodplain development and those who administer building codes. These responsibilities may be under the jurisdiction of a single office or distributed among several offices. Regardless of how your community is organized, it is recommended 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 that is designated as the State Coordinating Agency for the National Flood Insurance Program, commonly referred to as the "NFIP State Coordinator." Contact information for the NFIP State

Coordinators and a list of the Federal Emergency Management Agency's (FEMA) 10 regional offices are included in Appendix E.

FEMA and others have produced numerous documents and publications related to the NFIP and regulation of flood hazard areas. Reference and resource materials, including cited publications and online resources, are listed in Appendix A.

1.5 Purpose and Overview of the NFIP

NFIP Purpose. The original authorizing legislation for the NFIP was passed in 1968. Congress expressly found that "a program of flood insurance can promote the public interest by encouraging sound land use by minimizing exposure of property to flood losses. . . ".

The NFIP is intended to encourage states and local governments to recognize and incorporate flood hazards in land use and development decisions. In some communities this is achieved by guiding development to areas with lower risk. When decisions result in development within flood hazard areas, application of the criteria set forth in federal regulation (44 CFR Section 60.3) is intended to minimize exposure and flood-related damage.

Overview of the NFIP. The NFIP is administered by the DHS/FEMA and has three main elements:

1. *Hazard identification and mapping,* under which engineering studies are conducted and flood maps are prepared to delineate areas that are predicted to be subject to flooding under certain conditions;
2. *Floodplain management criteria for development*, which establish the minimum requirements for communities to apply to development within mapped flood hazard areas with the intent of recognizing hazards in the entire land development process; and
3. *Flood insurance*, which provides financial protection for property owners to cover flood-related damage to buildings and contents.

If your community does not currently participate in the NFIP (see Section 1.8), you are strongly urged to join. To do so, contact either your NFIP State Coordinator or your FEMA Regional Office listed in Appendix D.

Federal flood insurance is designed to provide an alternative to disaster assistance and disaster loans for home and business owners. Disaster assistance rarely comes close to covering all of the costs to repair and clean up. While available to qualified victims, disaster loans do not significantly ease the financial burden due to repayment terms. It is important to remember that disaster assistance is available only after

floods have been declared major disasters by the President of the United States. Disaster loans are 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 will be paid any time damage is sustained from a qualifying flood event.

Another important objective of the NFIP is to break the cycle of flood damage. Many buildings have been flooded, repaired or rebuilt, and flooded again. Before the NFIP, in some parts of the country this cycle occurred every couple of years: people rebuilt in the same flood-prone areas and used the same construction techniques that did not adequately resist flood damage.

By encouraging communities to guide development to lower risk areas, and by requiring elevation of new buildings and nonconforming buildings that sustain major damage, 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 with techniques that lead to little or no flood damage. Through the land development process, developers can often be required or encouraged to keep new development out of high-risk areas.

1.6 Overview of Community and State Responsibilities Under the NFIP

Overview of Community Responsibilities. The NFIP regulations (44 CFR Section 59.22) outline actions to be taken by a community to become and remain eligible to participate in the NFIP. A community agrees to take certain actions, including:

- Adopting and enforcing floodplain management regulations that either meet or exceed the minimum standards of the NFIP.
- Applying the regulations to all designated special flood hazard areas (SFHAs) throughout its jurisdiction.
- Submitting to FEMA the regulations (and subsequent amendments thereto), including copies of related zoning, building, and subdivision regulations; health codes; special purpose ordinances; and other corrective and preventive measures enacted to reduce or prevent flood-related damage.
- Submitting to FEMA certain estimates relating to the community as a whole and to flood hazard areas, including population, number of

residences, number of small businesses, and number of other types of structures.

- Responding to FEMA's periodic request for information on the community, including the number of permits and variances that may have been issued for development in the flood hazard area.
- Identifying the location where flood hazard maps will be maintained and available for public inspection.
- Appointing or designating an agency or individual official with the responsibility for the floodplain management program.
- Maintaining a file with specific information on all development that occurs within the mapped flood hazard area, including documentation of certain building elevations and documentation of floodproofing designs, and making this information available for public inspection.
- Conducting periodic field inspections to ensure that ongoing development complies with issued permits and to check for unpermitted development.
- Having objectives in the comprehensive plan that are consistent with floodplain management goals.
- Notifying FEMA when revisions to the flood hazard maps are necessary and providing available data to support those revisions.
- Cooperating with federal, state, local, and private entities that undertake projects to study, survey, identify, and map flood hazard areas.
- Notifying FEMA, the state, and adjacent communities of any alteration or relocation of a watercourse.
- Notifying FEMA when the community's boundaries have been modified by such legal actions as annexation.

Overview of State Responsibilities. The states have agreed to coordinate the NFIP with their communities and have designated an agency that is responsible for those functions (see Appendix E). The NFIP State Coordinator's office is specifically charged with being a link between FEMA and communities and can advise 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 as to how specific provisions have been interpreted in many situations.

The duties and responsibilities of the NFIP State Coordinator's office are set forth in the NFIP regulations (44 CFR Section 60.25) and include:

- Enacting, if necessary, legislation that enables communities to regulate development in designated flood hazard areas.
- Encouraging and assisting communities to qualify for participation in the NFIP.
- Guiding and assisting communities in developing, implementing, and maintaining floodplain management regulations.
- Providing communities and the general public with NFIP information.
- Assisting communities in disseminating information about flood hazard areas and floodplain management requirements.
- Assisting in the delineation of flood hazard areas when possible, and providing technical information to FEMA.
- Recommending priorities for federal activities relative to community needs.
- Notifying FEMA of problems with community regulations if such problems cannot be resolved between the state and the community.
- Establishing minimum floodplain management standards for state activities.
- Coordinating floodplain management activities with other state, regional, and local planning and enforcement agencies.
- Assisting in the identification and implementation of mitigation recommendations.
- Participating in training opportunities and preparedness programs.

Other ways that some NFIP State Coordinators may support communities include:

- Providing advice on improvements to local administrative procedures for issuing permits, handling variances, inspecting construction, and remedying violations.
- Producing a floodplain management newsletter.
- Reviewing proposed code and ordinance amendments to ensure NFIP compliance.
- Explaining ways to use flood hazard maps, including how to seek revisions.
- Assisting communities with applications to participate in the NFIP's Community Rating System (CRS).
- Conducting training workshops on all aspects of the NFIP and floodplain management.
- Performing on-site technical assistance visits.

- Providing reports on community compliance to FEMA.
- Developing a program of certification for floodplain managers.

1.7 Benefits of Participating in the NFIP

General information about flood insurance is on the Internet at **www.fema.gov**

While there is no federal requirement that communities participate in the NFIP, most communities choose to do so to make flood insurance available to their citizens. In addition, federal assistance for acquisition or construction of buildings in flood hazard areas is not available in nonparticipating communities. To participate, a community agrees to adopt, administer, and enforce provisions that either meet or exceed the minimum floodplain management requirements set forth in federal regulations.

If your community does not presently participate in the NFIP, you are strongly urged to join. To do so, contact either your NFIP State Coordinator or the FEMA Regional Office that supports your state.

There are four significant benefits of participating in the NFIP. One focuses on property protection, while the remaining three focus on financial security. Specifically:

1. Development that complies with the minimum NFIP performance criteria is less likely to experience major damage. Studies have shown that, on average, buildings that meet the NFIP criteria sustain approximately 80 percent less damage than those that do not.
2. Federally insured or regulated lenders must require that improvements located in mapped flood hazard areas 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 will not be available, including grants and loans.
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. Most homeowners' property insurance explicitly excludes damage from floods, and non-NFIP flood insurance is hard to find. However, it is easy for most home and business owners to get NFIP flood insurance because many private companies write and sell policies on behalf of the NFIP.
4. Federal disaster assistance is available to repair or restore public buildings in flood hazard areas if damaged by a disaster that is declared by the President of the United States.

In participating communities, NFIP flood insurance is available for both residential and nonresidential buildings, and additional coverage is available for contents. Policies on buildings in flood hazard areas shown on Flood Insurance Rate Maps (FIRMs) include coverage that provides a claim payment 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 3.10. The amount of this coverage is stated in the flood insurance policy documents.

1.8 Implications of Not Participating in the NFIP

Communities that have been provided a FIRM by FEMA may elect not to participate in the NFIP (unless required to do so by state law). If communities choose not to participate in the NFIP, the following apply:

- NFIP flood insurance is not available.
- Federal agencies cannot provide grants and loans for construction, reconstruction, repair, rehabilitation, or additions to buildings in mapped SFHAs, including such agencies as the U.S. Department of Housing and Urban Development (HUD), the U.S. Environmental Protection Agency (EPA), the U.S. Small Business Administration (SBA), and the U.S. Department of Health and Human Services.
- Federal disaster assistance will not be provided in identified flood hazard areas for permanent restorative construction. This means that public buildings damaged by flooding are not eligible for federal disaster assistance.
- Individuals and families will receive only limited federal disaster housing assistance when a major disaster is declared. Federal grants and assistance for repairs are not available.
- Direct federal loans to residents and developers for properties in flood hazard areas are not available from government programs such as the Department of Veterans Affairs (VA) and the Federal Housing Administration (FHA).
- Other regulated 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.

Communities that initially declined to participate when the FIRM was prepared may subsequently decide to join the NFIP. Insurance on buildings that were constructed in flood hazard areas after the date of the FIRM will be rated based on the risk of flooding. If they were built

below the base flood elevation (BFE) and are subject to damage, then flood insurance will be very expensive. The FIRM in effect at the time a building was constructed, and the applicable actuarial rates based on that map, applies regardless of when the community elects to join the NFIP.

1.9 FEMA's Involvement with Model Codes and Standards Producing Organizations

Many communities that participate in the NFIP do so through single-purpose floodplain management ordinances. For the most part, these ordinances are administered in land planning offices, usually in coordination with building permit offices. In other cases, communities participate through various combinations of laws, ordinances, and regulations. Despite efforts to coordinate, occasional conflicts have been known to arise between the NFIP requirements and a community's building and other health and safety codes.

In the early 1990s, FEMA requested assistance from the National Institute of Building Sciences to examine 23 model building codes and standards, and to perform a detailed comparison between NFIP regulations, model building codes, consensus standards, and technical guidance documents. The work was supported by the following model codes and standards organizations:

- Building Officials and Code Administrations International, Inc. (BOCA)*,
- Southern Building Code Congress International, Inc. (SBCCI)*,
- International Conference of Building Officials (ICBO)*,
- National Fire Protection Association (NFPA), and
- National Conference of States on Building Codes and Standards (NCSBCS).

* Effective February 1, 2003, BOCA, SBCCI and ICBO became one organization, the International Code Council, Inc. (ICC).

The result of this cooperative effort was the *Code Compatibility Report*, published in three volumes in October 1992. The report outlined recommended changes to the codes and to various FEMA documents. As the three major code organizations made progress on the development of the I-Codes, FEMA executed an agreement with the Structural Engineering Institute of the American Society of Civil Engineers (ASCE). ASCE was tasked with monitoring progress and proposing changes to the codes to improve consistency with the NFIP.

In 2008 the International Code Council is expected to publish ICC 600, *Standard for Residential Construction in High Wind Regions.* It will include FEMA 550 as guidance for design of flood-resistant foundations for residential buildings with wood or light-steel framed walls.

In the early 1990s, FEMA and ASCE's Structural Engineering Institute initiated work to develop flood loads for inclusion in ASCE 7 and ASCE 24, a standard for flood-resistant design and construction (see Sections 1.10 and 1.11). Although the NFIP had been in effect since 1968, and by 1990 nearly 19,000 counties and towns were participating, there were no consensus standards for determining flood loads or for flood-resistant design and construction.

As the I-Codes were developed, FEMA, with support of ASCE, proposed code changes. The 2000 editions were found to be nominally consistent with the NFIP minimum provisions. In the subsequent code development cycles, additional modifications continued to improve consistency.

1.10 ASCE 7: Minimum Design Loads for Buildings and Other Structures

In 1991, ASCE, with FEMA assistance, organized a committee of nationally recognized experts in the fields of structural engineering, construction techniques, and building codes and regulations. The committee was tasked with developing flood load provisions to be included in ASCE 7. Following the consensus standards process, including balloting, these provisions first appeared in ASCE 7-95. Additional revisions were made to the flood load provisions in the 1998 edition of ASCE 7.

The current edition, ASCE/SEI 7-05 is a referenced standard in the 2006 IBC.

1.11 ASCE 24: Flood-Resistant Design and Construction

In 1995, ASCE organized a standards development committee of nationally recognized individuals in the fields of floodplain management, structural engineering, construction techniques, and building codes and regulations. Following the consensus standards process, including balloting, the committee's work resulted in the first edition of ASCE 24 (1998), which provides minimum requirements for flood-resistant design and construction of buildings and structures located in flood hazard areas, including new structures and substantial repair or improvement of existing structures that are not designated as historic structures. ASCE 24-98, is a referenced standard in the 2003 IBC and was used in the development of the flood-resistant design and construction provisions of the 2003 IRC.

A revised edition, ASCE/SEI 24-05, was produced in 2005 and is referenced in the 2006 edition of the I-Codes.

1.12 Flood-Resistant Materials

The ICC Evaluation Service, Inc., a part of the International Code Council, performs technical evaluations of building products, components, methods, and materials. Acceptance criteria, which form the basis of the evaluations, are developed by the ICC-ES technical staff in consultation with interested parties and the applicants who submit documentation for the technical evaluations. The evaluation process results in the issuance of reports on code compliance, which are made available free of charge. As of late 2007, the ICC-ES has not been asked to evaluate materials to determine conformance with the requirements for flood-resistant materials. Details about the ICC-ES, acceptance criteria, the evaluation process, and the reports are available at **www.icc-es.org**.

In 1999, the National Evaluation Service, Inc. (NES), with support from FEMA, convened an advisory committee to develop an evaluation plan for determining the flood resistance of materials entitled *NES Evaluation Protocol for Determination of Flood-Resistance Properties of Building Elements*. This protocol provides guidance for testing to evaluate building elements for the ability to resist the effects of floodwater exposure. It serves as a starting point for manufacturers to determine whether their building products are suitable for use below flood levels. Building materials that may be evaluated include interior and exterior wall, floor, ceiling, and roof materials and finishes; structural elements; insulating materials; and windows, doors, vents, and other types of fixed or operable openings. The protocol addresses determining the physical and/or performance characteristics of the evaluation subject, exposure to simulated floodwater (fresh and saline), minimum drying times, and testing after exposure to establish changes in performance characteristics.

1.13 Flood Elevations: BFE and DFE

The BFE, as used by the NFIP, is the elevation of the floodwater surface relative to the datum specified on the FIRM that is expected to be reached by a flood having a 1-percent chance of being equaled or exceeded in any given year. Although the term is misleading, this flood is commonly called the “100-year flood.”

The I-Codes, ASCE 7, and ASCE 24 use the term "design flood elevation" (DFE). The DFE is the elevation of the design flood, including wave height in coastal areas, relative to a specified datum. The DFE must equal or exceed the BFE in all cases. The design flood, from which the DFE is derived, is the flood associated with the greater of the following two areas:

1. The area flooded by a 1-percent annual chance flood (base flood), or
2. The area designated as the flood hazard area on a community's flood hazard map.

A community may designate flood hazard areas by electing to incorporate such factors as the impacts of future development conditions on runoff, or a surcharge on flood stages resulting from designation of a floodway that is more restrictive than that designated by FEMA. Communities also may choose to base the DFE on a lower frequency flood (greater magnitude) or on an historical flood that was higher than the base flood used by FEMA.

Seek advice from the NFIP State Coordinator or the FEMA Regional Office if your FIRMs show A99 or AR zones. A99 zones designate areas to be protected from base flood by levees or Federal Flood Protection Systems that are under construction. AR zones are where previously accredited flood protection systems have been decertified but are in the process of being restored to provide base flood or greater levels of protection.

Many states require freeboard and many communities choose to adopt freeboard where it is not required (see Section 3.5). Freeboard is an added factor of safety expressed in feet above a specific flood elevation. It tends to compensate for the many unknown factors that could contribute to flood heights greater than those computed for ideal situations. Freeboard may be incorporated in the DFE (e.g., by defining the DFE as the BFE plus freeboard), or it may be specified to be added to the DFE.

There are circumstances where FIRMs do not specify BFEs:

- *Zone A is used for flood hazard areas where engineering analyses have not been performed to develop detailed flood elevations.* In these areas, other sources for flood information should be consulted, including the state, the U.S. Army Corps of Engineers, and the Natural Resources Conservation Service. FEMA has prepared a guidance document that outlines simplified methods to approximate the BFE, *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations* (FEMA 265).
- *AO and AH zones where shallow overland or sheetflow is expected.* The flood elevation is designated as a depth number on the map, or if not designated, the flood elevation is to be at least 2 feet (610 mm) above the highest grade adjacent to the proposed building footprint.

Table 1-1. Summary of Selected Key NFIP Provisions, Code Citations, and Reference Documents

(See Appendices B and C for comprehensive crosswalks of the NFIP regulations to the IBC and IRC, respectively; Appendix D contains the flood resistant provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.)

Key Provisions of the NFIP	2006 IBC	2006 IRC	ASCE/SEI 24-05	Other Publications
60.3(a)(3)(i) new construction and substantial improvements to be designed and adequately anchored to prevent flotation, collapse, or lateral movement	**1605.2.2** and **1605.3.1.2** flood loads and load combinations (reference ASCE 7) **1612.4** design and construction (reference ASCE 24) [Reference Appendix D for IEBC; see IBC Chapter 34 for existing buildings]	**R301.1** construction to support all loads, including flood loads **R324.1.1** structural systems designed, connected, and anchored	**Section 1.5.5** anchorage and connections to resist effects of vertical and lateral loads **Section 1.6** flood loads and combination of loads	ASCE/SEI 7-02 or ASCE/SEI 7-05, *Minimum Design Loads for Buildings and Other Structures* FEMA 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundation*
60.3(a)(3)(ii) new construction and substantial improvements to be constructed with materials resistant to flood damage	**801.1.3** interior finishes, trim, and decorative materials to be in accordance with FEMA FIA-TB#2 **1403.6** exterior walls to be resistant to water damage	**R324.1.7** and **R501.3** building materials to be flood-resistant, installation methods for flooring and walls to conform to FEMA FIA-TB#2	**Chapter 5** exposed structural and nonstructural materials, including connections, to be resistant to damage, deterioration, corrosion or decay due to direct and prolonged contact with floodwater	National Evaluation Service, Inc., *Evaluation Plan for Determination of Flood-Resistance of Building Elements* Technical Bulletin FEMA FIA-TB#2: *Flood-Resistant Material Requirements for Buildings Located In Special Flood Hazard Areas* Technical Bulletin FEMA FIA-TB#8: *Corrosion Protection for Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas*
60.3(a)(3)(iv) electrical, heating, ventilation, plumbing, and air-conditioning equipment and other service facilities to be designed and/or located to protect components	**1403.7** components not to be mounted on or through breakaway walls **1612.4** design and construction of buildings and structures (including utility support systems) to be in accordance with ASCE 24 [See also Appendix D for IMC, IPC, IFGC, and IPSDC]	**R324.1.5** new and replacement mechanical and electrical systems to be elevated **IFGC R301.5** appliance installations to be elevated or otherwise protected **R1601.3.8** ducts and duct systems to be elevated	**Chapter 7** utilities and attendant equipment to be elevated or designed, constructed and installed to prevent floodwaters from entering or accumulating within the components; utilities not to be mounted on breakaway walls	FEMA 348, *Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems* Technical Bulletin FEMA FIA-TB#4: *Elevator Installation for Buildings Located in Special Flood Hazard Areas*
60.3(a)(6)(i) new/replacement sanitary sewage system designed to minimize/eliminate infiltration/discharges **(ii)** on-site waste disposal systems located to avoid impairment or contamination	**Appendix G 401.3** Sewer facilities	**R324.1.6** general performance, refer to Chapter 3 of the *International Private Sewage Disposal Code*®	**Section 7.3** buried and exposed plumbing systems, systems below flood level, and sanitary systems, including septic tanks	FEMA 348, *Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*

Table 1-1. Summary of Selected Key NFIP Provisions, Code Citations, and Reference Documents

(See Appendices B and C for comprehensive crosswalks of the NFIP regulations to the IBC and IRC, respectively; Appendix D contains the flood resistant provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.)

Key Provisions of the NFIP	2006 IBC	2006 IRC	ASCE/SEI 24-05	Other Publications
60.3(b)(1) require permits for all development, including placement of manufactured homes	**Appendix G 101.3** Scope (and definition of Development)	**R101.2** Scope **R105.3.1.1** specifically addresses substantial improvement and substantial damage of existing buildings **Appendix E** Manufactured Housing Used as Dwellings AE101, Exception, refers to IRC R324 **Appendix J** Existing Buildings AJ102.5 work in existing buildings in flood hazard areas per R105.3.1.1	**Section 1.1** defines the scope to be new structures, including subsequent work and substantial repair or substantial improvement	ASFPM and Federal Interagency Floodplain Management Task Force, *Addressing Your Community's Flood Problems: A Guide for Elected Officials* FEMA 480, *NFIP Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials*
60.3(b)(5) where flood elevation data are provided: **(i)** obtain lowest floor elevation of new and substantially improved structures **(ii)** for floodproofed nonresidential structures, obtain elevation to which structure was floodproofed **(iii)** maintain records of elevations	**109.3.3** inspection and submission of Elevation Certificate **1612.5.1** submission of specific certifications, including Elevation Certificate **104.7** and **Appendix G 103.8** retention of department records	**R109.1.3** inspections and submission of Elevation Certificate **R104.7** retention of department records	Does not address administrative requirements or submission of certifications	*Elevation Certificate* (FEMA Form 81-31). [Online]. Available: **www.fema.gov/business/nfip/elvinst.shtm** *Floodproofing Certificate* (FEMA Form 81-65) [Online]. Available: **www.fema.gov/plan/prevent/fhm/dl_fpc.shtm** FEMA 467-1, *Floodplain Management Bulletin: Elevation Certificate*
60.3(b)(8) require installation of MFH using methods to minimize flood damage, including anchoring, and to resist wind forces	**Appendix G 501.1** elevation requirements **Appendix G 501.2** foundation requirements **Appendix G 501.3** anchoring requirements	**R324.1.8** MFH elevation per R324.2; anchor and tie-down per AE604 and AE605. MFH in floodways per IBC **Appendix AE101** refers to IRC R324	Does not specifically address manufactured housing separate from other buildings. Foundations for MFH to be designed as other foundations and based on location within flood hazard areas (with and without high-velocity wave action)	FEMA 85, *Manufactured Home Installation in Flood Hazard Areas* [Note: HUD, NFPA and ICC are developing MFH standards, including installation provisions.]

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(See Appendices B and C for comprehensive crosswalks of the NFIP regulations to the IBC and IRC, respectively; Appendix D contains the flood resistant provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.)

Key Provisions of the NFIP	2006 IBC	2006 IRC	ASCE/SEI 24-05	Other Publications
60.3(c)(2) require all new and substantially improved structures to have the lowest floor elevated to or above the flood elevation	**1603.1.6** Flood load (information in application) **1612.4** design and construction (reference ASCE 24) **3402.1** Exception requires substantial improvement or repair of existing buildings to be brought into compliance with flood provisions	**R105.3.1.1** specifically addresses substantial improvement and substantial damage of existing buildings **R324.2.1** elevation requirements, except for conforming enclosures **R324.1.4** lowest floor, excluding enclosures that meet certain use limitations and are compliant	**Section 2.3** specifies general elevation requirements **Section 4.4** specifies elevation requirements in Coastal High Hazard Areas (V Zones) and Coastal A Zones	FEMA 259, *Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings* FEMA 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations*
60.3(c)(3) for nonresidential structures: **(i)** lowest floor elevated, or **(ii)** floodproofed (including utility and sanitary facilities)	**1612.4** design and construction (reference ASCE 24)	Not applicable to one- and two-family dwellings	**Section 2.3** specifies general elevation requirements **Chapter 6** details restrictions and requirements for dry and wet floodproofing	Technical Bulletin FEMA FIA-TB#3: *Non-Residential Floodproofing – Requirements and Certification for Buildings Located in Special Flood Hazard Areas* FEMA 348, *Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*
60.3(c)(4) for floodproofed nonresidential structures: **(i)** registered design professional to develop and/or review the structural design and certify **(ii)** certification retained in records	**104.7** retention of department records **1612.5.1** submission of specific certifications, including Elevation Certificate	Not applicable to one- and two-family dwellings	**Chapter 6** details restrictions and requirements for dry and wet floodproofing, but does not include administrative requirements	*Floodproofing Certificate* (FEMA Form 81-65) [Online]. Available: **www.fema.gov/plan/prevent/fhm/dl_fpc.shtm**
60.3(c)(5) fully enclosed areas below elevated buildings are to be: limited in use (parking, access, storage); provided with flood openings that meet minimum criteria or are designed and certified by a registered design professional	**1202.3** under-floor ventilation (exception allows flood openings) **1612.4** design and construction (reference ASCE 24) **1612.5.1** Flood hazard certificates (for flood opening designs other than as specified)	**R324.2.2** enclosed area below design flood elevation, use limitations and flood opening specifications **R408.5** Enclosing underfloor spaces to have flood openings Garages allowed if elevated or compliant with provisions for enclosures below elevated buildings	**Section 2.6** details provisions for enclosures below DFE, including engineered and nonengineered openings (in A and AE Zones)	Technical Bulletin FEMA FIA-TB#1: *Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas*

Table 1-1. Summary of Selected Key NFIP Provisions, Code Citations, and Reference Documents

(See Appendices B and C for comprehensive crosswalks of the NFIP regulations to the IBC and IRC, respectively; Appendix D contains the flood resistant provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.)

Key Provisions of the NFIP	2006 IBC	2006 IRC	ASCE/SEI 24-05	Other Publications
60.3(d)(3) prohibit floodway encroachment unless no impact on flood levels is demonstrated	**Appendix G 103.5** and **G 401.1** floodway development not authorized unless no increase in flood level is demonstrated	**R301.2.4** residential development in floodways to be reviewed under the IBC **R324.1.8** manufactured housing in floodways to comply with the IBC	**Section 2.2** flood elevations and conveyance to be maintained	FEMA 480, *NFIP Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials* FEMA FIA-12, *Appeals, Revisions, and Amendments to NFIP Maps: A Guide for Community Officials*
Additional requirements for buildings and structures in flood hazard areas subject to high-velocity wave action (V Zones)				
60.3(e)(4) require all new and substantially improved construction to be elevated on pilings and columns so that: **(i)** bottom of lowest horizontal structural member of the lowest floor is at or above the flood elevation, **(ii)** pile or column foundation and structure are anchored to resist flotation, collapse and lateral movement due to wind and water loads; registered design professional to develop or review the design, specifications and plans and provide certification	**1603.1.6** specifies elevation of the bottom of the lowest horizontal structural member **1605.2.2** and **1605.3.1.2** flood loads and combined loads **1612.4** design and construction (reference ASCE 24) **1612.5.2** submission of certifications	**R324.3.1** elevation requirements **R324.3.2** foundation requirements, including wind and water loads **R324.3.5** registered professional to certify design and methods of construction	**Section 2.3** and **Section 4.4** specify elevation requirements **Section 1.5, Sections 2.4 and 2.5,** and **Chapter 4** address foundations and designs	FEMA 55, *Coastal Construction Manual* Technical Bulletin FEMA FIA-TB #8: *Corrosion Protection for Metal Connectors in Coastal Areas for Structures Located in Flood Hazard Areas* FEMA 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundation*
60.3(e)(5) enclosed areas, if any, are to be constructed with non-supporting, breakaway walls, lattice, or screening intended to collapse under wind and water loads; uses limited to parking, building access, or storage	**1612.4** requires design and construct in accordance with ASCE 24 **1612.5.2** submission of certification of breakaway wall design under certain circumstances	**R324.3.3** specifications for walls and partitions of enclosures below elevated buildings, specifically for breakaway walls	**Section 4.6** outlines provisions for enclosures below DFE with breakaway walls, and references ASCE 7 for design criteria	FEMA 55, *Coastal Construction Manual* Technical Bulletin FEMA FIA-TB #5: *Free of Obstruction Requirements for Buildings Located in Coastal High Hazard Areas* Technical Bulletin FEMA FIA-TB #9: *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings*

2. Approaches to Floodplain Management

States and communities throughout the United States take a number of approaches to floodplain management. While this guide does not cover every variation, it highlights three common approaches to illustrate the types of issues you may face in your community as you integrate floodplain management and building codes. The three approaches described below are:

- The comprehensive approach,
- The stand-alone floodplain management regulation approach, and
- The building code approach, relying on the *International Codes*® (I-Codes).

Section 2.4 outlines several advantages to using the I-Codes to participate in the NFIP. It is important for you to fully understand those advantages before you begin to evaluate your community's approach. A suggested framework for evaluation is covered in Chapter 6.

2.1 The Comprehensive Approach

Under the broad concept of "floodplain management," many communities coordinate several separate regulatory functions in separate agencies to achieve multiple land use, environmental, and public safety goals. These goals often include avoiding flood hazard areas when buildable land is available outside of mapped flood hazard areas and otherwise minimizing flood hazard area development. Minimization techniques include such measures as low-density zoning, waterway buffers or setbacks, transfer of development rights, evacuation access requirements, and others. While specific programs or functional organizations may vary considerably from community to community, the "comprehensive approach" to floodplain management is generally considered to include:

- *A plan* – whether it is called a comprehensive plan, general plan, land use plan, master plan, or is a combination of several plans. This plan is a collection of policies and guidance on how the community is expected to grow, change, and look in the future. With respect to flood hazard areas, this plan may recognize existing and future risks and establish a goal of reducing future exposure through various mechanisms.

The comprehensive approach yields another potential benefit. Avoiding and minimizing flood hazards may result in credits under the NFIP's Community Rating System, described in Section 3.3.

- *A zoning ordinance* – which is a tool to help achieve the goals set forth in the plan. Zoning typically divides a community into districts and establishes use and development criteria within each district type. Typical zoning districts are residential, commercial, industrial, and agriculture, and various permutations and combinations of these uses. Development criteria typically specify such parameters as density, size, bulk, height, setbacks, and appearance. Some communities address floodplains as a separate conservation zone with its own specifications, or as an "overlay" to the other zones, in which case the zoning specifications are modified to achieve flood-related goals.
- *A subdivision ordinance* – which is another tool to achieve the planning goals. These regulations typically address lot size, shape, and setbacks; curbs, sidewalks, and gutters; open space; and public improvements such as street layout and dimensions, drainage and storm water management, and installation of utilities. Many subdivision ordinances are designed to avoid mapped flood hazard areas through the use of open space conservation and setbacks from bodies of water. Where floodplain impacts are unavoidable, ordinances may guide development to less hazard-prone areas through lot layouts to put building pads on higher ground, or by requiring consideration of non-fill methods of elevating buildings.
- *Building codes and other health and safety codes* – which are applied after zoning, land use, and subdivision decisions, regarding what and where to build, have been made. The primary purpose of building codes and other health and safety codes is to provide minimum requirements to safeguard the public safety, health, and general welfare.

For a complete discussion of the comprehensive approach to floodplain management, and for 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*, Planning Advisory Service Report Number 473, published by the American Planning Association.

2.2 Stand-Alone Floodplain Management Regulations Approach

Many communities that participate in the NFIP have adopted a separate ordinance to address most, if not all, of the minimum requirements of the NFIP. Typically administered by a planning office, this single-purpose, stand-alone ordinance also incorporates other state and community floodplain management requirements, including administrative

procedures, land management criteria, and building-specific provisions. The extent to which the stand-alone ordinance is 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.

Some states and communities do not regulate development in general, but have a single "special use" permit that is required only in mapped flood hazard areas. Typically, this approach is taken solely to meet the minimum floodplain management requirements of the NFIP.

2.3 Building Code Approach

Prior to the availability of the 2000 I-Codes, the model building codes included flood-related provisions to varying degrees, but none were fully consistent with the requirements of the NFIP (FEMA, *Code Compatibility Report*). Therefore, to participate in the NFIP most communities adopted stand-alone floodplain management regulations or ordinances that typically included administrative, land use, and building sciences provisions.

When the IBC is adopted, the IRC is adopted by reference. If you specifically exclude the IRC, then you must *recapture* one- and two-family dwellings in another ordinance in order to participate in the NFIP. Similarly, you will include in that ordinance the provisions of IBC Appendix G if you do not adopt it.

With the 2003 and 2006 editions of the I-Codes, it is possible to integrate building codes and floodplain management into a single administrative process. In order to participate in the NFIP using this approach, all of the I-Codes must be adopted, including *International Building Code* Appendix G. Because Appendix G covers some development activities other than buildings and structures, it may be most appropriately administered by a planning or zoning office. A separate ordinance is still required in order to capture development that is not covered by the scopes of the I-Codes (filling and grading not associated with buildings and structures, paving, roads, bridges, culverts, dams, ponds, levees, floodwalls, and some utility infrastructure).

The inclusion of flood-resistant provisions in the I-Codes may bring new functions to many building departments, specifically with regard to the activities addressed in IBC Appendix G. However, it may help streamline the development process for some communities.

2.4 Advantages of Reducing Flood Losses Through the I-Codes

Continued close coordination between departments is vital to achieve a comprehensive approach to floodplain management. Adopting the I-Codes may result in shifting some provisions and responsibilities to the building department. As part of the discussion and decision process outlined in Chapter 6, you will need to address some of the implications of participating in the NFIP through the I-Codes, including:

- *All Hazard-Related Building Construction Requirements are in One Place*. In the past, the model building codes have included, to some extent, provisions related to natural hazards such as seismic hazards, high winds, severe winter storms, and flood hazards. The I-Codes address all of these hazards on a consistent and rational basis, which allows mitigation of the effects of the natural hazards that are found within each jurisdiction's boundaries.
- *Minimize Code Conflicts*. The likelihood of conflicting code provisions or interpretation increases when a community has two or more regulations that apply to a single project. When different departments, agencies, or offices administer the building code and other health and safety codes, along with the floodplain management ordinance, conflicts or misinterpretation among various code and ordinance provisions can result. This is especially true when one office administers the floodplain management provisions and another office administers the building code. Another way that code conflicts arise is when amendments are made to one code or ordinance and others are not amended at the same time to maintain consistency.
- *Strengthened Enforcement*. Building departments routinely inspect construction, and they have clear authority and responsibility to require compliance and to enforce building permit conditions. Stand-alone floodplain management ordinances 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 adopted without tailoring to local circumstances. 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, agencies, or offices.
- *Effective, Routine Inspections.* Building departments typically conduct multiple inspections at specific times during the construction process, and builders are accustomed to standard notification procedures. In communities where the flood-resistant design and

construction provisions are enforced by a department other than the building department, inspections to check those specific provisions may not be conducted with the same regularity or may not be coordinated with the building inspections.

- *Consistent Permit Conditions and Requirements*. Other problems arise if the building permit, construction plans and specifications, and inspection forms do not explicitly state the elements required for compliance with flood-resistant design and construction requirements. Inspectors may lack the proper information 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 as part of the application for a building permit. Similarly, if the flood openings specifications for an enclosed area beneath an elevated building are described in writing as a condition of the floodplain permit but are not shown on the construction drawings, they may be overlooked by both the contractor and the building inspector.
- *Improved Treatment of Existing Buildings.* One of the NFIP requirements that community officials sometimes find challenging to enforce effectively applies to existing buildings that are located in flood hazard areas that are proposed for improvements or restoration and repair after substantial damage. Building departments routinely handle permits for existing buildings, yet planning and zoning departments, which are often responsible for administering floodplain management ordinances, rarely deal with proposals to physically modify structures that are on sites that are already developed. This has been known to lead to gaps in enforcement of the substantial improvement and substantial damage requirements of the NFIP.

Section 3.7 provides additional background on substantial improvement and repair of substantially damaged buildings in flood hazard areas.

3. Implications of Adopting the I-Codes

As your community considers whether to use the International Codes® (I-Codes) as the primary means to regulate floodplain development and to participate in the National Flood Insurance Program (NFIP), you can use this section as a resource. It covers some of the floodplain management implications that will need to be addressed as you make your decisions. Worksheet B in Chapter 6 will help you assess your current floodplain management practices and procedures, the starting point for determining how the adoption of the I-Codes will impact those practices and what changes will be necessary as a result.

Topics covered in this section include: floodplain development other than buildings; the utility-related I-Codes; the NFIP's Community Rating System (CRS); choosing higher standards for flood hazard area development (including sample code revision texts); regulating substantial damage and substantial improvement; historic structures; and the NFIP's Increased Cost of Compliance insurance coverage. Chapter 4 addresses community responsibilities, including record keeping, permitting requirements, modifications to the I-Codes, flood hazard map duties, elevation certificates, inspections, and variances.

3.1 Development Other Than Buildings

The NFIP requires that minimum development standards be applied to all development, including buildings and structures that are built or substantially improved in the flood hazard area. The NFIP definition of "Development" is very broad: it includes temporary structures and development activities other than buildings. The same definition is included in the *International Building Code* (IBC), Appendix G. These other development activities are regulated to prevent floodway encroachments and obstructions that may increase flood heights.

The NFIP and IBC Appendix G define "Development" to mean "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." [NFIP §59.1]

Because the NFIP requires communities to regulate all development in flood hazard areas, a code that applies only to buildings does not fulfill the requirements for participation. The building code, or a combination of the code and another ordinance, must address all development. It is also important to note that adopting the IBC alone will not meet NFIP

requirements because it does not contain the floodplain management criteria that apply to development other than buildings.

IBC Appendix G addresses these development activities: subdivision of land; site development and utilities; placement of manufactured home units and recreational vehicles; above-ground and underground tanks; and other building work that is not within the scope of the IBC (detached accessory structures; fences in floodways that may block the passage of floodwaters; oil derricks; retaining walls; sidewalks and driveways; and prefabricated swimming pools).

Certain other development activities that are not normally addressed by building officials are included in the scope of IBC Appendix G. Specifically, development includes "other structures" that may impact waterways and floodways, such as fills, transportation infrastructure (roads, bridges, and culverts), and water resources facilities (flood walls and levees, channel modifications, dams, and ponds). For the most part, these activities may be permitted if outside of a mapped floodway, although analyses are to be prepared if a floodway has not been determined.

3.2 The Utility-Related I-Codes

Section 1.13 explains the base flood elevation (BFE) used by the NFIP and the design flood elevation (DFE) used by the I-Codes and ASCE 24.

With respect to minimizing flood damage, the overall objectives for on-site utility systems for buildings constructed in flood hazard areas are to minimize damage and to facilitate clean up and repairs so that people can return to their homes and businesses in a timely manner after a flood. The most effective way to achieve this objective is to elevate utilities to or above the design flood elevation (DFE). This requirement is specifically addressed in the IBC, the *International Residential Code*® (IRC®), and the specific utility codes, including the *International Mechanical Code*® (IMC®), the *International Plumbing Code*® (IPC®), the *International Private Sewage Disposal Code*® (IPSDC®), and the *International Fuel Gas Code*® (IFGC®).

Post-flood field investigations conducted by the Federal Emergency Management Agency (FEMA) reinforce the critical importance of elevating or otherwise protecting building utility systems from floodwater that may enter or accumulate within the system components. Exterior mechanical units, such as heat pumps and air-conditioning units, are easily elevated to or above the DFE on roofs, platforms, or fill pads. In

these cases, care should be directed to more than just the height of the platform. Utility platforms are subject to the same flood loads as building foundations, and should be designed and constructed to resist those loads. Platforms may be independent from the base building structure or attached to or cantilevered from the structure. If higher than 3 to 4 feet (914 to 1219 mm) off the ground, access stairs may be required by the applicable code, and the platform should be sized to allow access for repair and maintenance of the supported equipment.

Where elevating building utility equipment or systems above the DFE is not feasible, the NFIP regulations provide a performance-based option:

> *If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall . . . (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.* [Section 60.3(a)(3)]

To date, FEMA and most states and communities have relied on manufacturers' specifications, warranties, and written statements that specify which types of equipment meet this performance-based provision. For the community, this suggests that applicants may be required to submit a written statement from the manufacturer before a permit to use utility service equipment below the DFE is approved. States and communities have reported that manufacturers almost always refuse to provide such a statement or warranty because most equipment is not designed to be flood resistant. Indeed, experience indicates that most mechanical and electrical equipment suffers major damage when exposed to floodwater.

FEMA has prepared a guidance document on utilities: *Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems* (FEMA 348).

Each of the I-Codes addresses protection of building utility systems from flood damage in the following manner:

- *2006* and *2003 IBC.* Section 1612.1 sets forth the general requirement that "all new construction of buildings, structures and portions of buildings and structures, including substantial improvements and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads." Although this text does not specifically reference utility service equipment, the NFIP requires that it apply to all elements of a building, including building utility systems.

Subsequent chapters of the IBC refer to the individual I-Codes for specific utilities.

- *2006* and *2003 IRC.* Section R324 covers general flood-resistant construction provisions, including establishment of the DFE and protection of mechanical, plumbing, electrical systems, and ducts by elevation to or above the DFE. Section R324.1.6 includes requirements for the protection of water supply and sanitary sewage systems located in flood hazard areas, requiring both to be designed to minimize infiltration into the systems. In addition, sewage systems are to be located or designed to minimize discharges of sewage into floodwater.
- *2006* and *2003 IPC.* Section 309 specifically addresses flood-resistant requirements. Systems and equipment in structures in flood hazard areas are to be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy. Certain system elements must be sealed or elevated, including water supply pumps, potable water well seals, and manhole covers.
- *2006* and *2003 IMC.* Section 301.13 includes the general requirement that mechanical systems are to be placed above the BFE or protected to prevent water from entering or accumulating within appliance ducts or plenum spaces. Sections 602.4 and 603.7.3 require that plenum spaces and ducts meet the same criteria or be capable of resisting hydrostatic and hydrodynamic loads and stresses, including buoyancy.
- *2006* and *2003 IPSDC.* Certain types of private sewage disposal systems involve placement of earthen fill. Sections 301, 303, and 304 are comprehensive in that prior to approval of a disposal system, the building official is required to receive written evidence that construction in and filling of flood hazard areas is acceptable. The code includes a number of restrictions on placement of private sewage disposal systems in floodways, and mound systems are not allowed in the flood hazard area (see Section 902). Section 805 specifies that new and replacement holding tanks are to be protected from flood damage and adequately anchored to counter buoyant forces. Vents and service manholes are to be at least 2 feet (610 mm) above the regulatory flood elevation established by the local jurisdiction.
- *2006* and *2003 IFGC.* Section 301.11 includes the general requirement that appliance installations are to be placed above the DFE or protected to prevent water from entering or accumulating within appliances, ducts, or plenum spaces.

- *2006* and *2003 International Existing Building Code* (IEBC). Long-term reduction in exposure to flood hazards is one of the reasons that development in flood hazard areas is regulated. The IEBC is organized to address repairs, repairs of damaged buildings, alterations, additions, and relocated or moved buildings. For work covered by the IEBC, if the work constitutes substantial improvement (including repair of substantial damage), the proposed work and the existing building are to be brought into compliance with the flood-resistant design requirements for new construction. Certain historic buildings in flood hazard areas are not required to be brought into compliance provided they retain their historic designation.
- *2006* and *2003 International Code Council Performance Code* (ICC PC). This code focuses the user on outcomes rather than prescriptive solutions. Based on building use and occupancy, designs are to resist certain event magnitudes such that maximum tolerated levels of damage are not exceeded. Section 501.3.4 identifies expected loads for design. The flood with a mean return period of 100 years is to be used to determine flood resistance for all structures except Performance Group I.

3.3 The NFIP's Community Rating System and the I-Codes

For more than 30 years, communities that participate in the NFIP have recognized flood hazards in their construction and development decisions. Many communities have chosen to guide development towards areas of lower risk and new buildings are often located out of harm's way. Until 1990, the NFIP had few incentives for communities to do more than administer the minimum NFIP regulatory provisions and flood insurance rates were the same in every community, even though some elected to exceed those provisions.

The CRS has three goals:

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

The Community Rating System (CRS) was established to encourage specific community and state activities that exceed the NFIP minimum floodplain management requirements and that have been shown effective at reducing damage and claims against the NFIP. In communities that apply to the CRS and are verified as implementing some of those activities, citizens who purchase flood insurance benefit from discounted premiums.

The amount of flood insurance premium discount is based on a community's CRS classification. There are 10 classes, with a 5-percent

discount for each class. Class 10 has no premium discount, and Class 1 yields the maximum discount of 45 percent for policies on buildings in the mapped flood hazard area (and 10 percent on buildings not in the mapped area). A community's CRS classification is based on the number of credit points calculated for specific floodplain management activities undertaken to meet the goals of the NFIP and the Community Rating System. To be a CRS Class 7 or better, a community must have Building Code Effectiveness Grading Schedule (BCEGS) classification of 6 or better for both residential/personal and nonresidential/commercial. BCEGS is a measure of both the provisions in the code as they relate to natural hazards and a community's administration of the code.

Participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP, also called "good standing," may apply for a CRS classification. Technical support may be requested from your state's NFIP State Coordinator and the appropriate FEMA Regional Office (Appendix D). The application process is described in the *CRS Application* (FEMA FIA-15A).

Adopting the I-Codes yields Community Rating System credit.

Eighteen creditable activities are organized under four categories. FEMA conducted extensive evaluations of all the activities and developed a system of credit points. The points are based on how well each activity helps achieve the goals of the CRS. Communities are welcome to propose alternative approaches that go beyond the minimum requirements of the NFIP. FEMA will evaluate alternative approaches to determine how much, if any, CRS credit is appropriate. Table 3-1 lists some of ASCE 24-05 provisions and notes on corresponding CRS credits.

The IBC incorporates specific requirements of the NFIP, in large measure by reference to ASCE 24, *Flood Resistant Design and Construction.* ASCE 24 is organized to apply standards based on the structure categories used by the I-Codes. This means that some standards that exceed the minimum NFIP requirements are not applied uniformly to all buildings and structures in flood hazard areas.

Table 3-1. Selected ASCE 24-05 Provisions and Opportunities for Community Rating System Credits

ASCE 24-05 Provisions	Community Rating System Notes
Foundations to be designed for load combinations, including flood loads	Credit for Foundation Protection
Specific standards for High Risk Flood Hazard Areas (alluvial fans, flash flood, mudslide, erosion-prone, high-velocity, ice jam, and debris flow areas)	Credit based on the portion of the flood hazard area that is identified as subject to unique flood-related hazards where Special Hazards Regulations are applied
Based on structure category and type of flood hazard area, applies freeboard to lowest floor elevation	Credit for Freeboard, depending on the additional height (from 1 to 3 feet) and weighted by potential number of structures in each structure category
Based on structure category and type of flood hazard area, applies freeboard to utilities and mechanical and electrical equipment	Credit for Other Higher Standards, weighted by potential number of structures in each structure category
Tanks to be secured against 1.5 times potential buoyancy	Credit for Other Higher Standards
Specifies foundation types allowed in flood hazard areas subject to high-velocity wave action and high risk flood hazard areas	Credit for Other Higher Standards
In Coastal A Zones, applies requirements for flood hazard areas subject to high-velocity wave action	Credit for Other Higher Standards
Erosion analysis to establish minimum foundation depth in flood hazard areas subject to high-velocity wave action	Credit for Special Hazards, prorated by percent of flood hazard area that is subject to high-velocity wave action
Minimum warning time specified, and emergency operations plan required, for use of floodproofing that requires human intervention	Credit for Flood Warning Program, weighted by potential number of nonresidential buildings

Some activities that are eligible for CRS credit may be required or implemented by a state or a regional district, rather than at the local level. For example, some states have regulations that require freeboard, or state dam safety programs may meet national standards. All communities that apply for the CRS receive credit based on approved statewide standards and activities.

FEMA periodically reviews each CRS community's activities and performance. If the credited activities are not being implemented properly or fully, credit points and the CRS classification may be revised. A community may add, change, or drop creditable activities each year.

The discount in flood insurance premiums is only one of the rewards that a community gains by undertaking activities credited by the CRS. Other reasons 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.

To learn more about the CRS, contact the NFIP State Coordinator, the appropriate FEMA Regional Office, or check the NFIP CRS section of FEMA's website at **www.fema.gov/business/nfip/crs.shtm**.

3.4 Considering Higher Standards

The NFIP sets minimum national standards that apply to all communities, regardless of the unique characteristics that may be present. For a number of reasons, states may require higher standards, or communities may elect to apply provisions that exceed the minimum NFIP requirements:

- Flood history may prompt consideration of more restrictive provisions.
- Past events may have been more severe than the predicted 1-percent annual chance flood (also known as the 100-year flood) or events may have occurred more often than expected.
- Communities may have identified unique hazards associated with flooding, including flash flooding, alluvial fan flooding, ice jam flooding, mud flows, debris flows, and flood-related erosion and bluff failure.
- Upland development may have altered the runoff conditions, so that the magnitude and frequency of flooding have changed since the NFIP's maps were prepared.
- Advances in recent years have improved the modeling methodologies used to develop flood hazard mapping, but it may take many years before all current maps are revised to take advantage of the improved models.

Another frequently cited basis for electing to administer a higher standard is recognition that the engineering methods used to predict flood discharges and water surface elevations are mathematical approximations of the natural phenomenon of flooding. In addition, flood hazard maps may be based on topographic maps with wide contour intervals, or flood discharges were not computed to anticipate upland development. Choosing higher standards, such as freeboard, adds a factor of safety to acknowledge that flood hazard area delineation is not a precise science.

The NFIP's Community Rating System, described in Section 3.3, offers credit points to communities that adopt floodplain management

provisions that exceed the minimum requirements of the NFIP. The maximum number of points available for certain higher regulatory standards is summarized in Table 3-2. Actual points will be determined based on the specific provisions of a community's program.

Table 3-2. Maximum Allowable Points for Higher Standards

Community Rating System Activity 430: Higher Regulatory Standards	Maximum CRS Credits (as of 2006)
Freeboard (up to 3' above BFE)	300 points
Foundation Protection (fill compaction, engineered design)	35 points
Cumulative Substantial Improvement (over specific period)	110 points
Lower Substantial Improvement Threshold (less than 50%)	90 points
Protect Critical Facilities (to 500-year flood level)	100 points
Protect Flood Storage Capacity (minimize use of fill)	80 points
Protect Natural and Beneficial Floodplain Functions	40 points
Prohibit or Limit Enclosures Below Elevated Buildings	300 points
Other Higher Standards	100 points
Land Development Criteria (e.g., low-density zoning)	700 points
Special Hazards Regulations (unique flood-related hazards)	Variable points
State-Mandated Regulatory Standards	45 points
Building Code and Staffing (BCEGS)	190 points
Manufactured Housing (stringent anchoring & elevation)	50 points
Coastal A Zone (regulated to V Zone standards)	650 points

3.5 Amending the I-Codes to Implement Higher Standards

Once you have considered higher standards that are appropriate for your community's circumstances, then you need to determine the best way to implement those standards. In this section some of the higher standards that apply specifically to buildings are described and sample language to amend the IBC and the IRC is suggested. One higher standard, known as the Coastal A Zone, is described in Section 3.6.

Freeboard. Freeboard is a factor of safety that results in elevating buildings above the minimum flood elevation. Floods can and do rise higher than established flood elevations selected for regulatory purposes. For riverine waterways, continuing development in upstream watersheds will, over time, cause more runoff that may worsen flooding. Future land use conditions, such as increased development and runoff, are presently not taken into consideration in FEMA's flood insurance studies. One hundred CRS credit points are allowed for each additional foot of

Communities that adopt a freeboard usually do so to provide an inexpensive yet effective means to increase flood protection. There is another reason that property owners will appreciate. When homes are built above the BFE, whether 1 foot (304 mm), 2 feet (610 mm), or 3 feet (914 mm) higher, owners will qualify for a reduction in NFIP flood insurance premiums ranging from 20 to 40 percent.

freeboard above the BFE, up to 3 feet (914 mm), for a maximum of 300 points.

The IBC includes freeboard by reference to ASCE 24 for flood-resistant provisions. Freeboard is required for Category III and Category IV buildings (see Section 3.9 for the description of the categories). ASCE does not require freeboard for certain minor buildings (referred to as Category I structures) and one- and two-family homes (included in Category II structures).

The report, *Evaluation of the National Flood Insurance Program's Building Standards,* examines the incremental costs and benefits of adding freeboard to elevated foundations. The benefits include future avoided damage and lower cost NFIP flood insurance. The report is online at **www.fema.gov/business/nfip/nfipeval.shtm**

The IRC specifies that the lowest floors of homes in flood hazard areas must be at or above the DFE. To incorporate freeboard into the IRC, 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, as appropriate. As an alternative, the following sample revision language would incorporate freeboard in text that in essence defines the DFE.

Sample code revision language

IRC: R324.1.3.1 Freeboard. A freeboard of * ft (* m) shall be added where the design flood elevation or other elevation requirements are specified.

** Insert selected freeboard height.*

Prohibition on Enclosures Below Elevated Buildings. Flood hazard areas are subject to considerable forces that may be exerted on the foundation system and any portion of a building that extends below the DFE. Enclosures below otherwise properly elevated buildings are allowable under the NFIP and the I-Codes, provided the enclosures meet certain provisions. However, to minimize obstructing flow and damage that can still be sustained, some communities choose to prohibit enclosures below elevated buildings altogether. Prohibiting enclosures below elevated buildings may earn CRS credits.

Sample code revision language

IBC: 1612.4.1 Enclosures below design flood elevation. Fully enclosed areas below the design flood elevation shall not be permitted.

Exception. Crawl spaces that comply with the requirements for openings in enclosures below the design flood elevation in ASCE 24.

IRC: R324.2.2 Enclosed area below design flood elevation. ~~Enclosed areas, including crawl spaces, that are below the design flood elevation shall:~~ Fully enclosed areas below the design flood elevation shall not be permitted.

~~(1) Be used solely for parking of vehicles, building access or storage.~~

Exception. Crawl spaces shall: *(remainder of section unchanged)*

IRC: R324.3.4 Walls below design flood elevation. *Delete the existing text in its entirety and replace:* Walls and partitions shall not be permitted below the elevated floor.

Exception. Walls constructed with insect screening or open lattice.

IRC: ~~R324.3.5 Enclosed areas below design flood elevation.~~ *Delete in its entirety and renumber following section.*

Limit the Size of Enclosures Below Elevated Buildings. Limiting the size of enclosures below elevated buildings is another way to minimize flood damage. The NFIP and the I-Codes allow such enclosures that are used solely for building access, storage, or parking. All other uses are prohibited. Enclosures for access and storage do not need to be large, otherwise owners may be tempted to convert the areas to uses that are not allowed, such as bedrooms, family rooms, bathrooms, and workshops. Limiting the size of enclosures to less than 300 square feet (28 m^2) yields 100 CRS credit points. An additional 50 points are available if the regulations require property owners to sign a nonconversion agreement whereby they acknowledge the use restrictions and agree not to convert enclosures below elevated buildings.

Sample code revision language

IBC: 1612.4.1 Enclosures below design flood elevation. Fully enclosed areas below the design flood elevation shall be no larger than * square feet (* m^2) in total enclosed area.

Exception. Crawl spaces that comply with the requirements for openings in enclosures below the design flood elevation in ASCE 24.

IRC: R324.2.2 Enclosed area below design flood elevation. Enclosed areas~~, including crawl spaces,~~ that are below the design flood elevation shall:

1. Be no larger than * square feet (* m^2) in total enclosed area. *Retain and renumber two items for allowable uses and criteria for flood openings.*

Exception. Crawl spaces that comply with the openings criteria in (3) are not limited in size.

IRC: R324.3.5 Enclosed area below design flood elevation. Enclosed areas below the design flood elevation shall be:

1. No larger than * square feet (* m^2) in total enclosed area, and
2. Used solely for parking of vehicles, building access or storage.

Exception. Walls constructed with insect screening or open lattice.

** Insert selected size limit.*

3.6 The Coastal A Zone

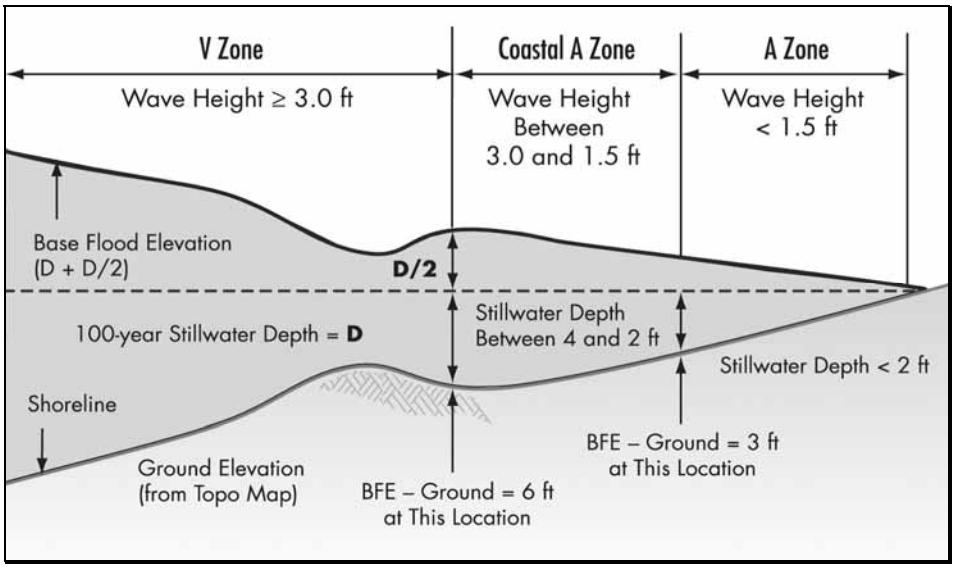
Flood maps for many coastal communities show both "V Zones" and "A Zones" along open shorelines. V Zones are flood hazard areas subject to high-velocity wave action, where breaking wave heights are greater than or equal to 3 feet (914 mm). Flood hazard areas immediately inland of V Zones (and inland of shorelines without V Zones) are labeled on the flood maps as A Zones. These areas experience some wind-driven waves, but the breaking wave heights are predicted to be less than 3 feet (914 mm).

FEMA's field observations in recent years and laboratory research have determined that flooding with breaking waves between 1.5 feet (457 mm) and 3 feet (914 mm) high produces more damage than flooding of similar depths without waves. Therefore, through reference to ASCE 24, the IBC requires application of V Zone design requirements in areas with such wave conditions, called "Coastal A Zones."

The Coastal A Zone is not delineated on flood hazard maps prepared by FEMA, but is a zone where wave forces, overland transport of sand, debris impacts, foundation scour, and erosion potential should be taken into consideration. Figure 3-1 illustrates the two conditions that must be present in order for an area to be a Coastal A Zone: stillwater depth greater than or equal to 2 feet (610 mm), and breaking wave heights greater than or equal to 1.5 feet (457 mm).

The stillwater depth is the vertical distance between the stillwater elevation and the ground. Note that the stillwater depth of at least 2 feet (610 mm) is necessary, but is not sufficient by itself to render an area a Coastal A Zone. In order for breaking waves to develop, there should be few obstructions between the shoreline and the site. Obstructions may block wind and limit the initial growth of waves or may cause friction that attenuates wave energy. Obstructions can include buildings, locally high ground, and dense, continuous stands of vegetation.

Figure 3-1. Schematic of Flood Hazard Zones in Coastal Areas



Because Coastal A Zones are not delineated on Flood Insurance Rate Maps, 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 2-foot (610 mm) 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 FEMA flood map.

One way to address the potential for damage due to Coastal A Zone waves and potential for scour is to apply the V Zone foundation and elevation requirements. As noted above, the IBC incorporates the Coastal A Zone by referencing ASCE 24. Communities that amend the IRC to incorporate the Coastal A Zone may qualify for up to 650 credit points under the NFIP's Community Rating System (see Section 3.3).

Sample code revision language

IRC: R324.2 [Flood hazard areas (including A Zones)

Exception: In flood hazard areas inland of and contiguous to flood hazard areas subject to high-velocity wave action (V zones), and flood hazard areas inland of shorelines without high-velocity wave action, buildings and structures shall be designed and constructed in accordance with R324.3. Areas subject to this requirement are those where the stillwater depth is greater than or equal to 2.0 feet (610 mm), and breaking wave heights are greater than or equal to 1.5 feet (457 mm).

3.7 Substantial Improvement and Substantial Damage

The I-Codes' definition of "substantial improvement" is consistent with the NFIP. If a proposed improvement, or the repair of damage due to any cause, will cost more than 50 percent of the market value of the building before the improvement or repair, then the entire building is to be made compliant with the flood-resistant provisions. This requirement applies to all buildings and structures located in all flood hazard areas, except designated historic structures.

To help address many of the questions that often arise, FEMA prepared *Answers to Questions About Substantially Damaged Buildings* (FEMA 213). It also has useful information about substantial improvements that are not triggered by a damaging event. Improvements to existing buildings generally are one of four types:

1. Rehabilitation of an older building without modifying its external dimensions.
2. Additions to an existing building that increase the square footage and usually involve modifying the structure of the original building.
3. Reconstruction of a building, in whole or in part, on the same footprint and foundation.
4. Restoration or repair of damage of any origin to restore a building to its predamaged condition.

Substantial damage may be caused by damage of any nature. Therefore, after a damage event, whether flood, fire, tornado, earthquake, vandalism, or any other cause, the substantial damage requirements of the I-Codes should prompt field inspections to evaluate damage that may trigger the substantial improvement/substantial damage requirements for buildings and structures located in flood hazard areas.

After a damage event that affects multiple properties or large areas, buildings that are in flood hazard areas should be checked for damage. Some communities distribute flyers explaining permit requirements and how exposure to future flood damage can be reduced during repairs. Most property owners may be unaware that they need permits to repair and restore damaged buildings.

Complete with detailed diagrams and explanations, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding* (FEMA 312), is a good resource for owners, designers, and builders who are considering improvements and repairs.

Quick action is needed when substantial damage is discovered because most owners want to repair or rebuild immediately and get back to "normal." It is good to keep in mind that if they have been damaged by flood, then "normal" means they are likely to get damaged again by the next flood. After major natural hazard events such as floods, tornadoes, and earthquakes, some communities and states organize special permit assistance teams or set up recovery center desks where impacted people can get help.

Following major flooding, states and communities often seek technical support and assistance from FEMA to evaluate flood damage. Contact your NFIP State Coordinator or FEMA Regional Office to find out about post-disaster assistance that may be available when many damaged buildings must be evaluated. FEMA has developed a user-friendly software program, and paper forms, that can be used to help determine whether specific buildings have been substantially damaged. The software is free and is included with *Guidance on Estimating Substantial Damage Using*

the NFIP Residential Substantial Damage Estimator (FEMA 311), which also includes a field workbook and training video on CD-ROM.

2006* and *2003 IBC. The IBC covers substantial improvement and substantial damage in a number of places. First, the scope of the code is broad and includes:

- *101.2 Scope:* includes alteration, movement, enlargement, replacement, and repair. Thus, activities that may qualify as substantial improvement or substantial repair are included within the scope.
- *105 Permits, 105.1 Required:* reinforces intended activities that are subject to the requirements of the code, including those that enlarge, alter, repair, move, or demolish a building or structure.
- *105.2.3 Repairs:* clarifies that applications for permits need not be submitted for "ordinary repairs," provided such repairs do not include certain actions that may affect the structural design and other elements of the building.

The IBC includes substantial improvements and restoration of substantial damage among activities listed in Section 1612.1 that are to be designed and constructed to resist the effects of flood hazards and flood loads. "Substantial improvement" and "substantial damage" are defined in Section 1612.2.

Importantly, Chapter 34 addresses existing buildings, and specific language addresses flood hazard areas:

> ***3402.1 Existing buildings or structures.***
>
> ***Exception:*** *For buildings and structures in flood hazard areas established in Section 1612.3, any additions, alterations or repairs that constitute substantial improvement of the existing structure, as defined in Section 1612.2, shall comply with the flood design requirements for new construction and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design.*

The scope of Chapter 34 is broad, covering "the alteration, repair, addition and change of occupancy of existing structures." These definitions are substantially the same as the NFIP terminology:

- "Addition" is an extension or increase in floor area or height of a building or structure.

- "Alteration" is any construction or renovation to an existing structure other than repair or addition.
- "Repair" is the reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

2006* and *2003 IRC. The IRC covers substantial improvement and substantial damage in three sections:

- *R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding:* specifies that the building official shall examine applications and prepare a finding with regard to the value of the proposed work. If the value equals or exceeds 50 percent of the market value of the building before the damage occurred or the improvement is started, the finding is provided to the board of appeals.
- *R112.2.1 Determination of substantial improvement in areas prone to flooding*: the board of appeals is to determine if a proposal, referred to the board by the building official pursuant to Section R105.3.1.1, constitutes a substantial improvement (or repair of substantial damage). If the proposed work is found to be a substantial improvement or repair of substantial damage, the work must meet the requirements of Section R324. Section R112.2.1 sets forth specific work that is not included in the term "substantial damage" and that need not be included in the valuation.
- *Appendix J, Existing Buildings and Structures, Section AJ102.5 Flood hazard areas:* specifies that work in existing buildings is subject to the provisions of Section R105.3.1.1, described above.

2006* and *2003 IEBC. The IEBC is organized based on the nature of the work: repairs; repair of damaged buildings; alterations (Levels 1, 2 and 3); work associated with change of occupancy classification; additions (horizontal, vertical, new/raised foundations); and relocated or moved buildings. The provisions of the IEBC that pertain to flood resistance are all triggered by the determination of whether the work constitutes substantial improvement or substantial damage. In every instance where that occurs, the existing building is required to be brought into compliance with Section 1612 of the IBC. The 2006 IEBC includes, as Chapter 3, text from IBC Chapter 34 as an alternative compliance method.

The IEBC also includes provisions for historic structures. The following section describes how certain historic structures may be handled.

3.8 Historic Structures

Substantial improvement or repair of substantial damage of historic structures may be handled in two ways. After a finding that the structure will retain its historic designation:

- If you are issuing a building permit for other work, you can cite the exception to the flood provisions; or
- You can issue a variance to the requirements.

Work that, by valuation, would be determined to be substantial improvement or repair of substantial damage of certain historic structures is treated in a different manner than is described in Section 3.7. If a historic structure retains its historic designation, the NFIP does not require that it be brought into compliance with the flood-resistant requirements. This provision is found in the I-Codes. The best way to determine if a structure retains its historic designation is to require the applicant to have the proposed work reviewed by the appropriate entity that makes such designations and keep a copy of the findings in your permanent records.

It is important to note that only historic structures that meet certain criteria that are outlined in the I-Codes need not be brought into compliance. Simply being named "historic" or being located in an historic district does not qualify. The following language is found in the IBC (Section 3407.2), the IRC (Section R112.2.1) and the IEBC (Section 1001.4) to describe historic structures that are not subject to the compliance requirement:

> ***Exception**: Historic buildings that are:*
>
> 1. *Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or*
> 2. *Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or*
> 3. *Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.*

Simply because a building qualifies for the exception does not relieve you of the responsibility to work with the owner to consider measures to reduce flood damage and protect historic resources. Such measures include: elevation on a raised foundation; use of water-resistant materials; relocation of flood-prone equipment and utilities; and reconfiguration of the use of flood-prone space.

3.9 Critical and Essential Facilities

In general usage, 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.

Critical and essential facilities commonly include public and private facilities that a community considers essential for the delivery of vital services and for the protection of public safety. They usually include emergency response facilities (fire stations, police stations, rescue squads, and emergency operation centers, custodial/residential facilities (jails and other detention centers, long-term care facilities, hospitals, and other health care facilities), schools, emergency shelters, utilities (water supply, wastewater treatment facilities, and power), and any other assets determined by the community to be of critical importance for the protection of the health, safety and welfare.

The IBC does not define "critical facilities." The term "essential facilities" is defined in IBC Section 1602: "Buildings and other structure that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes."

The NFIP does not have requirements that are specific to critical and essential facilities, although communities should be aware that Federal agencies are required to undertake a deliberative decision process when federal funding is proposed to be used for certain critical actions, including the construction, upgrade, or repair of critical facilities. (See box on the following page).

The IBC, through reference to ASCE 24, does incorporate some additional requirements that apply to critical facilities that are located in flood hazard areas and that result in a higher level of flood-resistance (Table 3-3). ASCE 7 classifies buildings and other structures into four categories based on occupancy; most critical and essential facilities fall into Category III or Category IV, described below:

- *Category I* includes buildings and other structures whose failure would represent a low hazard to human life, such as agricultural buildings and storage facilities.
- *Category II* includes all buildings not specifically included in other categories.

President's Executive Order 11988 and Critical Facilities

When Federal funding is provided for the planning, design, and construction of new critical facilities, or for the repair of existing critical facilities located within the 500-year floodplain, the funding agency is required to address additional considerations. Executive Order 11988, Floodplain Management, requires Federal agencies to apply a decision-making process to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid the direct or indirect support of floodplain development whenever there is a practicable alternative. If there is no practicable alternative, the Federal agency must minimize any adverse impacts to life, property, and the natural and beneficial functions of floodplains.

The executive order establishes the base flood elevation as the minimum standard for all Federal agencies. Implementation guidance specifically addresses "critical actions," which are described as those actions for which even a slight chance of flooding would be too great. The construction or repair of critical facilities, such as fire stations, hospitals and clinics, emergency operations centers, the storage of hazardous wastes, and the storage of critical records, are examples of critical actions.

After determining that a site is in a mapped flood hazard area, and after giving public notice, the Federal funding agency is required to identify and evaluate practicable alternatives to locating a critical facility in a 500-year floodplain. If the Federal agency has determined that the only practicable alternative is to proceed, then the impacts of the proposed action must be identified. If the identified impacts are harmful to people, property, and the natural and beneficial functions of the floodplain, the Federal agency is required to minimize the adverse effects on the floodplain and the funded activity.

Having identified the impacts of the proposed action and the methods to minimize these impacts, the Federal agency is required to re-evaluate the proposed action. The re-evaluation must consider whether the action is still feasible, whether the action can be modified to relocate the facility or eliminate or reduce identified impacts, or if a "no action" alternative should be chosen. If the finding results in a determination that there is no practicable alternative to locating a critical facility in the floodplain, or otherwise affecting the floodplain, then a statement of findings and a public explanation must be provided.

- *Category III* includes buildings and other structures that represent a substantial hazard to human life in the event of failure, including buildings with higher concentrations of occupants such as educational facilities with capacities greater than 250 for elementary and secondary facilities, 500 for colleges and adult education facilities, or 150 for daycare facilities.
- *Category IV* includes essential facilities such as hospitals, fire and police stations, rescue and other emergency service facilities, power stations, water supply facilities, aviation facilities, and other buildings critical for the national and civil defense.

Table 3-3. ASCE 24-05 Provisions Related to Critical Facilities

		Category III	Category IV
Elevation of Lowest Floor or Bottom of Lowest Horizontal Structural Member	A Zone: elevation of lowest floor	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is parallel to direction of wave approach	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is perpendicular to direction of wave approach	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
Elevation Below Which Flood-Damage-Resistant Materials Shall be Used	A Zone	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is parallel to direction of wave approach	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is perpendicular to direction of wave approach	BFE +3 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher
Minimum Elevation of Utilities and Equipment	A Zone	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is parallel to direction of wave approach	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: where the lowest horizontal structural member is perpendicular to direction of wave approach	BFE +3 ft or DFE, whichever is higher	BFE +3 ft or DFE, whichever is higher
Dry Floodproofing	A Zone: elevation to which dry floodproofing extends	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher
	V Zone and Coastal A Zone: dry floodproofing not allowed	Not applicable	Not applicable

3.10 Increased Cost of Compliance

The requirement to achieve compliance after substantial damage is sustained has been part of the NFIP regulations since 1974. Standard NFIP flood insurance policies issued or renewed since May 1997 include coverage called Increased Cost of Compliance. This coverage is intended to help cover a substantial part of the cost of bringing a flood-damaged building into compliance with the flood-resistant provisions of the community's codes and regulations. Most buildings in FEMA-mapped flood hazard areas that are insured by the NFIP that are declared "substantially damaged" by the community will qualify for an additional insurance claim payment of up to an amount stated in the flood insurance policy. In 2007, the maximum amount was $30,000; the actual amount that is paid is a function of the nature of the work and a determination of eligibility of costs. This additional claim payment may also be used as part of the nonfederal cost-share for certain federally funded flood mitigation grants.

Although not widely available, some private insurance companies do provide flood coverage that is not underwritten by the federal government. Those policies most likely do not include additional coverage to help pay the increased cost of bringing a building into compliance.

Building officials have a significant role in working with property owners and insurance adjusters in order for owners to be able to file a claim for Increased Cost of Compliance claim payments. A formal determination of substantial damage must be made and a building permit for the work required to achieve compliance must be issued. Contact your NFIP State Coordinator as soon as you suspect that flood damage may qualify as substantial damage.

To help answer questions, FEMA prepared *Guidance for State and Local Officials: Increased Cost of Compliance Coverage* (FEMA 301).

Increased Cost of Compliance claim payments may be available for insured buildings that sustain repetitive flood losses, but only if the community has adopted a specific cumulative substantial damage provision that either meets or exceeds the definition in the standard flood insurance policy.

4. Community Responsibilities Under the NFIP

If your community participates in the National Flood Insurance Program (NFIP), then the responsibilities described in this section are already being addressed, although perhaps by an office other than the building department. Worksheet B in Chapter 6 can be used to identify each department in your community that has a role in administering the current floodplain management regulations. The NFIP provides flood insurance and flood hazard information. In return, states and communities agree to regulate development in flood hazard areas.

The NFIP was founded on the principle that managing floodplain development at the local level will lead to avoidance and minimization of future flood damage. The Federal Emergency Management Agency (FEMA) provides convincing evidence to support this concept: Buildings that are constructed in compliance with the NFIP requirements sustain little or no damage during most floods.

When a community decides to participate in the NFIP it accepts the responsibility to adopt, administer, and enforce floodplain management provisions that either meet or exceed the minimum NFIP requirements. Communities become partners with the federal government. The objectives of the partnership are to reduce safety risks to people, to protect the natural and beneficial functions of floodplains, to mitigate flood damage to real and personal property, and to create disaster-resistant communities.

State or local modifications of the flood-resistant provisions of the I-Codes may result in a code that does not meet the minimum requirements of the NFIP. If this happens, in order to continue to participate in the NFIP, the state or community must adopt compensating provisions in a separate ordinance or regulation. Before changing any flood-resistant provision of the I-Codes, contact your NFIP State Coordinator or the appropriate FEMA Regional Office to discuss the impact of the proposed changes.

4.1 Modifications of the I-Codes

Review Chapter 5 about some state actions that may affect how you coordinate your building code and NFIP responsibilities. Check with your NFIP State Coordinator and the state building official to determine if your state has adopted the *International Codes*® (I-Codes) and if there were any modifications to the flood-resistant provisions of the I-Codes.

As you compare the flood-resistant provisions of the I-Codes to your current floodplain management regulations, you may determine that you need to adopt amendments to the code or a companion floodplain

management ordinance in order to retain local standards that exceed the minimums in the code. FEMA encourages communities to adopt higher or more restrictive standards and has established the NFIP Community Rating System (CRS) to recognize the value of doing so. Section 3.3 is a brief overview of the CRS. Examples of higher standards, along with suggested code revision language, are found in Section 3.4 and Section 3.5.

4.2 Regulate All Development

As described in Section 3.1, to participate in the NFIP, communities are required to regulate all development. When examining how the I-Codes help you to fulfill that responsibility, pay special attention to ensure that this requirement is accomplished. Any activity that is either exempt or not covered by the codes must be recaptured in a companion floodplain management ordinance.

If your state or community amends or does not adopt the administrative provisions outlined in the IBC (including Appendix G) and the IRC, then you must recapture those provisions in a companion floodplain management ordinance. Be sure to review the remainder of this section and Section 1.6 for an overview of community responsibilities under the NFIP.

4.3 Record Keeping

Keeping complete permit records is a key element of your community's responsibilities under the NFIP. The I-Codes contain specific requirements concerning record keeping:

- Section 104.7 of the IBC requires retention of all official records "for the period required for retention of public records."
- The NFIP and IBC Appendix G require that records related to development in flood hazard areas be maintained permanently and that they be available for public inspection and review. In addition to retaining permit files, many communities keep a separate log of permits issued in flood hazard areas.
- Section R104.7 of the IRC requires retention of official records of applications, permits and certificates issued, reports of inspections, and notices and orders issued. Such records are to be retained "for the period required for retention of public records."

Required Documentation. The I-Codes require communities to obtain and retain documentation needed to determine that floodplain development activities are compliant, including:

- Documentation of lowest floor elevations (IBC Sections 109.3.3 and 1612.5; IRC Sections R109.1.3 and R324.1.9),
- Documentation of floodproofing (IBC Section 1612.5),
- Documentation of the design of flood openings that meet the performance specifications (IBC Section 1612.5),

- In certain circumstances, documentation of breakaway wall design (IBC Section 1612.5; IRC Section R324.3.6),
- Documentation of foundation design, only in flood hazard areas subject to high-velocity wave action (IBC Section 1612.5; IRC Section R324.3.6),
- Documentation that floodway encroachments will not increase flood levels (IBC Appendix G, Section G103.5),
- Notifications provided to adjacent communities, the state, and FEMA for watercourse alterations (IBC Appendix G, Section G103.6),
- Documentation of all floodplain management variance actions, including justifications (IBC Appendix G, Section G105.2; IRC Section R104.7),
- Notifications provided to recipients of floodplain management variances of certain cautions [IBC Appendix G, Section G105.7(5); IRC Section R112.2.2(5)], and
- Copies of inspection reports for buildings located in flood hazard areas (IBC Appendix G, Section G103.8; IRC Section R104.7).

Biennial Reports to FEMA. Periodically, FEMA sends Biennial Report forms to each participating community. The information to be reported by the community, including updates of previously submitted data, helps FEMA and the states plan for technical assistance and flood map needs. FEMA is particularly interested in the number of permits issued and variances granted. Accurate record keeping is essential for a community to be able to properly complete the Biennial Report forms.

Plan Review and Inspection Checklist. Some communities use a checklist during plan review to verify that appropriate flood-resistant provisions have been checked and are acceptable. The sample plan review checklists included in Appendix F are designed to be transferred to the inspection staff and used to document that specific flood-resistant construction details have been found to be acceptable. Use of a checklist is not required by the NFIP. However, it is a good way to document plan review and compliance.

4.4 Requiring Other Permits

The NFIP regulations specifically require that communities review development proposed in flood hazard areas to ensure that all other necessary permits have been received. Such permits and approvals may

need to be obtained from federal, state, or local regulatory authorities. Examples at the federal level include permitting under Section 404 of the Clean Water Act of 1972 and Section 10 of the Rivers and Harbors Act of 1899, and consultation or permitting under the Endangered Species Act of 1973. State and regional agencies may also regulate activities in flood hazard areas, including activities that impact wetlands, forestry resources, dunes, the shoreline or coastal zone, subaquatic vegetation, threatened and endangered species, navigation, and waterways.

Section 105.3.1 of the IBC directs the building official to reject applications that do not conform to the requirements of pertinent laws. Although not defined, pertinent laws include applicable federal, state, or other local laws. IBC Appendix G, Section G103.2 specifically requires that proposed developments in flood hazard areas are not to be approved until applicants provide proof that other necessary permits have been granted by federal or state authorities. Coordination of multiple permits may help applicants to avoid added costs associated with differing requirements.

4.5 Notifying Potentially Impacted Parties

When an applicant proposes activities that involve alteration of a watercourse, IBC Appendix G, Section G103, specifies that the building official shall require the applicant to notify FEMA, the state, and adjacent communities. Changes to streams and rivers have the potential to significantly alter flow patterns and carrying capacities, which may adversely impact upstream, cross-stream, and downstream properties.

The NFIP regulations require that the carrying capacity of an altered watercourse be not less than that of the natural watercourse before alterations were made. Engineering analyses are required to demonstrate that this requirement is satisfied. Applicants are to submit a comparison of the existing and proposed channel capacities, a description of the proposed alterations, land use of the adjacent properties, information about adjacent property owners, and an assessment of the potential impacts.

4.6 Evaluating Floodway Impacts

Communities are required to prohibit floodway encroachments, including fills, new construction, and substantial improvements, if they would cause flood levels to increase more than a designated height. The designated height limit on the allowable increase is found in the floodway tables of a community's Flood Insurance Study.

If a community decides to permit a floodway proposal that could cause an increase in the base flood elevation (BFE), a Conditional Letter of Map Revision (CLOMR) and floodway map revision must be reviewed and issued by FEMA. Preliminary permit approvals should be conditioned on the applicant obtaining the CLOMR.

The *floodway* is the channel and adjacent land areas that must be reserved in order to pass the base flood without cumulatively increasing the water surface elevation more than a designated height, which is specified in the Flood Insurance Study. Floodways are delineated along most waterways that are studied using detailed methods.

4.7 Flood Hazard Map-Related Duties

At a minimum, communities must use the Flood Insurance Rate Map (FIRM) and floodway map, if provided by FEMA, in the administration of flood-resistant provisions adopted for participation in the NFIP. Flood hazard data that are available from other federal, state, or other sources may be used if FEMA has not provided a map or if detailed data are not specified, for example, in flood hazard areas without BFE information.

Communities must notify FEMA and the NFIP State Coordinator if they intend to adopt maps showing flood hazard areas that are larger or different than those on the FIRMs. This situation may arise if a community conducts a detailed study of an area that was not mapped by FEMA. It may also arise if the community prepares maps of flood hazard areas using criteria that are different than the minimum map specifications used by the NFIP, such as future watershed development runoff, "no-rise" floodway, or other aspect that would result in a more restrictive flood hazard area. Under these circumstances, the elevation of the flood hazard area is referred to as the design flood elevation (DFE). At a minimum, the DFE equals the BFE, which is shown on the FIRM. Section 1.13 includes definitions of both DFE and BFE.

Some flood hazard areas, mapped without benefit of engineering analyses to develop detailed BFEs, are shown as "Zone A" on FIRMs. A valuable resource document is FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations.*

Another map-related responsibility pertains to flood hazard areas for which base flood elevations are specified but floodway boundaries are not designated. In these flood hazard areas, the NFIP requires demonstration "that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the

water surface elevation of the base flood more than one foot at any point within the community." [44 CFR 60.3(c)(10)] This is usually accomplished by requiring applicants to prepare floodway analyses using methods acceptable to FEMA.

Communities that participate in the NFIP are required to:

- *Participate in studies to produce or revise the maps.* For the most part, flood-prone communities have some level of map issued by FEMA. From time to time, waterways are restudied or new studies are conducted in areas without detailed flood elevation data.
- *Adopt map revisions issued by FEMA.* A change to an effective NFIP map is called a "map revision." The effective map is the most recent map. When a map revision is warranted, FEMA will revise and republish the affected map panels and, if necessary, the Flood Insurance Study report. This is referred to as a "physical map revision." If the scale of the revision is small, or if it affects only one property, FEMA will issue a Letter of Map Revision (LOMR). A LOMR describes the changes and officially revises the effective map.
- *Retain all versions of the maps.* The most recent map, called the "effective" map, is to be used to regulate development in flood hazard areas. Previous versions of the map should be retained for historical purposes and in the event permit or enforcement decisions need to be reconstructed.
- *Allow for public access to the maps.* Flood hazard maps serve multiple purposes. They are the basis for mortgage lenders requiring flood insurance and insurance agents use them to determine insurance rates. Citizens should have ready access to the maps so they can better understand flood risks and the implications of decisions regarding permits and flood insurance.
- *Notify FEMA when revisions are needed.* FEMA should be notified when a community becomes aware of a significant need for a change to the flood hazard maps.

To help applicants gather and complete the data necessary for map changes, FEMA developed application and certification forms that are accessible online. Additional detailed guidance on all of the map change processes is found in *Appeals, Revisions, and Amendments to NFIP Maps: A Guide for Community Officials* (FEMA FIA-12).

The following are related to FEMA's efforts to keep maps current to reflect changes in conditions:

- *Map Modernization.* FEMA is in the midst of a multiyear initiative to improve and update the nation's flood hazard maps. Partnerships with state, regional, and local stakeholders help to facilitate such tasks as collecting, updating, adopting and maintaining flood data.
- *Community boundaries.* Most older FIRMs were issued for individual communities, and the areas shown are those within the

corporate boundaries at the time the map was prepared. Over time, FEMA will convert FIRMs to digital media and will issue them on a "countywide" basis rather than individual towns, cities, and the unincorporated areas of counties.

- *Engineering analyses of certain proposed activities*. Applications for permits for certain proposed activities, such as flood control structures, bridges and culverts, waterway alterations, or fill for multiple lots, are to be supported with documented engineering analyses. FEMA reviews the analyses to determine whether the proposals meet the criteria for a map revision. FEMA's initial comments are known as "conditional determinations" that are issued as CLOMR and Conditional Letters of Map Revision Based on Fill (CLOMR-F). When a project is completed, "as-builts" are submitted to support FEMA's issuance of a final Letter of Map Amendment (LOMA) or a physical map revision.
- *Flood fringe fills (individual lots)*. In flood hazard areas designated as AE Zones, if individual lots are filled so that the buildable surface is at or above the BFE or DFE, owners may submit documentation and request that FEMA remove the flood hazard area designation. If the fill meets certain criteria, including acknowledgement by the community that any structures are "reasonably safe from flooding," then FEMA will issue a Letter of Map Revision based on Fill (LOMR-F). Without the LOMR-F, lenders will require that flood insurance be purchased on buildings that, based on the FIRM, appear to be within the mapped flood hazard area.
- *Naturally high ground (individual lots)*. Because of the scale of the original topography and the approximate nature of flood hazard mapping techniques, some land areas may have been inadvertently included in the mapped flood hazard area. Land owners may submit documentation to show that an individual structure and/or a legally described parcel of land is above the BFE. FEMA will issue a LOMA if it is determined that the natural grade of a parcel of land is actually above the BFE. The LOMA applies to only the described structure or parcel, and officially amends the effective map.

Learn more by reading FEMA's Technical Bulletin #10, *Ensuring that Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding (NFIP Interim Guidance)*.

4.8 Elevation Certificates

During construction, certain ground and building elevations are to be surveyed and certified so that building officials can determine the elevation of the lowest floor. The lowest floor elevation is the most significant element in determining that floodplain construction is compliant. The same elevation certification is used by insurance agents to determine appropriate insurance ratings. A good resource for

Many communities attach a blank FEMA Elevation Certificate to the issued permit and clearly indicate when it must be completed and submitted.

understanding the certification and documentation of elevations is the *Floodplain Management Bulletin: Elevation Certificate* (FEMA 467-1).

IBC Section 109.3.3 and IRC Section 109.1.3 call for inspections when the lowest floor level is set and before further vertical construction takes place, and elevation data are to be submitted to the building official. That way, errors in the elevation can be corrected with minimal cost and delay. Because the building official's determination of the "lowest floor" is, in part, dependent on the location of utilities and the final site grading, documentation of the a final "as-built" elevations must be completed and sealed when that work is finished.

FEMA's Elevation Certificate (FEMA Form 81-31) can be ordered from FEMA. It is available online in the library section of FEMA's website, **www.fema.gov/business/nfip/elvinst.shtm**. The form includes several pages of instructions and illustrations with specifics for the surveyor/engineer and the building official:

- *Surveyor/Engineer*. A registered professional who is licensed to perform elevation surveys is required to complete, sign, and affix a professional seal to the documentation of elevations. The documentation must be dated to document when the elevations were surveyed because continuing construction or future modifications could alter and/or outdate the information. The registered professional is responsible for obtaining and certifying accurate elevations of key ground and building elevations.

  Using the diagrams provided by FEMA, the registered professional determines which building elevations to survey by selecting the building diagram that most closely represents the actual building. If the diagrams do not match the configuration of the building, the registered professional may need to note in the comment section to clarify the diagram selected. The Elevation Certificate and building diagrams specify the various elevations that are to be surveyed or measured, including:

  - The bottom floor and the next higher floor;
  - The floor of enclosures, attached garages, below-grade areas, and the interior grade of crawl spaces;
  - Lowest elevation of machinery, appliances and other utility equipment servicing the building;
  - For buildings in flood hazard areas subject to high-velocity wave action, the top of floors and the bottom of the lowest horizontal structural members;

Certain other design documentation may be required:

- *Floodproofing,* for certain nonresidential buildings designed to be watertight.
- *Piles or columns*, for buildings in flood hazard areas subject to high - elocity wave action.
- *Breakaway walls*, only if anticipated loads exceed certain values set forth in the code.
- *Flood openings*, if flood openings do not conform to the prescriptive specifications in the code.

  - For all buildings, the highest and lowest adjacent grades; and
  - For buildings with enclosures below the elevated floor, the number and total net area of flood openings that are within 12 inches (305 mm) of the adjacent grade are to be noted on the certificate.
- *Building Official.* The issued building permit should clearly specify the DFE and the minimum elevation of the lowest floor (including basement). When documentation of the elevations is submitted by a registered design professional, it is the building official's responsibility to determine that all required surveyed elevations and information are noted on the "as-built" certification.

  If all the required elevations have been surveyed, the building official then determines which level is the lowest floor and compares its "as-built" elevation to the DFE. This comparison determines whether the building is compliant with the elevation provisions of the code. If not compliant, enforcement action should be initiated immediately.

In determining the lowest floor, two factors should be kept in mind:

- In flood hazard areas not subject to wave action (A Zones), if an enclosed area below an elevated building has flood openings, has flood-resistant materials, and if it is used only for parking, building access, or storage*, then it is not considered the "lowest floor."
- In areas subject to high-velocity wave action (V Zones), if an enclosed area beneath an elevated building has breakaway walls, flood-resistant materials, and is used only for parking, building access, or storage*, then it is not considered the "lowest floor."

* Enclosures intended for access and limited storage do not need to be large; otherwise, owners may be tempted to convert the areas to uses that are not permissible, such as bedrooms, family rooms, bathrooms, and workshops. Anything stored is subject to flooding. Therefore, only limited storage should be allowed. Storage does not include working appliances such as freezers, refrigerators, washers, and dryers.

A copy of the documentation of elevations (e.g., FEMA's Elevation Certificate) is to be placed in the community's permanent permit file. To facilitate reporting to FEMA and the state, some communities keep a separate log with information on flood hazard area permits. At a later date, if documentation of elevations is not found in the file, the community will be required to obtain a replacement to verify proper administration of the NFIP requirements.

4.9 Inspections

Even when building permits and construction plans are complete, good inspection and enforcement procedures are important. Building inspectors need to understand the flood-resistant design and construction requirements that they are to check. If deviations from the conditions of the permit are found early during construction, it is easier to work with the owner and builder to achieve compliance through corrective actions.

Using a plan review and inspection checklist (examples in Appendix F) can make inspections easier because the inspector will have a standardized summary of flood-related requirements that are not seen in non-floodplain buildings. A checklist also documents the inspection, which can be important for maintaining a community's good standing in the NFIP.

The following summarizes some of the inspections that can be performed to facilitate compliance with flood-resistant provisions:

- *Stake Out or Site Inspection*. The best time to make sure a building will be located correctly is during the site inspection when setbacks and distances from the watercourse or floodway can be checked. Checking that the lowest floor is properly elevated is easier if there is a nearby elevation benchmark or reference mark. If one of the reference marks shown on the flood hazard map is not close to the site, placement of a temporary reference mark on site can make it easier to check the elevation when the floor level is set, and to certify the elevation when the "as-built" documentation of elevations is completed.
- *Fill Inspection*. Fill that is placed to structurally support an elevated building should be inspected to check compaction and compaction reports should be collected. It is also important to check that the final elevation of the fill is as high as required by the permit because this will affect the final elevation of the lowest floor.
- *Footing or Foundation Inspection*. For solid perimeter foundation walls that will create enclosures below otherwise elevated buildings (crawlspaces), inspectors should check for the specified number, size, and location of flood openings. Flood openings are to be close to the ground and should not be confused with under-floor air ventilation openings, which are located just under the floor level. For slab-on-grade (and stemwall) buildings, the lowest floor inspection is conducted at this time.

- *Lowest Floor Inspection.* Under Sections 109.3 of the IBC and R109.1.3 of the IRC, documentation of the lowest floor elevation is to be submitted. An important part of administering provisions for flood-resistant construction is making sure that buildings are elevated properly. The best time to verify compliance is when the lowest floor elevation is set and before further vertical construction takes place. An error of a foot or two in elevation may seem minor, but correction can be expensive and complicated if that error is discovered once the walls and roof are in place. In addition, federal flood insurance is very costly for new buildings that are constructed with the lowest floor below the DFE.
- *Final Inspection*. A final inspection to document compliance with the floodplain management requirements of the I-Codes can be done at the same time as the final inspection to issue the occupancy certificate. During the final inspection, the important things to check include:
  - Verify that utilities and other building elements are located properly, usually above the DFE. Frequently overlooked items include: heating, cooling, and ventilation equipment; electrical outlets; plumbing fixtures; and ductwork that is installed under the floor, usually in a crawlspace.
  - In flood hazard areas not subject to high-velocity wave action (A Zones), inspect enclosures below elevated buildings to ensure the flood openings are correct in number, total net open area, and placement. If standard air ventilation units are used as flood vents, the closure mechanism must be permanently disabled so that floodwater can automatically enter and exit freely, without any human intervention.
  - In flood hazard areas subject to high-velocity wave action (V Zones), inspect enclosures below elevated buildings to determine that breakaway walls are constructed to break away freely without causing damage to the building's foundation or the elevated portion of the building. To minimize transfer of loads during flood conditions, utility connections are not to be mounted on, or penetrate through, breakaway walls.
  - For enclosed areas below the DFE, check that the approved use (only parking, storage, and building access) appears to be consistent with what has been built.
  - Check that exterior fill is placed according to the approved plans and specifications, and that next to all sides of the foundation the fill is not higher than the interior slab or grade of crawl spaces (unless the interior crawlspace grade is filled to above the DFE).

- Verify that flood damage-resistant materials are used below the DFE. Refer to FEMA Technical Bulletin *Flood-Resistant Material Requirements for Buildings Located in Special Flood Hazard Areas* (FEMA FIA-TB #2).
- Examine building utility systems and equipment to determine if they have been elevated or otherwise installed according to plans to resist flood damage. Heat pumps and pad-mounted air-conditioning units must be elevated.
- Collect the "as-built" documentation of elevations prior to the final sign-off and issuance of occupancy certificates.
- If used, complete and sign the plan review and inspection checklist and place all inspection reports in the permit file.

- *Post-Damage Inspections.* After a flood or any event that causes significant damage, buildings located in flood hazard areas should be inspected. Some communities distribute flyers explaining permit requirements and how future flood damage can be reduced during the repair process. Most homeowners do not realize that they may need permits to repair and restore damaged buildings if they are in flood hazard areas. Damage that may meet the "substantial damage" definition must be addressed in accordance with the applicable provisions of the I-Codes (see Section 3.7).

4.10 Enforcement and Violations

Proper enforcement of the floodplain management provisions is a critical part of a community's responsibility under the NFIP. During construction, violations of these provisions are to be resolved as soon as they are discovered and before further construction takes place. What may appear to be a minor violation could end up being expensive when the owner purchases NFIP flood insurance. A community's standing in the NFIP depends on making a good faith effort to successfully resolve violations. By allowing any violation to go unresolved, the community may set a precedent, making it more difficult to take future enforcement actions.

Perhaps one of the more persuasive arguments for adopting the I-Codes is to consolidate enforcement authority for flood-resistant design and construction provisions. The building department typically has mechanisms in place to aggressively handle code violations, while planning and zoning departments may not.

4.11 The Variance Process

For the purposes of the NFIP, a variance is a grant of relief from the application of the NFIP floodplain management requirements. A variance allows construction in a manner that is otherwise prohibited. Variances are granted 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 prohibitively expensive.

Communities are encouraged to consult with either the NFIP State Coordinator or the appropriate FEMA Regional Office prior to issuing variances.

The primary goals of the flood-resistant provisions of the code 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 the susceptibility of buildings and people to flooding and flood damage.

Even if allowed by a properly issued variance, NFIP flood insurance on a building that is only 1 or 2 feet (305 or 610 mm) below the BFE may cost two to three times more than if the lowest floor of the building is at the minimum elevation.

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 would create an exceptional hardship for the applicant. A variance should not be granted based on the personal circumstances of an individual.

2006* and *2003 IBC. Section 112 creates a board of appeals to hear and decide appeals of orders, decisions, or determinations made by the building official. Specific requirements, considerations, and conditions for issuing variance from floodplain management requirements can be found in IBC Appendix G, Section G105.

If the administrative sections of the I-Codes (including Appendix G) are not adopted, the variance provisions must be recaptured in a companion floodplain management ordinance.

2006* and *2003 IRC. Section R112 creates a board of appeals to hear appeals of orders, decisions, or determinations made by the building official. The board of appeals has specific responsibilities related to flood hazard area development:

- *R112.2.1 Determination of substantial improvement in areas prone to flooding:* requires the board of appeals to evaluate the building official's finding regarding the value of proposed improvements to existing buildings to determine if the work constitutes a substantial improvement, and

- *R112.2.2 Criteria for issuance of a variance for areas prone to flooding:* sets forth specific criteria, consistent with the minimum NFIP requirements, to be applied in the review and consideration of variances to the minimum flood hazard area requirements.

5. State Building Codes and Flood Provisions

States handle building codes in a number of ways that can affect whether and to what extent communities can rely on the code to participate in the National Flood Insurance Program (NFIP). Regardless of how your state does it, you need to be sure that state-level amendments do not jeopardize the minimum flood-resistant provisions. In addition, in order to achieve the level of flood protection desired by your community (especially if you participate in the Community Rating System and administer any higher standards), you will need to coordinate your amendments with both the state building code agency and the NFIP State Coordinator.

You may need to develop a companion floodplain management ordinance to assure that all NFIP requirements are addressed.

Whether the building codes are adopted at the state level for local administration or adopted at the local level, either way will affect how you will reference the flood hazard maps that are the basis for regulation (see Section 5.6).

5.1 Meeting More Restrictive State Requirements

Many states have specific requirements that apply to development in flood hazard areas. Typically the requirements are set forth in statutes or regulations that are under the jurisdiction of the natural resource, community development, or emergency management agency.

The NFIP State Coordinator can identify all specific state requirements. Some of the more common higher standards provisions imposed by state regulations include freeboard, more restrictive floodway encroachment limits, setbacks, and factors to address erosion.

Freeboard is the most common state floodplain requirement that exceeds NFIP minimums. It is found in the statutes or regulations of 15 states. Section 3.4 offers sample language to capture this requirement in the I-Codes.

5.2 State Amendments to the I-Codes

Before considering any amendments to the *International Codes* (I-Codes) that are related to flood hazard areas and flood-resistant construction, the state agency that is responsible for the state code should work with the NFIP State Coordinator and the appropriate Federal Emergency Management Agency (FEMA) regional office. Whether amendments are proposed at the state level or local amendments are approved at the state level, care must be taken to ensure that modifications are consistent with

the requirements for the NFIP. Otherwise, the burden falls to communities to resolve inconsistencies in their floodplain management ordinances.

5.3 Local Amendments to State Building Codes

One of the primary purposes for a statewide building code is consistency between communities. For this reason, some states do not allow communities to amend the code. However, most state building code authorities have a mechanism by which communities can seek approval to adopt amendments to the code to address local circumstances with adequate justification.

Many communities have incorporated provisions in their floodplain management ordinances that exceed the minimum requirements of the NFIP, and the justifications for those higher standards may vary from community to community. Common justifications include the need to provide a greater degree of protection given a community's history of flooding or to recognize uncertainties in modeling and mapping the flood hazard. In addition, lower federal flood insurance premiums may be available if a community participates in the NFIP's Community Rating System (see Section 3.3). Incorporating those higher standards into your local building code may require approval by the state building code agency or you may decide to capture them in the companion floodplain management ordinance.

5.4 Exemptions from State Building Codes

The I-Codes list specific types of work that are exempt from the permit requirements of the codes. Some state building codes identify additional specific activities or additional types of buildings that also are exempt. Examples that have been identified include buildings under a certain size, manufactured housing units installed according to a manufacturer's instructions, agricultural buildings and structures, and structures and activities undertaken by specific industries such as mining or logging.

As described in Section 3.1, NFIP minimum standards require that participating communities apply floodplain management requirements to all development in flood hazard areas. If your state exempts specific activities or types of buildings from the state building code, you must

recapture them in a companion floodplain management ordinance to ensure compliance with the NFIP requirements.

5.5 Direct State Regulation of Certain Activities or Buildings

Some states issue building permits for certain activities or specific types of occupancies or buildings that are then exempt from a local building permit. For example, some states issue permits and conduct inspections of all public school buildings, some states regulate certain other public buildings, and some states regulate the installation of manufactured homes in manufactured home parks.

In situations where the state has direct regulatory authority, the authority to address the floodplain development aspects may be shared between the community and the state. For example, the community may approve a project under its zoning ordinance or floodplain management ordinance, while the state requires compliance with codes pertaining to design and construction.

Check with your state building code official and the NFIP State Coordinator to determine whether these or similar situations exist in your state. Coordinated actions may be necessary to ensure that all NFIP requirements are adequately addressed. You may need to recapture in a companion floodplain management ordinance those activities that are authorized by the state.

5.6 Referencing Flood Maps in the Building Codes

FEMA prepares Flood Insurance Studies and Flood Insurance Rate Maps (FIRMs) for flood-prone communities. Some waterways studied using detailed engineering methods show floodways, which may be shown on the FIRM or on a separate Flood Boundary and Floodway Map. FIRMs and floodway maps serve as the minimum basis for delineating flood hazard areas within which development is regulated. A growing number of communities develop and adopt their own maps, often using a basis that results in higher predicted water surface elevations and greater areas subject to regulation. Section 1.13 describes the base flood elevation (BFE) developed by the NFIP and the design flood elevation (DFE) that is referenced by the I-Codes.

Most communities have FIRMs with more than one panel. Each map panel may have a different date. It is important that the date of each currently effective map panel be identified.

Check with your NFIP State Coordinator to learn how map revisions should be handled.

Flood hazard areas are established in the *International Building Code* [see Section 1612.3] and in the *International Residential Code* [see Table R301.2(1)]. In both, the governing body is to adopt a flood hazard map and supporting data. At a minimum, FIRMs, floodway maps, and Flood Insurance Studies prepared by FEMA shall be cited:

- *IBC Section 1612.3, Establishment of flood hazard areas*: specifically requires the governing body to adopt a flood hazard map and supporting data. The text calls for insertion of the name of the jurisdiction and the date of issuance of the map and study. When the code is adopted at the local level, this approach works well. When the IBC is adopted at the state level for local administration, each community will need to cite its study and the dates of all effective maps in the companion floodplain management ordinance.
- *IRC R301.2, Climatic and geographic design criteria:* requires local jurisdictions to establish criteria in Table R301.2(1). The table is designed for insertion of criteria that may vary from community to community, such as wind speed, seismic design category, and other criteria. For flood hazards, the table requires each community to insert the date of entry into the NFIP and the dates of the FIRMs, floodway maps, or other maps adopted by the community.

6. Your Community's Approach

Regulating flood hazard area development is not a "one-size-fits-all" process. Communities vary considerably both within a state and across the country. Each state has its own statutes and regulations, which may mandate – or limit – how a community approaches building codes, other health and safety codes, and floodplain management regulations.

The *International Codes* (I-Codes) include the provisions pertinent to buildings that are the minimum necessary to meet the National Flood Insurance Program (NFIP) floodplain management requirements [other provisions are included in the *International Building Code*, Appendix G]. Your community needs to assess the current approach used to satisfy the requirements of the NFIP in order to determine the best way to coordinate the building code with your current land planning, zoning, and regulatory framework.

Before working through the process, you should review Chapter 5 and contact the NFIP State Coordinator and the state building code official to learn about state-specific requirements. States that adopt the I-Codes at the state level may have made amendments or may require that local amendments be approved by the state. Some states have specific requirements for flood hazard area development and some issue floodplain permits. Others exempt certain activities or types of buildings from the requirement to obtain a building permit, and some states may issue building permits for some activities.

6.1 Assessing Your Community's Current Approach

Perhaps the most important issue that you need to consider is whether the I-Codes will replace some or all of requirements in your current floodplain management regulations. During this consideration, you may want to use the crosswalks in Appendices B, C, and D to compare specific sections of the 2006 editions of the I-Codes with the NFIP regulations.

The I-Code texts in the appendices are annotated to show code changes approved in the 2006/2007 cycle and published in the 2007 *Supplement.*

The worksheets on pages 6-4 and 6-5 are useful tools to assess your community's current approach. Worksheet A lists certain functions and regulatory requirements related to the flood-resistant provisions of the NFIP. Across the top are listed the I-Codes in which those functions and

requirements can be found. Worksheet B is set up for use in the following manner:

- Across the top you can list all of your community's departments that are involved in regulating flood hazard areas. The typical departments are listed, and space is provided for you to add others, if appropriate to your community's organization.
- Consider the functions and regulatory requirements of the NFIP that are listed on the right. Mark the table to indicate the department that currently is responsible for each, 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 decision process that comes next.

6.2 Modifying Your Community's Approach

The next step you need to take to coordinate the I-Codes is to get together with representatives of all departments that currently have a role in floodplain management, as noted on Worksheet B. More than likely, a series of meetings will be needed. The topics and objectives suggested in Worksheet C (page 6-6) may help you lay out the steps needed to produce a clearly coordinated approach to managing flood hazard areas.

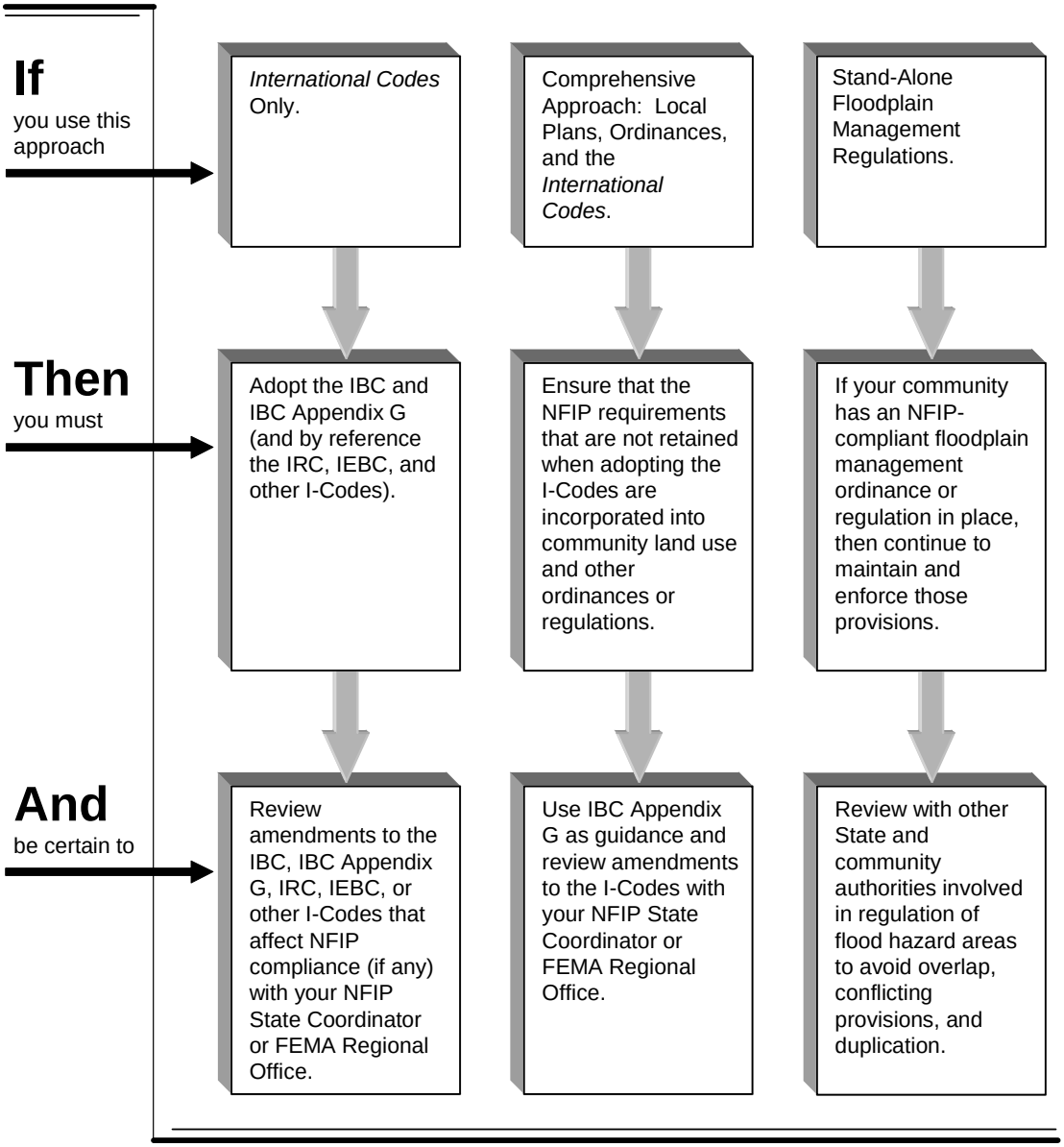
Chapter 2 outlined three approaches that should be reviewed to understand your options: the comprehensive approach; the stand-alone floodplain management regulations approach; and the building code approach. Review Chapter 3 to look at some options to consider, such as higher standards. Be sure that your discussions touch on all of community responsibilities listed in Chapter 4 so that each one is assigned to the appropriate office. And, before you get too far along, review Chapter 5 and check with the appropriate state offices to understand state-specific requirements and processes.

The purpose of the initial session with representatives of different departments in your community is to determine your approach (see Figure 6-1) and to start the process of effectively integrating the I-Codes. Keep the following objectives in mind:

- All NFIP requirements must be addressed;
- If flood-related provisions are addressed in multiple codes or regulations, then coordination is critical to avoid overlap, conflicting provisions, and duplication;

- A department must be designated to be responsible for each code or regulation related to floodplain management; and
- Communication between the departments that deal with related provisions needs to be arranged to facilitate the development review process.

Figure 6-1. Approaches to Fulfilling the Requirements of the NFIP



NOTE: Take extra care if you propose amendments to the flood hazard provisions of the IBC, IBC Appendix G, IRC, IEBC, or other I-Codes. Amendments should be carefully reviewed to avoid inconsistencies with the NFIP minimum requirements. Prior to adoption of amendments consult with your NFIP State Coordinator or your FEMA Regional Office.

Worksheet A. The NFIP and the I-Codes

National Flood Insurance Program Provisions and Processes	The *International Codes*							
	IBC	IBC App. G	IRC	IEBC	IPC	IMC	IPSDC	IFGC
Planning and Zoning								
1. Compatibility with conservation, resource, or overlay zoning (density, setbacks, etc.).								
2. Consideration of overall planning objectives, including flood hazard reduction objectives.		◆						
3. Storm water management and drainage.		◆						
4. Subdivision of land.		◆						
Development Review								
1. Changes to land (filling, grading, paving, excavation, mining, dredging, drilling, channel modifications, alteration of sand dunes and/or mangrove stands).		◆						
2. One- and two-family dwellings (except in floodways).			◆					
3. Buildings and structures (including tanks, towers, and one- and two-family dwellings in floodways).	◆	◆						
4. Site-related public/private utilities (sewage disposal, water supply).		◆	◆		◆		◆	
5. Building utilities (electrical, plumbing, HVAC, fuel).	◆		◆	◆	◆	◆		◆
6. Existing buildings and structures (additions, alterations, repairs, rehabilitations).	◆		◆	◆				
7. Site development (water, sewer, drainage, on-site waste disposal systems).		◆					◆	
8. Transportation infrastructure (roads, bridges, culverts).								
9. Other water resources infrastructure (dams, ponds, levees, floodwalls).								
10 Placement/replacement of manufactured housing.		◆	◆					
11. Recreational vehicle parks.		◆						
12. Refer to other federal, state, local agencies and require appropriate permits.		◆						
13. Review and grant of variances.		◆	◆					
Records								
1. Maintain records of corporate boundaries; report changes to FEMA.								
2. Maintain record of permits and variances, including documented elevations (Elevation Certificates) and documented floodproofing designs (Floodproofing Certificates); make available for public inspection.	◆	◆	◆	◆				
3. Maintain flood hazard maps; make available for public inspection.								
4. Identify, record, and report map needs to FEMA.								
Inspection and Enforcement								
1. Subdivision lot layout (with respect to flood hazard areas).		◆						
2. Location of building/structure footprints on lot.	◆	◆	◆					
3. Foundations.	◆		◆					
4. Lowest floor elevation (buildings and structures).	◆		◆	◆				
5. Lowest floor elevation (manufactured housing units).		◆	◆					
6. Enclosure below lowest floor (flood openings or breakaway).	◆		◆					
7. Collect/review documentation (elevation, floodproofing, flood openings, breakaway wall).	◆		◆	◆				
8. Damaged buildings (to determine if building is substantially damaged).	◆		◆	◆				

Worksheet B. Assessing Your Community's Approach

Your Community's Organization										Provisions and Processes (Check which department handles each code provision or function)
Planning	Zoning	Sub-division	Health	Flood Control or Storm Water	Engineer-ing or Public Works	Build-ing Code	Other	Other	Other	
										Planning and Zoning
										1. Compatibility with conservation, resource, or overlay zoning (density, setbacks, etc.).
										2. Consideration of overall planning objectives, including flood hazard reduction objectives.
										3. Storm water management and drainage.
										4. Subdivision of land.
										Development Review
										1. Changes to land (filling, grading, paving, excavation, mining, dredging, drilling, channel modifications, alteration of sand dunes and/or mangrove stands).
										2. One- and two-family dwellings (except in floodways).
										3. Buildings and structures (including tanks, towers, and one- and two-family dwellings in floodways).
										4. Site-related public/private utilities (sewage disposal, water supply).
										5. Building utilities (electrical, plumbing, HVAC, fuel).
										6. Existing buildings and structures (additions, alterations, repairs, rehabilitations).
										7. Site development (water, sewer, drainage, on-site waste disposal systems).
										8. Transportation infrastructure (roads, bridges, culverts).
										9. Other water resources infrastructure (dams, ponds, levees, floodwalls).
										10 Placement/replacement of manufactured housing.
										11. Recreational vehicle parks.
										12. Refer to other federal, state, local agencies and require appropriate permits.
										13. Review and grant of variances.
										Records
										1. Maintain records of corporate boundaries; report changes to FEMA.
										2. Maintain record of permits and variances, including documented elevations (Elevation Certificates) and documented floodproofing designs (Floodproofing Certificates); make available for public inspection.
										3. Maintain flood hazard maps; make available for public inspection.
										4. Identify, record, and report map needs to FEMA.
										Inspection and Enforcement
										1. Subdivision lot layout (with respect to flood hazard areas).
										2. Location of building/structure footprints on lot.
										3. Foundations.
										4. Lowest floor elevation (buildings and structures).
										5. Lowest floor elevation (manufactured housing units).
										6. Enclosure below lowest floor (flood openings or breakaway).
										7. Collect/review documentation (elevation, floodproofing, flood openings, breakaway wall).
										8. Damaged buildings (to determine if building is substantially damaged).

Worksheet C. Discussion Topics, Decision Steps

Steps	Actions	Date Completed
1	Identify all offices involved in floodplain management (Worksheet B), circulate this guide as background, and convene a meeting.	
2	Review how each of the NFIP functions and regulatory requirements is met under your current approach to floodplain management.	
3	Review Chapter 3 to understand additional floodplain management implications of using the I-Codes to participate in the NFIP. This chapter also briefly discusses some opportunities to further reduce the impacts of flooding beyond those required under the NFIP.	
4	Review Chapter 5 and check with the NFIP State Coordinator and the state building code agency for state-specific requirements.	
5	Review Worksheet A to understand which of the NFIP functions and requirements are addressed in each of the I-Codes.	
6	Discuss the NFIP functions and requirements that are currently performed by offices other than those that are responsible for administering the various building codes (Worksheet B).	
7	Determine which of the I-Codes your community is required to adopt by state law, or which you will choose to adopt if your state does not have a requirement. Refer to Figure 6-1 to see how this determination influences how you handle development that is covered by IBC Appendix G.	
8	Review Worksheet B again with respect to how the NFIP functions and requirements are currently addressed. Decide whether those functions and requirements will continue to be administered by the noted offices, which may be appropriate to the comprehensive approach and to effectively guide development as part of the planning, zoning, and subdivision processes.	
9	Identify which functions and requirements will be administered by the building department upon adoption of the I-Codes.	
10	If the decision is to consolidate some or all of those functions and requirements in the building department, then a critical review of all of the existing ordinances that address floodplain management provisions must be prepared to determine if there are any elements that are *not* covered by the I-Codes. Those elements must be recaptured either by amending the I-Codes or by inclusion in a companion floodplain management ordinance.	
11	If elements are to be recaptured, review the I-Codes and prepare the appropriate language to be included in the Ordinance for Adoption.	
12	Review Sections 3.3, 3.4 and 3.5 to understand how certain higher standards may be beneficial to your community.	
13	If your community decides to adopt higher standards, prepare the appropriate language to be included in the Ordinance for Adoption.	
14	Prepare the companion floodplain management ordinance to retain only those provisions not covered by the I-Codes.	
15	Submit the Ordinance for Adoption of the I-Codes, plus the companion floodplain management ordinance, to your NFIP State Coordinator. The NFIP State Coordinator will coordinate with the FEMA Regional Office to review the materials and determine whether they are acceptable for your community's continued participation in the NFIP.	

Appendix A. References and Online Resources

FEMA publications and forms may be obtained at no cost. These and other materials may also be available online at **http://www.fema.gov/library/index.jsp**

Hardcopy publications and forms may be ordered from:

DHS/FEMA
P.O. Box 2012
Jessup, Maryland 20794-2012
Toll free: 1-800-480-2520

APA PAS #473, *Subdivision Design in Flood Hazard Areas*. Washington, DC: American Planning Association, 1997.

ASCE 7-98, *Minimum Design Loads for Buildings and Other Structures*. Reston, VA: American Society of Civil Engineers, 1998.

ASCE/SEI 7-05, *Minimum Design Loads for Buildings and Other Structures*. Reston, VA: American Society of Civil Engineers, 2005.

ASCE/SEI 24-05, *Flood Resistant Design and Construction.* Reston, VA: American Society of Civil Engineers, 2005.

ASFPM and Federal Interagency Floodplain Management Task Force, *Addressing Your Community's Flood Problems: A Guide for Elected Officials*. Madison, WI: Association of State Floodplain Managers, Inc., 1996.

FEMA, *44 CFR, Part 59-60, National Flood Insurance Program*. Washington, DC: Federal Emergency Management Agency, 1990.

FEMA Federal Insurance Administration, *Code Compatibility Report*. Washington, DC: Federal Emergency Management Agency, 1992.

FEMA FIA-12, *Appeals, Revisions, and Amendments to NFIP Maps: A Guide for Community Officials*. Washington, DC: Federal Emergency Management Agency, Federal Insurance Administration, 1993.

FEMA FIA-15A, *CRS Application*. Washington, DC: Federal Emergency Management Agency, Federal Insurance Administration, 2002.

FEMA 55CD (3rd edition), *Coastal Construction Manual*: *Principles And Practices of Planning, Siting, Designing, Constructing, And Maintaining Residential Buildings in Coastal Areas*. Washington, DC: Federal Emergency Management Agency, 2000.

FEMA 85, *Manufactured Home Installation in Flood Hazard Areas*. Washington, DC: Federal Emergency Management Agency, 1985.

FEMA 213, *Answers to Questions About Substantially Damaged Buildings*. Washington, DC: Federal Emergency Management Agency, 1991.

FEMA 259, *Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings*. Washington, DC: Federal Emergency Management Agency, 1995.

FEMA 265, *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations*. Washington, DC: Federal Emergency Management Agency, 1995.

FEMA 301, *Guidance for State and Local Officials: Increased Cost of Compliance Coverage*. Washington, DC: Federal Emergency Management Agency, 2003.

FEMA 311, *Guidance on Estimating Substantial Damage Using the NFIP Residential Substantial Damage Estimator*. Washington, DC: Federal Emergency Management Agency, 1998.

FEMA 312, *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding*. Washington, DC: Federal Emergency Management Agency, 1998.

FEMA 348, *Protecting Building Utilities from Flood Damage: Principles and Practices for the Design and Construction of Flood*

Resistant Building Utility Systems. Washington, DC: Federal Emergency Management Agency, 1999.

FEMA 480, *NFIP Floodplain Management Requirements: A Study Guide and Desk Reference.* Washington, DC: Federal Emergency Management Agency, 2005.

FEMA 467-1, *Floodplain Management Bulletin: Elevation Certificate.* Washington, DC: Federal Emergency Management Agency, 2004.

FEMA 550, *Recommended Residential Construction for the Gulf Coast: Building on Strong and Safe Foundations.* Washington, DC: Federal Emergency Management Agency, 2006.

FEMA. *Floodproofing Certificate* (FEMA Form 81-65). [Online]. Available: **www.fema.gov/plan/prevent/fhm/dl_fpc.shtm**

FEMA. *Elevation Certificate* (FEMA Form 81-31). [Online]. Available: **www.fema.gov/business/nfip/elvinst.shtm**

FEMA. (various dates) *NFIP Technical Bulletin Series*. Washington, DC: National Flood Insurance Program. [Online]. Available: **www.fema.gov/fima/techbul.shtm**

FEMA FIA-TB #0: *User's Guide to Technical Bulletins*. 1999.

FEMA FIA-TB #1: *Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #2: *Flood-Resistant Material Requirements for Buildings Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #3: *Non-Residential Floodproofing—Requirements and Certification for Buildings Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #4: *Elevator Installation for Buildings Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #5: *Free of Obstruction Requirements for Buildings Located in Coastal High Hazard Areas*. 1993.

FEMA FIA-TB #6: *Below Grade Parking Requirements for Buildings Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #7: *Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas*. 1993.

FEMA FIA-TB #8: *Corrosion Protection for Metal Connectors in Coastal Areas for Structures Located in Special Flood Hazard Areas*. 1996.

FEMA FIA-TB #9: *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings*. 1999.

FEMA FIA-TB #10: *Ensuring that Structures Built on Fill in or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding.* 2001.

FEMA FIA-TB #11: *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas (NFIP Interim Guidance).* 2001.

IBC 2003, *International Building Code.* Washington, DC: International Code Council, Inc., 2003.

IBC 2006, *International Building Code.* Washington, DC: International Code Council, Inc., 2006.

ICC 600, *Standard for Residential Construction in High Wind Regions.* Washington, DC: International Code Council, Inc., 2008 (anticipated publication date).

ICC PC 2003, International Code Council Performance Code. Washington, DC: International Code Council, Inc., 2003.

ICC PC 2006, *International Code Council Performance Code.* Washington, DC: International Code Council, Inc., 2006.

IEBC 2003, *International Existing Building Code.* Washington, DC: International Code Council, Inc., 2003.

IEBC 2006, *International Existing Building Code.* Washington, DC: International Code Council, Inc., 2006.

IFGC 2003, *International Fuel Gas Code.* Washington, DC: International Code Council, Inc., 2003.

IFGC 2006, *International Fuel Gas Code.* Washington, DC: International Code Council, Inc., 2006.

IMC 2003, *International Mechanical Code.* Washington, DC: International Code Council, Inc., 2003.

IMC 2006, *International Mechanical Code.* Washington, DC: International Code Council, Inc., 2006.

IPC 2003, *International Plumbing Code.* Washington, DC: International Code Council, Inc., 2003.

IPC 2006, *International Plumbing Code.* Washington, DC: International Code Council, Inc., 2006.

IPSDC 2003, *International Private Sewage Disposal Code.* Washington, DC: International Code Council, Inc., 2003.

IPSDC 2006, *International Private Sewage Disposal Code.* Washington, DC: International Code Council, Inc., 2006.

IRC 2003, *International Residential Code.* Washington, DC: International Code Council, Inc., 2003.

IRC 2006, *International Residential Code.* Washington, DC: International Code Council, Inc., 2006.

Jones, Christopher P., W.L. Coulbourne, J. Marshall, and S.M. Rogers, Jr., *Evaluation of the National Flood Insurance Program's Building Standards*. Washington, D.C.: American Institutes for Research, 2006.

Supplement to the International Codes. Washington, DC: International Code Council, Inc., 2007.

NES Evaluation Protocol for Determination of Flood-Resistance Properties of Building Elements. National Evaluation Service, Inc., April 2000.

Appendix B. Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
Sec. 59.1 Definitions	
BASE FLOOD. Base flood means the flood having a one percent chance of being equaled or exceeded in any given year.	**BASE FLOOD.** The flood having a 1-percent chance of being equaled or exceeded in any given year. **BASE FLOOD ELEVATION.** The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the flood insurance rate map (FIRM).
BASEMENT. Any area of the building having its floor subgrade (below ground level) on all sides.	**BASEMENT.** The portion of a building having its floor subgrade (below ground level) on all sides.
[Not defined in the NFIP regulations.]	**DESIGN FLOOD.** The flood associated with the greater of the following two areas: 1. Area with a floodplain subject to a 1-percent or greater chance of flooding in any year, or 2. Area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.
[Not defined in the NFIP regulations.]	**DESIGN FLOOD ELEVATION.** The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where the depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).
DEVELOPMENT. 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.	**101.2 Scope** **105.1 [Permits] Required** **105.2 Work exempt from permit** **Appendix G. DEVELOPMENT.** Any man-made 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.
See **FLOODPROOFING.**	**DRY FLOODPROOFING.** A combination of design modifications that result in a building or structure, including the attendant utility and sanitary facilities, being watertight with walls substantially impermeable to the passage of water and with structural components having the capacity to resist loads as identified in ASCE 7.
EXISTING CONSTRUCTION (EXISTING STRUCTURES). For the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures."	**EXISTING CONSTRUCTION.** Any buildings and structures for which the "start of construction" commenced before the effective date of the community's first floodplain management code, ordinance or standard. "Existing construction" may also be referred to as "existing structures." **EXISTING STRUCTURES.** See "Existing construction."

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
FLOOD or FLOODING. (a) A general and temporary condition of partial or complete inundation of normally dry land areas from: (1) The overflow of inland or tidal waters. (2) The unusual and rapid accumulation or runoff of surface waters from any source.	**FLOOD or FLOODING.** A general and temporary condition of partial or complete inundation of normally dry land from: 1. The overflow of inland or tidal waters. 2. The unusual and rapid accumulation or runoff of surface waters from any source.
[Not defined in the NFIP regulations.]	**FLOOD DAMAGE-RESISTANT MATERIALS.** Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair.
[Not defined in the NFIP regulations.]	**FLOOD HAZARD AREA.** The greater of the following two areas: 1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any year. 2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated. **FLOOD HAZARD AREA SUBJECT TO HIGH-VELOCITY WAVE ACTION.** Area within the flood hazard area which is subject to high-velocity wave action, and shown on a Flood Insurance Rate Map or other flood hazard map as Zone V, VO, or V1-30.
FLOOD INSURANCE RATE MAP (FIRM). An official map of a community, on which the Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community.	**FLOOD INSURANCE RATE MAP (FIRM).** An official map of a community on which the Federal Emergency Management Agency has delineated both the special flood hazard areas and the risk premium zones applicable to the community.
FLOOD INSURANCE STUDY (see FLOOD ELEVATION STUDY). An examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.	**FLOOD INSURANCE STUDY.** The official report provided by the Federal Emergency Management Agency containing the Flood Insurance Rate Map, the Flood Boundary and Floodway Map (FBFM), the water surface elevation of the base flood and supporting technical data.
FLOODWAY – See **REGULATORY FLOODWAY.**	**FLOODWAY.** The channel of the river, creek, or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.
FUNCTIONALLY DEPENDENT USE. A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. The term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities, but does not include long-term storage or related manufacturing facilities.	**Appendix G. FUNCTIONALLY DEPENDENT FACILITY.** A facility which cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading or unloading of cargo or passengers, shipbuilding, or ship repair. The term does not include long-term storage, manufacture, sales, or service facilities.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
HISTORIC STRUCTURE. (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: (1) By an approved state program as determined by the Secretary of the Interior or (2) Directly by the Secretary of the Interior in states without approved programs.	**HISTORIC BUILDINGS.** Buildings that are listed in or eligible for listing in the National Register of Historic Places, or designated as historic under an appropriate state or local law (see Section 3407). §**3407.2 Flood hazard areas.** Within flood hazard areas established in Sec. 1612.3, where the work proposed constitutes substantial improvement as defined in Sec. 1612.2, the building shall be brought into conformance with Sec. 1612.2. **Exception:** Historic buildings that are: 1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or 2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or 3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.
LOWEST FLOOR. The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; *Provided*, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of Sec. 60.3.	**LOWEST FLOOR.** The floor of the lowest enclosed area, including basement, but excluding any unfinished or flood resistant enclosure, useable solely for vehicle parking, building access, or limited storage provided that such enclosure is not built so as to render the structure in violation of this section.
MANUFACTURED HOME. 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 "manufactured home" does not include a "recreational vehicle."	**Appendix G. MANUFACTURED HOME.** A structure that is transportable in one or more sections, built on a permanent chassis, designed for use with or without a permanent foundation when attached to the required utilities, and constructed to the Federal Mobile Home Construction and Safety Standards and rules and regulations promulgated by the U.S. Department of Housing and Urban Development. The term also includes mobile homes, park trailers, travel trailers, and similar transportable structures that are placed on a site for 180 consecutive days or longer.
MANUFACTURED HOME PARK OR SUBDIVISION. A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.	**Appendix G. MANUFACTURED HOME PARK OR SUBDIVISION.** A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
RECREATIONAL VEHICLE. A vehicle which is: (a) built on a single chassis; (b) 400 square feet or less when measured at the largest horizontal projection; (c) designed to be self-propelled or permanently towable by a light duty truck; and (d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.	**Appendix G. RECREATIONAL VEHICLE.** A vehicle that is built on a single chassis, 400 square feet or less when measured at the largest horizontal projection, designed to be self-propelled or permanently towable by a light duty truck, and designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.
REGULATORY FLOODWAY. The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.	See **FLOODWAY.**
REMEDY A VIOLATION. To bring the structure or other development into compliance with State or local flood plain management regulations, or, if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing Federal financial exposure with regard to the structure or other development.	**113 Violations** **Appendix G101.4 VIOLATIONS.** Any violation of a provision of this appendix, or failure to comply with a permit or variance issued pursuant to this appendix or any requirement of this appendix, shall be handled in accordance with Section 113.
SPECIAL HAZARD AREA. Area of special flood hazard is the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year. The area may be designated as Zone A on the FHBM. After detailed ratemaking has been completed in preparation for publication of the flood insurance rate map, Zone A usually is refined into Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, or V1-30, VE, or V. For purposes of these regulations, the term “special flood hazard area (SFHA)” is synonymous in meaning with the phrase “area of special flood hazard.”	**SPECIAL FLOOD HAZARD AREA.** The land area subject to flood hazards and shown on a Flood Insurance Rate Map or other flood hazard map as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE, or V1-30.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
START OF CONSTRUCTION. Construction (for other than new construction or substantial improvements under the Coastal Barrier Resources Act (Pub. L. 97-348)), includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement was within 180 days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.	**START OF CONSTRUCTION.** The date of permit issuance for new construction and substantial improvements to existing structures, provided the actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns. Permanent construction does not include land preparation (such as clearing, excavation, grading, or filling), or the installation of streets or walkways, or excavation for a basement, footings, piers or foundations, or the erection of temporary forms, or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.
STRUCTURE. For flood plain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. "Structure" for insurance coverage purposes, means a walled and roofed building, other than a gas or liquid storage tank, that is principally above ground and affixed to a permanent site, as well as a manufactured home on a permanent foundation. For the latter purpose, the term includes a building while in the course of construction, alteration or repair, but does not include building materials or supplies intended for use in such construction, alteration or repair, unless such materials or supplies are within an enclosed building on the premises.	**101.2 Scope** **105.2 Work exempt from a permit**
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 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.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
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 which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (2) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure."		**SUBSTANTIAL IMPROVEMENT.** Any repair, reconstruction, rehabilitation, addition, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. 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.
VARIANCE. A grant of relief by a community from the terms of a flood plain management regulation.		**104.10 Modifications** **104.11 Alternative materials, design and methods of construction and equipment.** [In flood hazard areas, modifications require a formal variance.] **Appendix G. VARIANCE.** A grant of relief from the requirements of this section which permits construction in a manner otherwise prohibited by this section where specific enforcement would result in unnecessary hardship.
VIOLATION. The failure of a structure or other development to be fully compliant with the community's flood plain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Sec. 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided.		**113 Violations** **Appendix G. VIOLATION.** A development that is not fully compliant with this appendix or Section 1612 , as applicable.
59.22 [This section outlines actions to be taken by communities to be eligible for the National Flood Insurance Program, including application procedures, documentation requirements, and a commitment to fulfill certain functions and responsibilities.]		
1	(a)(9)(iii) Maintain for public inspection and furnish upon request certificates of elevation and certificates of floodproofing.	**104.7 Department Records** **Appendix G103.8 Records.** The building official shall maintain a permanent record of all permits issued in flood hazard areas, including copies of inspection reports and certifications required in Section 1612.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
2	(b)(1) Appoint the agency or official with the responsibility, authority, and means to implement the commitments, including certain reporting requirements.	**103 Department of Building Safety** **104 Duties and Powers of the Building Official** **Appendix G104.3 Validity of permit.** The issuance of a permit under this appendix shall not be construed to be a permit for, or approval of, any violation of this appendix or any other ordinance of the jurisdiction. The issuance of a permit based on submitted documents and information shall not prevent the building official from requiring the correction of errors. The building official is authorized to prevent occupancy or use of a structure or site which is in violation of this appendix or other ordinances of this jurisdiction. **Appendix G104.4 Expiration.** A permit shall become invalid if the proposed development is not commenced within 180 days after its issuance, or if the work authorized is suspended or abandoned for a period of 180 days after the work commences. Extensions shall be requested in writing and justifiable cause demonstrated. The building official is authorized to grant, in writing, one or more extensions of time, for periods not more than 180 days each. **Appendix G104.5 Suspension or revocation.** The building official is authorized to suspend or revoke a permit issued under this appendix wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of any ordinance or code of this jurisdiction.
Sec. 60.2 Minimum compliance with flood plain management criteria. [Sections (a) through (c) pertain to meeting specific criteria set forth herein, as a function of the type of flood-related hazard and the level of detail provided on the flood hazard map prepared by FEMA. Section (e) provides for coordination with State Coordinating Agencies with respect to submission of regulations for participation in the NFIP; Section (f) addresses the community function to submit reports periodically, when requested; and Section (g) directs communities to assure that their comprehensive plans are consistent with floodplain management objectives.]		

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
3	(h) The community shall adopt and enforce floodplain management regulations based on data provided by the Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce floodplain management regulations based upon modified data reflecting natural or man-made changes.	**1612.3 Establishment of flood hazard areas.** To establish flood hazard areas, the applicable governing authority shall 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. ***1612.3.1 Design flood elevations.*** *Where design flood elevations are not included in the flood hazard areas established in Section 1612.3, or if floodways are not designated, the building official is authorized to require the applicant to:* *1. Obtain and reasonably utilize any design flood elevation and floodway data available from a federal, state, or other source, or* *2. Determine the design flood elevation and/or floodway in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice.* **Appendix G102.2 Establishment of flood hazard areas.** Flood hazard areas are established in Section 1612.3 of the *International Building Code*, adopted by the applicable governing authority on _____.
Sec. 60.3 Floodplain management criteria for flood-prone areas. (a) When the Administrator has not defined the special flood hazard areas within a community, has not provided water surface elevation data, and has not provided sufficient data to identify the floodway or coastal high hazard area, but the community has indicated the presence of such hazards by submitting an application to participate in the Program, the community shall:		

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
4	(1) Require permits for all proposed construction or other development, including the placement of manufactured homes, to determine whether such development is proposed within flood hazard areas;	**101.2 Scope** **105.2 Work exempt from permit** **105.2.2 Repairs** **1612.1 General (Flood Loads)**. Within flood hazard areas as established in Section 1612.3, all new construction of buildings, structures and portions of buildings and structures, including substantial improvements and restoration of substantial damage to buildings and structures, shall be designed and constructed to resist the effects of flood hazards and flood loads. For buildings that are located in one or more flood hazard area, the provisions associated with the most restrictive flood hazard area shall apply. **3403.1 Existing buildings or structures**. Additions or alterations to any building or structure shall conform with the requirements of the code for new construction. Additions or alterations shall not be made to an existing building or structure which will cause the existing building or structure to be in violation of any provisions of this code. An existing building plus additions shall comply with the height and area provisions of Chapter 5. Portions of the structure not altered and not affected by the alteration are not required to comply with the code requirements for a new structure. **3403.1.1 Flood hazard areas.** For buildings and structures in flood hazard areas established in Section 1612.3, any additions, alterations or repairs that constitute substantial improvement of the existing structure, as defined in Section 1612.2, shall comply with the flood design requirements for new construction and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design. **Appendix G101.1 Purpose.** The purpose of this appendix is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific flood hazard areas through the establishment of comprehensive regulations for management of flood hazard areas, designed to: 1. Prevent unnecessary disruption of commerce, access, and public service during times of flooding; 2. Manage the alteration of natural floodplains, stream channels, and shorelines; 3. Manage filling, grading, dredging, and other development which may increase flood damage or erosion potential; 4. Prevent or regulate the construction of flood barriers which will divert flood waters or which can increase flood hazards; and **5.** Contribute to improved construction techniques in the floodplain. **Appendix G102.1 General (Applicability).** This appendix, in conjunction with the *International Building Code*, provides minimum requirements for development located in flood hazard areas, including the subdivision of land; installation of utilities; placement and replacement of manufactured homes; new construction and repair, reconstruction, rehabilitation, or additions to new construction; substantial improvement of existing buildings and structures, including restoration after damage, and certain building work exempt from permit under Section105.2.
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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
4 **continued from previous page**		**Appendix 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, and all new construction and substantial improvement of existing buildings and structures, including restoration after damage; *temporary structures and temporary or permanent storage; utility and miscellaneous Group U buildings and structures;* and certain building work exempt from permit under Section105.2, shall be designed and constructed with methods, practices, and materials that minimize flood damage and that are in accordance with this code and the ASCE 24. **Appendix G104.1 [Permits] Required.** Any person, owner or authorized agent who intends to conduct any development in a flood hazard area shall first make application to the building official and shall obtain the required permit. **G801 Other Building Work** **G801.1 Detached accessory structures.** Detached accessory structures shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. Fully enclosed accessory structures shall have flood openings to allow for the automatic entry and exit of flood waters. **G801.2 Fences.** Fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, shall meet the requirement of BG103.5. **G801.3 Oil derricks.** Oil derricks located in flood hazard areas shall be designed in conformance with the flood loads in Section 1603.1.6 and Section 1612. **G801.4 Retaining walls, sidewalks and driveways.** Retaining walls, sidewalks and driveways shall meet the requirements of Section 1803.4. **G801.5 Prefabricated swimming pools.** Prefabricated swimming pools in floodways shall meet the requirement of BG103.5. ***G901 Temporary Structures and Temporary Storage*** ***G901.1 Temporary structures.*** *Temporary structures shall be erected for a period of less than 180 days. Temporary structures shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. Fully enclosed temporary structures shall have flood openings to allow for the automatic entry and exit of flood waters.* ***G901.2 Temporary storage.*** *Temporary storage includes storage of goods and materials for a period of less than 180 days. Stored materials shall not include hazardous materials.* ***G901.3 Temporary structures and storage.*** *Temporary structures and temporary storage in floodways shall meet the requirements of Section G103.5.*
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NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
4 **continued from previous page**		***G1001 Utility and Miscellaneous Group U*** ***G1001.1 Utility and Miscellaneous Group U.*** *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.* ***G1001.1 Flood loads.*** *Utility and miscellaneous Group U buildings and structures, 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.* ***G1001.2 Elevation.*** *Utility and miscellaneous Group U buildings and structures, 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*.* ***G1001.4 Enclosures below design flood elevation.*** *Fully enclosed areas below the design flood elevation shall be at or above grade on all sides and conform to the following:* *1. In flood hazard areas not subject to high-velocity wave action, shall have flood openings to allow for the automatic inflow and outflow of floodwaters.* *2. In flood hazard areas subject to high-velocity wave action, shall have walls below the design flood elevation that are designed to break away or collapse from a water load less than that which would occur during the design flood, without causing collapse, displacement or other structural damage to the building or structure.* ***G1001.5 Flood-damage resistant materials.*** *Flood-damage resistant materials shall be used below the design flood elevation.* ***G1001.6 Protection of mechanical, plumbing and electrical systems.*** *Mechanical, plumbing and electrical systems, including plumbing fixtures, shall be elevated to or above the design flood elevation.* ***Exception:*** *Electrical systems, equipment and components, and heating, ventilating, air conditioning, and plumbing appliances, plumbing fixtures, duct systems, and other service equipment are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood-resistant construction requirements of the* International Building Code*. Electrical wiring systems are permitted to be located below the design flood elevation provided they conform to the provisions of the electrical part of the* International Code Council Electrical Code Administrative Provisions *[for wet locations].*

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
5	(2) Review proposed development to assure that all necessary permits have been received from other governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334;	**105.3.1 Action on application** **Appendix G103.2 Other permits.** It shall be the responsibility of the 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.
6 **continued on next page**	(3) Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall: (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.	**106.2.*5* Site plan.** The construction documents submitted with the application for permit shall be accompanied by a site plan showing to scale the size and location of new construction and existing structures on the site, distances from lot lines, the established street grades and the proposed finished grades, and, as applicable, flood hazard areas, floodways, and design flood elevations; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the site plan shall show construction to be demolished and the location and size of existing structures and construction that are to remain on the site or plot. The building official is authorized to waive or modify the requirement for a site plan when the application for permit is for alteration or repair or when otherwise warranted. ***R106.2.5.1 Design flood elevation.*** *Where design flood elevations are not specified, they shall be established in accordance with Section 1612.3.1.* **801.1.3 Applicability.** For buildings in flood hazard areas as established in Section 1612.3, interior finishes, trim, and decorative materials that extend below the design flood elevation shall be flood-damage-resistant materials. **1403.6 Flood resistance.** For buildings in flood hazard areas as established in Section 1612.3, exterior walls extending below the design flood elevation shall be resistant to water damage. Wood shall be pressure preservative treated in accordance with AWPA U1 for the species, product and end use using a preservative listed in Section 4 in APWA standards or decay-resistant heartwood of redwood, black locust, or cedar. **1603.1.6 Flood design data.** For buildings located in whole or in part in flood hazard areas as established in Section 1612.3, the following documentation pertaining to design, if required in Section 1612.5, shall be shown, regardless of whether flood loads govern the design of the building: **1.** In flood hazard areas not subject to high-velocity wave action, the elevation of proposed lowest floor, including basement. **2.** In flood hazard areas not subject to high-velocity wave action, the elevation to which any nonresidential building will be dry floodproofed. **3.** In flood hazard areas subject to high-velocity wave action, the proposed elevation of the bottom of the lowest horizontal structural member of the lowest floor, including basement.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
6 **continued from previous page**		**1605.2 Load combinations using strength design or load and resistance factor design.** **1605.2.2 Other loads.** Where F_a is to be considered in design, the load combinations of Section 2.3.3 of ASCE 7 shall be used. [Note: F_a = flood loads.] **1605.3 Load combinations using allowable stress design.** **1605.3.1.2 Other loads.** Where F_a is to be considered in design, the load combinations of Section 2.4.2 of ASCE 7 shall be used. [Note: F_a = flood loads.] **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 ASCE 24. **1801.1 Scope (Soils and Foundations).** The provisions of this chapter shall apply to building and foundation systems in those areas not subject to scour or water pressure by wind and wave action. Buildings and foundations subject to such scour or water pressure loads shall be designed in accordance with Chapter 16. **1803.4 Grading and fill in flood hazard areas.** In flood hazard areas established in Section 1612.3, grading and/or fill shall not be approved: 1. Unless fill is placed, compacted, and sloped to minimize shifting, slumping and erosion during the rise and fall of floodwater and, as applicable, wave action. 2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a registered design professional in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the design flood. 3. In flood hazard areas subject to high-velocity wave action, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure. **4.** Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed flood hazard area encroachment, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than one foot at any point. **3001.2 Referenced standards**. Except as otherwise provided for in this code, the design, construction, installation, alteration, repair and maintenance of elevators and conveying systems and their components shall conform to ASME A17.1, ASME A90.1, ASME B20.1, ALI ALCTV, and ASCE 24 for construction in flood hazard areas as established in Section 1612.3. **3102.7 Engineering design.** The structure shall be designed and constructed to sustain dead loads, loads due to tension or inflation, live loads including wind, snow, flood, and seismic loads and in accordance with Chapter 16. **3403.1.1 [Existing buildings or structures] Flood hazard areas.** SEE BLOCK 4 [For electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities, see Appendix D for texts from IMC, IPC, IFGC and IPSDC.]
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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
6 **continued from previous page**		**Appendix G101.1 Purpose (Flood Resistant Construction).** SEE BLOCK 4 **Appendix G101.2 Objectives.** The objectives of this appendix are to protect human life, minimize the expenditure of public money for flood control projects, minimize the need for rescue and relief efforts associated with flooding, minimize prolonged business interruption, minimize damage to public facilities and utilities, help maintain a stable tax base by providing for the sound use and development of flood-prone areas, contribute to improved construction techniques in the floodplain, and ensure that potential owners and occupants are notified that property is within flood hazard areas. **Appendix 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 work exempt from permit under Section105.2. **Appendix 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 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, 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. **Appendix G401.5 Storm drainage.** Storm drainage shall be designed to convey the flow of surface waters so as to minimize or eliminate damage to persons or property. **Appendix G401.6 Streets and sidewalks**. Streets and sidewalks shall be designed to minimize potential for increasing or aggravating flood levels. **Appendix G701.1 Underground tanks.** Underground tanks in flood hazard areas shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. **Appendix G701.2 Above-ground tanks**. Above-ground tanks in flood hazard areas shall be elevated to or above the design flood elevation or shall be anchored or otherwise designed and constructed to prevent flotation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of the design flood.
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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
6 **continued from previous page**		**Appendix G701.3 Tank inlets and vents.** In flood hazard areas, tank inlets, fill openings, outlets and vents shall be: 1. At or above the design flood elevation or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood. 2. Anchored to prevent lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. **Appendix G801.1 Detached accessory structures.** Detached accessory structures shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood. Fully enclosed accessory structures shall have flood openings to allow for the automatic entry and exit of flood waters. **Appendix G801.2 Fences.** Fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, shall meet the requirement of BG103.5. **Appendix G801.3 Oil derricks.** Oil derricks located in flood hazard areas shall be designed in conformance with the flood loads in Section 1603.1.6 and Section 1612. **Appendix G801.4 Retaining walls, sidewalks and driveways.** Retaining walls, sidewalks and driveways shall meet the requirements of Section 1803.4. **Appendix G801.5 Prefabricated swimming pools.** Prefabricated swimming pools in floodways shall meet the requirement of Section G103.5.
7	4. Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that: (i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;	**Appendix G301.1 General (Subdivisions).** 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, and 2. All public utilities and facilities, such as sewer, gas, electric, and water systems are located and constructed to minimize or eliminate flood damage, and 3. Adequate drainage is provided to reduce exposure to flood hazards. **Appendix G301.2 Subdivision requirements.** The following requirements shall apply in the case of any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within a flood hazard area: 1. The flood hazard area, including floodways 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 floodway; and 4. The design criteria for utilities and facilities set forth in this appendix and appropriate *International Codes* shall be met. **Appendix G401.5 Storm drainage.** SEE BLOCK 6

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
8	(5) Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and	**Appendix G401.4 Water facilities.** All new or replacement water facilities shall be designed in accordance with the provisions of Chapter 7, ASCE 24 to minimize or eliminate infiltration of flood waters into the systems.
9	(6) Require within flood-prone areas (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.	**Appendix G401.3 Sewer facilities.** All new or replaced sanitary sewer facilities, private sewer treatment plants (including all pumping stations and collector systems) and onsite waste disposal systems, shall be designed in accordance with Chapter 7, ASCE 24 to minimize or eliminate infiltration of flood waters into the facilities and discharge from the facilities into flood waters, or impairment of the facilities and systems. [See Appendix D for texts from IPSDC.]
(b) When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:		
10	(1) Require permits for all proposed construction and other developments including the placement of manufactured homes, within Zone A on the community's FHBM or FIRM; (2) Require the application of the standards in paragraphs (a) (2), (3), (4), (5) and (6) of this section to development within Zone A on the community's FHBM or FIRM;	[Prior provisions cumulative]
11	(3) Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;	**Appendix G103.3 Determination of design flood elevations**. If design flood elevations are not specified, the building official is authorized to require the applicant to: 1. Obtain, review and reasonably utilize data available from a federal, state or other source, or 2. 2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering techniques. Such analyses shall be performed and sealed by a registered design professional. Studies, analyses, and computations shall be submitted in sufficient detail to allow thorough review and approval by the building official. The accuracy of data submitted for such determination shall be the responsibility of the applicant.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
12	(4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs (c)(2), (c)(3), (c)(5), (c)(6), (c)(12), (c)(14), (d)(2) and (d)(3) of this section;	**1612.3 Establishment of flood hazard areas.** SEE BLOCK 3 **Appendix G103.3 Determination of design flood elevations**. SEE BLOCK 11
13	(5) Where base flood elevation data are utilized, within Zone A on the community's FHBM or FIRM: (i) Obtain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures, and (ii) Obtain, if the structure has been floodproofed in accordance with paragraph (c)(3)(ii) of this section, the elevation (in relation to mean sea level) to which the structure was floodproofed, and (iii) Maintain a record of all such information with the official designated by the community under Sec. 59.22 (a)(9)(iii);	**104.7 Department records** **109.3.3 Lowest floor elevation**. In flood hazard areas, upon placement of the lowest floor, including basement, and prior to further vertical construction, the elevation documentation required in Section 1612.5 shall be submitted to the code official. **1612.5 Flood hazard documentation.** The following documentation shall be prepared and sealed by a registered design professional and shall be submitted to the building official: 1. For construction in flood hazard areas not subject to high-velocity wave action: 1.1 The elevation of the lowest floor elevation, including basement, as required by the lowest floor elevation inspection in Section 109.3.3. 1.2 For fully enclosed areas below the design flood elevation where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.6.2.1, ASCE 24, construction documents shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.6.2.2, ASCE 24. 1.3 For dry floodproofed nonresidential buildings, construction documents shall include a statement that the dry floodproofing is designed in accordance with ASCE 24.
14	(6) Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the Administrator;	**Appendix G103.6 Watercourse alteration**. Prior to issuing a permit for any alteration or relocation of any watercourse, the building official shall require the applicant to provide notification of the proposal to the appropriate authorities of all affected adjacent government jurisdictions, as well as appropriate state agencies. A copy of the notification shall be maintained in the permit records and submitted to FEMA.
15	(7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;	**Appendix G103.6.1 Engineering analysis**. The building official shall require submission of an engineering analysis which demonstrates that the flood carrying capacity of the altered or relocated portion of the watercourse will not be decreased. Such watercourses shall be maintained in a manner which preserves the channel's flood carrying capacity.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
16	(8) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not 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.	**Appendix G501.1 Elevation (Manufactured Homes).** All new and replacement manufactured homes to be placed or substantially improved 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. **Appendix G501.2 Foundations.** All new and replacement manufactured homes, including substantial improvement of existing manufactured homes, shall be placed on a permanent, reinforced foundation that is designed in accordance with Section 1612 of the building code. **Appendix G501.3 Anchoring.** All new and replacement manufactured homes to be placed or substantially improved 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.
(c) When the Administrator has provided a notice of final flood elevations for one or more special flood hazard areas on the community's FIRM and, if appropriate, has designated other special flood hazard areas without base flood elevations on the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area, the community shall:		
17	(1) Require the standards of paragraph (b) of this section within all A1-30 zones, AE zones, A zones, AH zones, and AO zones, on the community's FIRM;	[Prior provisions cumulative]
18	(2) Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level, unless the community is granted an exception by the Administrator for the allowance of basements in accordance with Sec. 60.6 (b) or (c);	**1603.1.6 Flood design data.** SEE BLOCK 6 **1612.1 General (Flood Loads).** SEE BLOCK 4 **1612.3 General (Flood Loads).** SEE BLOCK 3 **1612.4 Design and construction.** SEE BLOCK 6 **1807.1.2.1 Flood hazard areas.** For buildings and structures in flood hazard areas as established in Section 1612.3, the finished ground level of an underfloor space such as a crawl space shall be equal to or higher than the outside finished ground level. **Exception:** Underfloor spaces of Group R-3 buildings that meet the requirements of FEMA/FIA TB 11-1. **3403.1.1 Flood hazard areas (Existing buildings or structures).** SEE BLOCK 4

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
19	(3) Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's FIRM: (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;	**1603.1.6 Flood design data.** SEE BLOCK 6 **1612.1 General (Flood Loads).** SEE BLOCK 4 **1612.4 Design and construction.** SEE BLOCK 6 **3403.1.1 Flood hazard areas (Existing buildings or structures).** SEE BLOCK 4
20	(4) Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) a registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) a record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under Sec. 59.22(a)(9)(iii);	**104.7 Department records.** **1612.5.1 Flood hazard documentation.** [Flood hazard areas not subject to high-velocity wave action] SEE BLOCK 13 **Appendix G103.8 Records.** SEE BLOCK 1

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
21	(5) Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.	**1202.3.2 [Under-floor ventilation] Exceptions** 5. For buildings in flood hazard areas as established in Section 1612.3, the opening requirements of ASCE 24 are authorized to be satisfied by ventilation openings that are designed and installed in accordance with ASCE 24. **1612.4 Design and construction.** SEE BLOCK 6 **1612.5 Flood hazard documentation.** [Flood hazard areas not subject to high-velocity wave action] SEE BLOCK 13
22	(6) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites: (i) outside of a manufactured home park or subdivision, (ii) in a new manufactured home park or subdivision, (iii) in an expansion to an existing manufactured home park or subdivision, or (iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement.	**Appendix G. Section 501 Manufactured Homes.** SEE BLOCK 16

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
23	(7) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified);	**DESIGN FLOOD ELEVATION** SEE DEFINITIONS **1612.4 Design and construction.** SEE BLOCK 6
24	(8) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of nonresidential structures (i) have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or (ii) together with attendant utility and sanitary facilities be completely floodproofed to that level to meet the floodproofing standard specified in Sec. 60.3(c)(3)(ii);	**DESIGN FLOOD ELEVATION** SEE DEFINITIONS **1603.1.6 Flood design data.** SEE BLOCK 6 **1612.4 Design and construction.** SEE BLOCK 6 **1807.1.2.1 Flood hazard areas.** SEE BLOCK 18 **3403.1.1 Flood hazard areas (Existing buildings or structures).** SEE BLOCK 4
25	(9) Require within any A99 zones on a community's FIRM the standards of paragraphs (a)(1) through (a)(4)(i) and (b)(5) through (b)(9) of this section;	**1603.1.6 Flood design data.** SEE BLOCK 6 **1612.4 Design and construction.** SEE BLOCK 6 **1807.1.2.1 Flood hazard areas.** SEE BLOCK 18 **3403.1.1 Flood hazard areas (Existing buildings or structures).** SEE BLOCK 4
26	(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.	**R106.2.5.1 Design flood elevation.** SEE BLOCK 6 **1803.4 Grading and fill in flood hazard areas.** SEE BLOCK 6 **Appendix G103.4 Activities in riverine flood hazard areas.** In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the building official shall not permit any new construction, substantial improvement or other development, including fill, unless the applicant demonstrates that the cumulative effect of the proposed development, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than one foot at any point within the community.
27	(11) Require within Zones AH and AO, adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.	**Appendix G401.5 Storm drainage.** SEE BLOCK 6

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
28	(12) Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either (i) The lowest floor of the manufactured home is at or above the base flood elevation, or (ii) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.	**Appendix G501 Manufactured Homes.** SEE BLOCK 16
29	(13) Notwithstanding any other provisions of Sec. 60.3, a community may approve certain development in Zones Al-30, AE, and AH, on the community's FIRM which increase the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision, fulfills the requirements for such a revision as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.	**Appendix G103.5 Floodway encroachment.** Prior to issuing a permit for any floodway encroachment, including fill, new construction, substantial improvements and other development or land disturbing activity, the building official shall require submission of a certification, along with supporting technical data, that demonstrates that such development will not cause any increase of the level of the base flood. **Appendix G103.5.1 Floodway revision.** A floodway encroachment that increases the level of the base flood is authorized if the applicant has applied for a conditional FIRM revision and has received the approval of FEMA.
30	(14) Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either (i) Be on the site for fewer than 180 consecutive days, (ii) Be fully licensed and ready for highway use, or (iii) Meet the permit requirements of paragraph (b)(1) of this section and the elevation and anchoring requirements for "manufactured homes" in paragraph (c)(6) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.	**Appendix G601.1 Placement prohibited (Recreational Vehicles).** The placement of recreational vehicles shall not be authorized in flood hazard areas subject to high-velocity wave action and in floodways. **Appendix G601.2 Temporary placement.** Recreational vehicles in flood hazard areas shall be fully licensed and ready for highway use, and shall be placed on a site for less than 180 consecutive days. **Appendix G601.3 Permanent placement.** Recreational vehicles that are not fully licensed and ready for highway use, or that are to be placed on a site for more than 180 consecutive days shall meet the requirements of Section G501 for manufactured homes.
(d) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall:		
31	(1) Meet the requirements of paragraphs (c) (1) through (14) of this section;	[Prior provisions cumulative]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
32	(2) Select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point;	**1612.3 Establishment of flood hazard areas.** SEE BLOCK 3 **Appendix G103.4 Activities in riverine flood hazard areas.** SEE BLOCK 26
33	(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;	**1803.4 Grading and fill in flood hazard areas.** SEE BLOCK 6 **Appendix G103.5 Floodway encroachment.** SEE BLOCK 29 **Appendix G103.5.1 Floodway revision.** SEE BLOCK 29 **Appendix G401.1 Development in floodways.** Development or land disturbing activity shall not be authorized in the floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment will not result in any increase in the level of the base flood. **Appendix J101.2 Flood hazard areas.** The provisions of this chapter shall not apply to grading, excavation and earthwork construction, including fills and embankments, in floodways within flood hazard areas established in Section 1612.3, or in flood hazard areas where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed work will not result in any increase in the level of the base flood.
34	(4) Notwithstanding any other provisions of Sec. 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.	**1803.4 Grading and fill in flood hazard areas.** SEE BLOCK 6 **Appendix G103.5.1 Floodway revision.** SEE BLOCK 29
(e) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified on the community's FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall.		
35	(1) Meet the requirements of paragraphs (c)(1) through (14) of this section;	[Prior provisions cumulative]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
36	(2) Within Zones V1-30, VE, and V on a community's FIRM, (i) obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and (ii) maintain a record of all such information with the official designated by the community under Sec. 59.22(a)(9)(iii);	**104.7 Department records** **1603.1.6 Flood design data.** SEE BLOCK 6 **1612.1 General (Flood Loads).** SEE BLOCK 4 **1612.5 Flood hazard documentation.** The following documentation shall be prepared and sealed by a registered design professional and shall be submitted to the building official: 2. For construction in flood hazard areas subject to high-velocity wave action: 2.1 The elevation of the bottom of the lowest horizontal structural member as required by the lowest floor elevation inspection in Section 109.3.3. 2.2 Construction documents shall include a statement that the building is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16. 2.3 For breakaway walls designed to resist a nominal load of less that 10 psf (0.48 kN/m^2) or more than 20 psf (0.96 kN/m^2), construction documents shall include a statement that the breakaway wall is designed in accordance with ASCE 24. **Appendix G103.8 Records.** SEE BLOCK 1 **Appendix G501 Manufactured Homes.** SEE BLOCK 16
37	(3) Provide that all new construction within Zones V1-30, VE, and V on the community's FIRM is located landward of the reach of mean high tide;	**Appendix G401.2 Flood hazard areas subject to high-velocity wave action.** *In flood hazard areas subject to high-velocity wave action:* 1. *New buildings and buildings that are substantially improved* shall only be authorized landward of the reach of mean high tide. 2. The use of fill for structural support of buildings is prohibited.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
38	(4) Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4)(i) and (ii) of this section.	**109.3.3 Lowest floor elevation**. SEE BLOCK 13 **1603.1.6 Flood design data.** SEE BLOCK 6 **1605.2.2 Other loads.** SEE BLOCK 6 **1605.3.1.2 Other loads.** SEE BLOCK 6 **1612.4 Design and construction.** SEE BLOCK 6 **1612.5 Flood hazard documentation.** [Flood hazard areas subject to high-velocity wave action] SEE BLOCK 36

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
39	(5) Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions: (i) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and, (ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural). Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.	**1403.7 Flood resistance for high-velocity wave action areas.** For buildings in flood hazard areas subject to high-velocity wave action as established in Section 1612.3, electrical, mechanical, and plumbing system components shall not be mounted on or penetrate through exterior walls that are designed to break away under flood loads. **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 ASCE 24. **1612.5.2 Flood hazard documentation.** [Flood hazard areas subject to high-velocity wave action] SEE BLOCK 36 [For utility components, see Appendix D for texts from IMC and IPC.]
40	(6) Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM;	**1803.4 Grading and fill in flood hazard areas.** SEE BLOCK 6 **Appendix G401.2 Flood hazard areas subject to high-velocity wave action.** SEE BLOCK 37

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
41	(7) Prohibit man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage.	**Appendix G103.7 Alterations in coastal areas.** Prior to issuing a permit for any alteration of sand dunes and mangrove stands in flood hazard areas subject to high-velocity wave action, the building official shall require submission of an engineering analysis which demonstrates that the proposed alteration will not increase the potential for flood damage.
42	(8) Require that manufactured homes placed or substantially improved within Zones V1-30, V, and VE on the community's FIRM on sites (i) Outside of a manufactured home park or subdivision, (ii) In a new manufactured home park or subdivision, (iii) In an expansion to an existing manufactured home park or subdivision, or (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, meet the standards of paragraphs (e)(2) through (7) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones VI-30, V, and VE on the community's FIRM meet the requirements of paragraph (c)(12) of this section.	**Appendix G501. Manufactured Homes.** SEE BLOCK 16
43	(9) Require that recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either (i) Be on the site for fewer than 180 consecutive days, (ii) Be fully licensed and ready for highway use, or (iii) Meet the requirements in paragraphs (b)(1) and (e) (2) through (7) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.	**Appendix G601. Recreational Vehicles.** SEE BLOCK 30

NFIP Regulations		2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
Sec. 60.6 Variance and exceptions		
44	(a) The Administrator does not set forth absolute criteria for granting variances from the criteria set forth in Secs. 60.3, 60.4, and 60.5. The issuance of a variance is for flood plain management purposes only. Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance. The community, after examining the applicant's hardships, shall approve or disapprove a request. While the granting of variances generally is limited to a lot size less than one-half acre (as set forth in paragraph (a)(2) of this section), deviations from that limitation may occur. However, as the lot size increases beyond one-half acre, the technical justification required for issuing a variance increases. The Administrator may review a community's findings justifying the granting of variances, and if that review indicates a pattern inconsistent with the objectives of sound flood plain management, the Administrator may take appropriate action under Sec. 59.24(b) of this subchapter.	**Appendix G105.1 General (Variances).** The board of appeals established pursuant to Section 112 shall hear and decide requests for variances. The board of appeals shall base its determination on technical justifications, and has the right to attach such conditions to variances as it deems necessary to further the purposes and objectives of this appendix and Section 1612. **Appendix G105.6 Considerations.** In reviewing applications for variances, the board of appeals shall consider all technical evaluations, all relevant factors, all other portions of this appendix, and the following: 1. The danger that materials and debris may be swept onto other lands resulting in further injury or damage; 2. The danger to life and property due to flooding or erosion damage; 3. The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners; 4. The importance of the services provided by the proposed development to the community; 5. The availability of alternate locations for the proposed development that are not subject to flooding or erosion; 6. The compatibility of the proposed development with existing and anticipated development; 7. The relationship of the proposed development to the comprehensive plan and floodplain management program for that area; 8. The safety of access to the property in times of flood for ordinary and emergency vehicles; 9. The expected heights, velocity, duration, rate of rise, and debris and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site, and; 10. 10. The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems, streets and bridges.
45	Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.	**Appendix G105.3 Historic structures**. A variance is authorized to be issued for the repair or rehabilitation of a historic structure upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure, and the variance is the minimum necessary to preserve the historic character and design of the structure. **Exception:** Within flood hazard areas, historic structures that are not: 1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or 2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or 3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
46	Procedures for the granting of variances by a community are as follows: (1) Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result;	**Appendix G105.5 Restrictions.** The board of appeals shall not issue a variance for any proposed development in a floodway if any increase in flood levels would result during the base flood discharge.
47	(2) Variances may be issued by a community for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, in conformance with the procedures of paragraphs (a) (3), (4), (5) and (6) of this section;	**Appendix G105.1 General (Variances).** SEE BLOCK 44 **Appendix G105.6 Considerations.** SEE BLOCK 44
48	(3) Variances shall only be issued by a community upon: (i) a showing of good and sufficient cause, (ii) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances;	**Appendix G105.7 Conditions for issuance.** Variances shall only be issued by the board of appeals upon: 1. A technical showing of good and sufficient cause that the unique characteristics of the size, configuration, or topography of the site renders the elevation standards inappropriate; and 2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable; and 3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances; and 4. A determination that the variance is the minimum necessary, considering the flood hazard, to afford relief; and 5. 5. Notification to the applicant in writing over the signature of the building official that the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage, and that such construction below the base flood level increases risks to life and property.
49	(4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief;	**Appendix G105.7 Conditions for issuance.** BLOCK 48

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IBC®.

	NFIP Regulations	2006 IBC® and Appendix G *[annotated with 2007 Supplement]*
50	(5) A community shall notify the applicant in writing over the signature of a community official that (i) the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage and (ii) such construction below the base flood level increases risks to life and property. Such notification shall be maintained with a record of all variance actions as required in paragraph (a)(6) of this section; and	**Appendix G105.7 Conditions for issuance.** SEE BLOCK 48
51	(6) A community shall (i) maintain a record of all variance actions, including justification for their issuance, and (ii) report such variances issued in its annual or biennial report submitted to the Administrator.	**Appendix G105.2 Records.** The building official shall maintain a permanent record of all variance actions, including justification for their issuance.
52	(7) Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that (i) the criteria of paragraphs (a)(1) through (a)(4) of this section are met, and (ii) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.	**Appendix G105.4 Functionally dependant facilities.** A variance is authorized to be issued for the construction or substantial improvement of a functionally dependant facility provided the criteria in Section 1612.1 are met and the variance is the minimum necessary to allow the construction or substantial improvement, and that all due consideration has been given to methods and materials that minimize flood damages during the design flood and create no additional threats to public safety.

Appendix C. Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
Sec. 59.1 Definitions	
BASE FLOOD. Base flood means the flood having a one percent chance of being equaled or exceeded in any given year.	**R301.2.4 Floodplain construction.** SEE BLOCK 3 **Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.** SEE BLOCK 3 **R324.1.3 Establishing the design flood elevation.** SEE BLOCK 12
BASEMENT. Any area of the building having its floor subgrade (below ground level) on all sides.	**R324.1.4 Lowest floor.** SEE BLOCK 28 **R324.2.1 [Flood hazard areas (including A Zones)] Elevation requirements.** SEE BLOCK 18 **R324.3.2 [Coastal flood hazard areas (including V Zones)] Elevation requirements.** SEE BLOCK 36 **R408.5 [Under-Floor Space] Finished grade.** SEE BLOCK 18
DEVELOPMENT. 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.	**R101.2 Scope.** **R105.1 Permits required.** **R105.2 Work exempt from permit.** **R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4
EXISTING CONSTRUCTION (EXISTING STRUCTURES). For the purposes of determining rates, structures for which the "start of construction" commenced before the effective date of the FIRM or before January 1, 1975, for FIRMs effective before that date. "Existing construction" may also be referred to as "existing structures."	**R102.7.2 [Existing Structures] Additions, alterations or repairs.** SEE BLOCK 4 **BUILDING, EXISTING** in Chapter 2.
FLOOD OR FLOODING. (a) A general and temporary condition of partial or complete inundation of normally dry land areas from: (1) The overflow of inland or tidal waters. (2) The unusual and rapid accumulation or runoff of surface waters from any source.	[General usage throughout.]
FLOOD INSURANCE RATE MAP (FIRM). An official map of a community, on which the Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community.	**R301.2.4 Floodplain construction. Exception.** SEE BLOCK 3 **Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.** SEE BLOCK 3
FLOODWAY – See **REGULATORY FLOODWAY.**	**R301.2.4 Floodplain construction. Exception.** SEE BLOCK 3 **Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.** SEE BLOCK 3
HIGHEST ADJACENT GRADE. The highest natural elevation of the ground surface prior to construction next to the proposed walls of a structure.	**R324.2.1 [Flood hazard areas (including A Zones)] Elevation requirements.** SEE BLOCK 18

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
HISTORIC STRUCTURE. Any structure that is: (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register; (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or (d) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either: (1) By an approved state program as determined by the Secretary of the Interior or (2) Directly by the Secretary of the Interior in states without approved programs.	[Not explicitly defined; refer to definition in IBC.]
LOWEST FLOOR. The lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; *Provided,* that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of Sec. 60.3.	**R309.5 [Garages and Carports] Flood hazard areas.** SEE BLOCK 21 **R324.1.4 Lowest floor.** SEE BLOCK 18
MANUFACTURED HOME. 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 "manufactured home" does not include a "recreational vehicle."	**Chapter 2, MANUFACTURED HOME.** **Appendix E Manufactured Housing Used as Dwellings.**
MANUFACTURED HOME PARK OR SUBDIVISION. A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.	[Subdivision of land not addressed in IRC; see IBC Appendix G.]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
RECREATIONAL VEHICLE. A vehicle which is: (a) built on a single chassis; (b) 400 square feet or less when measured at the largest horizontal projection; (c) designed to be self-propelled or permanently towable by a light duty truck; and (d) designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.	**R107 Temporary structures and uses.**
REGULATORY FLOODWAY. The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.	See **FLOODWAY.**
REMEDY A VIOLATION. To bring the structure or other development into compliance with State or local flood plain management regulations, or, if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations, or reducing Federal financial exposure with regard to the structure or other development.	**R113 Violations.**
STRUCTURE. For flood plain management purposes, a walled and roofed building, including a gas or liquid storage tank, that is principally above ground, as well as a manufactured home. "Structure" for insurance coverage purposes, means a walled and roofed building, other than a gas or liquid storage tank, that is principally above ground and affixed to a permanent site, as well as a manufactured home on a permanent foundation. For the latter purpose, the term includes a building while in the course of construction, alteration or repair, but does not include building materials or supplies intended for use in such construction, alteration or repair, unless such materials or supplies are within an enclosed building on the premises.	**R102.1 Scope.** **R105.2 Work exempt from permit.** **Appendix E Manufactured Housing Used as Dwellings.**
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.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
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 which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or (2) Any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a "historic structure."		**R102.7.1 [Existing structures] Additions, alterations or repairs.** **R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R108.3 Building permit valuations.**
VARIANCE. A grant of relief by a community from the terms of a flood plain management regulation.		**R104.10.1 [Modifications] Areas prone to flooding.** BLOCK 44 **R112.2.2 Criteria for issuance of a variance for flood hazard areas.** SEE BLOCK 47
VIOLATION. The failure of a structure or other development to be fully compliant with the community's flood plain management regulations. A structure or other development without the elevation certificate, other certifications, or other evidence of compliance required in Sec. 60.3(b)(5), (c)(4), (c)(10), (d)(3), (e)(2), (e)(4), or (e)(5) is presumed to be in violation until such time as that documentation is provided.		**R113 Violations.**
Sec. 59.22 [This section outlines actions to be taken by communities to be eligible for the Program, including application procedures, documentation requirements, and a commitment to fulfill certain functions and responsibilities.]		
1	(a)(9)(iii) Maintain for public inspection and furnish upon request certificates of elevation and certificates of floodproofing.	**R104.7 Department records.**
2	(b)(1) Appoint the agency or official with the responsibility, authority, and means to implement the commitments, including certain reporting requirements.	**R103 Department of Building Safety.** **R104 Duties and Powers of Code Official.**

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
Sec. 60.2 Minimum compliance with flood plain management criteria. [Sections (a) through (c) pertain to meeting specific criteria set forth herein, as a function of the type of flood-related hazard and the level of detail provided on the flood hazard map prepared by FEMA. Section (e) provides for coordination with State Coordinating Agencies with respect to submission of regulations for participation in the NFIP; Section (f) addresses the community function to submit reports periodically, when requested; and Section (g) directs communities to assure that their comprehensive plans are consistent with floodplain management objectives.]		
3	(h) The community shall adopt and enforce floodplain management regulations based on data provided by the Administrator. Without prior approval of the Administrator, the community shall not adopt and enforce floodplain management regulations based upon modified data reflecting natural or man-made changes.	**R301.2.4 Floodplain construction.** Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table R301.2(1) shall be designed and constructed in accordance with Section R324. **Exception:** Buildings and structures in identified floodways established in Table R301.2(1) shall be designed and constructed *in accordance with Flood Resistant Design and Construction (ASCE 24)*. **Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.** The jurisdiction shall 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 dates(s) of the currently effective FIRM and FBFM, or other flood hazard map adopted by the community, as may be amended. **R324.1 General.** Buildings and structures constructed in whole or in part in flood hazard areas (including A or V Zones) as established in Table 301.2(1) shall be designed and constructed with the provisions in this section. **Exception:** Buildings and structures located in whole or in part in identified floodways shall be designed and constructed *in accordance with ASCE 24*.
Sec. 60.3 Floodplain management criteria for flood-prone areas. (a) When the Administrator has not defined the special flood hazard areas within a community, has not provided water surface elevation data, and has not provided sufficient data to identify the floodway or coastal high hazard area, but the community has indicated the presence of such hazards by submitting an application to participate in the Program, the community shall:		
4	(1) Require permits for all proposed construction or other development, including the placement of manufactured homes, to determine whether such development is proposed within flood hazard areas;	**R101.2 Scope.** **R102.7.1 [Existing structures] Additions, alterations or repairs.** Additions, alterations or repairs to any structure shall conform to that required for a new structure without requiring the existing structure to comply with all of the requirements of this code, unless otherwise stated. Additions, alterations or repairs shall not cause an existing structure to become unsafe or adversely affect the performance of the building. **R105.2 Work exempt from permit.** **R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding.** For applications for reconstruction, rehabilitation, addition, or other improvement of existing buildings or structures located in an area prone to flooding as established by Table R301.2(1), the building official shall examine or cause to be examined the construction documents and shall prepare a finding with regard to the value of the proposed work. For buildings that have sustained damage of any origin, the value of the proposed work shall include the cost to repair the building or structure to its predamage condition. If the building official finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the finding shall be provided to the board of appeals for a determination of substantial improvement or substantial damage. Applications determined by the board of appeals to constitute substantial improvement or substantial damage shall *require all existing portions of the entire building or structure to* meet the requirements of Section R324.

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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
4 **continued from previous page**		**R106.1.3 Information for construction in areas prone to flooding.** 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 4. If design flood elevations are not included on the community's Flood Insurance Rate Map (FIRM), the code official and the applicant shall obtain and reasonably utilize any design flood elevation and floodway data available from other sources. **R301.2.4 Floodplain construction.** SEE BLOCK 3 **Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.**. SEE BLOCK 3 **R324.2 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. All buildings and structures constructed in whole or in part in flood hazard areas shall be designed and constructed in accordance with Sections R324.2.1 through R324.2.3. **Appendix E Manufactured Housing, Section AE101 Scope. Exception:** In addition to these provisions, new and replacement manufactured homes to be located in flood hazard areas as established by Table R301.2(1) of the *International Residential Code* shall meet the applicable requirements of Section R324 of the *International Residential Code.* **Appendix J Existing Buildings and Structures, Section AJ102.5 Flood hazard areas.** Work performed in existing buildings located in a flood hazard area as established by Table 301.2(1) shall be subject to the provisions of R105.3.1.1.
5	(2) Review proposed development to assure that all necessary permits have been received from other governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 U.S.C. 1334;	**R105.3.1 (Permits) Action on application.**

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
6	(3) Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall: (i) be designed (or modified) and adequately anchored to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, (ii) be constructed with materials resistant to flood damage, (iii) be constructed by methods and practices that minimize flood damages, and (iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R301.1 Design.** Buildings and structures, and all parts thereof, shall be constructed to support safely all loads, including dead loads, live loads, roof loads, flood loads, snow loads, wind loads and seismic loads as prescribed in this code. The construction of buildings and structures shall result in a system that provides a complete load path capable of transferring all loads from their point of origin through the load-resisting elements to the foundation. **R301.2.4 Floodplain construction.** SEE BLOCK 3 **R324.1 [Flood Resistant Construction] General. Exception.** [Refers to IBC for floodway construction.) SEE BLOCK 3 **R324.1.1 Structural systems.** All structural systems of all buildings and structures shall be designed, connected and anchored to resist flotation, collapse or permanent lateral movement due to structural loads and stresses from flooding equal to the design flood elevation. **R324.1.2 Flood-resistant construction.** All buildings and structures erected in areas prone to flooding shall be constructed by methods and practices that minimize flood damage. **R324.1.5 Protection of mechanical, plumbing and electrical systems.** Electrical systems, equipment and components, and heating, ventilating, air conditioning, and plumbing appliances, plumbing fixtures, duct systems, and other service equipment shall be located at or above the design flood elevation. If replaced as part of a substantial improvement, electrical systems, equipment and components, and heating, ventilation, air conditioning, and plumbing appliances, plumbing fixtures, duct systems, and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads. **Exception:** Electrical systems, equipment and components, and heating, ventilating, air conditioning, and plumbing appliances, plumbing fixtures, duct systems, and other service equipment are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood-resistant construction requirements of *ASCE 24*. Electrical wiring systems are permitted to be located below the design flood elevation provided they conform to the provisions of the electrical part of this code for wet locations.
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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
6 **continued from previous page**		**R324.1.7 Flood-resistant materials.** Building materials used below the design flood elevation shall comply with the following: 1. All wood, including floor sheathing, shall be pressure preservatively treated in accordance with AWPA U1 for the species, product, preservative and end use or the decay-resistant heartwood or redwood, black locust, or cedars. Preservatives shall conform to AWPA P1/13, P2, P3 or P5. 2. Materials and installation methods used for flooring and interior and exterior walls and wall coverings shall conform to the provisions of FEMA/FIA-TB-2. **R324.2.3 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 inches (152 mm) plain masonry walls shall be no greater than 3 feet (914 mm). 2. The unsupported height of 8 inches (203 mm) plain masonry walls shall be no greater than 4 feet (1219 mm). 3. The unsupported height of 8 inches (203 mm) reinforced masonry walls shall be no greater than 8 feet (2438 mm). For the purpose of this exception, unsupported height is the distance from the finished grade to the under-floor space and the top of the wall. **R401.1 [Foundations] Application.** The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for all buildings. In addition to the provisions of this chapter, the design and construction of foundations in areas prone to flooding as established by Table R301.2(1) shall meet the provisions of Section R324. **M1401.5 Flood hazard.** In areas prone to flooding as established by Table R301.2(1), heating and cooling equipment and appliances shall be located or installed in accordance with Section R324.1.5 **M1601.3.8 Flood hazard areas.** In areas prone to flooding as established by Table R301.2(1), duct systems shall be located or installed in accordance with Section R324.1.5 **M1701.6 [Combustion air] Opening location.** In areas prone to flooding as established by Table R301.2(1), openings shall be located at or above the design flood elevation established in Section R324. **M2001.3 Flood resistant installation.** In areas prone to flooding as established in Table R301.2(1), boilers, water heaters, and their control systems shall be located or installed in accordance with Section R324.1.5.
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Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
6 **continued from previous page**		**G2404.7 (301.11) Flood hazard.** For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located or installed at or above the design flood elevation and shall comply with the flood-resistant construction requirement of Section R324. **Exception:** The appliance, equipment and system installations regulated by this code are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation and shall comply with the flood-resistant construction requirements of Section R324. **M2201.6 Flood resistant installation.** In areas prone to flooding as established by Table R301.2(1), tanks shall be installed at or above the design flood elevation established in Section R324 or shall be anchored to prevent flotation, collapse and lateral movement under conditions of the design flood. **G2404.7 (301.11) Flood hazard.** For structures located in areas prone to flooding as established by Table R301.2(1), the appliance, equipment and system installations regulated by this code shall be located or installed in accordance with Section R324.1.5. **P2601.3 Flood hazard area.** In areas prone to flooding as established by Table R301.2(1), plumbing fixtures, drains, and appliances shall be located or installed in accordance with Section R324.1.5. **P2705.1 General.** 7. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R324.1.5. **P3001.3 Flood resistant installation.** In areas prone to flooding as established by Table R301.2(1), drainage waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters. **P3101.5 Flood resistance.** In areas prone to flooding as established by Table R301.2(1), vents shall be located at or above the design flood elevation established in Sec. R324. **Appendix E Manufactured Housing, Section AE502.3 Footings and foundations.** Piers and bearing walls shall be supported on masonry or concrete foundations or piles or other approved foundation systems which shall be of sufficient capacity to support all loads.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
7	(4) Review subdivision proposals and other proposed new development, including manufactured home parks or subdivisions, to determine whether such proposals will be reasonably safe from flooding. If a subdivision proposal or other proposed new development is in a flood-prone area, any such proposals shall be reviewed to assure that: (i) all such proposals are consistent with the need to minimize flood damage within the flood-prone area, (ii) all public utilities and facilities, such as sewer, gas, electrical, and water systems are located and constructed to minimize or eliminate flood damage, and (iii) adequate drainage is provided to reduce exposure to flood hazards;	[Subdivision of land not addressed in IRC; see IBC Appendix G.] **R324.1.6 Protection of water supply and sanitary sewage systems.** New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the systems in accordance with the plumbing provisions of this code. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into systems and discharges from systems into floodwaters in accordance with the plumbing provisions of this code and Chapter 3 of the *International Private Sewage Disposal Code*.
8	(5) Require within flood-prone areas new and replacement water supply systems to be designed to minimize or eliminate infiltration of flood waters into the systems; and	**R324.1.6 Protection of water supply and sanitary sewage systems.** SEE BLOCK 7 **P2602.2 Flood resistant installation.** In areas prone to flooding as established by Table R301.2(1): 1. Water-supply systems shall be designed and constructed to prevent infiltration of floodwaters. 2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.
9	(6) Require within flood-prone areas: (i) new and replacement sanitary sewage systems to be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and (ii) onsite waste disposal systems to be located to avoid impairment to them or contamination from them during flooding.	**R324.1.6 Protection of water supply and sanitary sewage systems.** SEE BLOCK 7

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
(b) When the Administrator has designated areas of special flood hazards (A zones) by the publication of a community's FHBM or FIRM, but has neither produced water surface elevation data nor identified a floodway or coastal high hazard area, the community shall:		
10	(1) Require permits for all proposed construction and other developments including the placement of manufactured homes, within Zone A on the community's FHBM or FIRM; (2) Require the application of the standards in paragraphs (a) (2), (3), (4), (5) and (6) of this section to development within Zone A on the community's FHBM or FIRM;	[Prior provisions cumulative.]
11	(3) Require that all new subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is the lesser, include within such proposals base flood elevation data;	[Subdivision of land not addressed in IRC; see IBC Appendix G.]
12	(4) Obtain, review and reasonably utilize any base flood elevation and floodway data available from a Federal, State, or other source, including data developed pursuant to paragraph (b)(3) of this section, as criteria for requiring that new construction, substantial improvements, or other development in Zone A on the community's FHBM or FIRM meet the standards in paragraphs (c)(2), (c)(3), (c)(5), (c)(6), (c)(12), (c)(14), (d)(2) and (d)(3) of this section;	**R106.1.3(3) Information for construction in areas prone to flooding.** SEE BLOCK 4 **R324.1.3 Establishing the design flood elevation.** The design flood elevation shall be used to define areas prone to flooding, and shall describe, at a minimum, the base flood elevation at the depth of peak elevation of flooding (including wave height) which has a 1 percent (100–year flood) or greater chance of being equaled or exceeded in any given year. **R324.1.3.1 Determination of design flood elevations.** If design flood elevations are not specified, the building official is authorized to require the applicant to: 1. Obtain and reasonably utilize data available from a federal, state or other source, or 2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a registered design professional who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses, and computations shall be submitted in sufficient detail to allow thorough review and approval. **R324.1.3.2 Determination of impacts.** In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall demonstrate that the effect of the proposed buildings and structures on design flood elevations, including fill, when combined with all other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than one foot at any point within the jurisdiction.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
13	(5) Where base flood elevation data are utilized, within Zone A on the community's FHBM or FIRM: (i) Obtain the elevation (in relation to mean sea level) of the lowest floor (including basement) of all new and substantially improved structures, and (ii) Obtain, if the structure has been floodproofed in accordance with paragraph (c)(3)(ii) of this section, the elevation (in relation to mean sea level) to which the structure was floodproofed, and (iii) Maintain a record of all such information with the official designated by the community under Sec. 59.22 (a)(9)(iii);	**R104.7 Department records** **R109.1.3 Floodplain inspections**. For construction in areas prone to flooding as established by Table 301.2(1), upon placement of the lowest floor, including basement, and prior to further vertical construction, the building official shall require submission of documentation, prepared and sealed by a registered design professional, of the elevation of the lowest floor, including basement, required in Section R324. **R324.1.9 As-built elevation documentation.** A registered design professional shall prepare and seal documentation of the elevations specified in Section R324.2 or R324.3. [NFIP requirement 60.3(b)(5)(ii) applies to non-residential construction; see IBC.]
14	(6) Notify, in riverine situations, adjacent communities and the State Coordinating Office prior to any alteration or relocation of a watercourse, and submit copies of such notifications to the Administrator;	[Not addressed in IRC, see IBC Appendix G.]
15	(7) Assure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained;	[Not addressed in IRC, see IBC Appendix G.]
16	(8) Require that all manufactured homes to be placed within Zone A on a community's FHBM or FIRM shall be installed using methods and practices which minimize flood damage. For the purposes of this requirement, manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement. Methods of anchoring may include, but are not 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.	**R324.1.8 Manufactured housing.** New or replacement manufactured housing shall be elevated in accordance with Section R324.2 and the anchor and tie-down requirements of Sections AE604 and AE605 of Appendix E shall apply. The foundation and anchorage of manufactured housing to be located in identified floodways as established in Table R301.2(1) shall be designed and constructed in accordance with the applicable provisions in the *International Building Code.* **Appendix E Manufactured Housing, Section AE101 Exception** SEE BLOCK 4

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
(c) When the Administrator has provided a notice of final flood elevations for one or more special flood hazard areas on the community's FIRM and, if appropriate, has designated other special flood hazard areas without base flood elevations on the community's FIRM, but has not identified a regulatory floodway or coastal high hazard area, the community shall:		
17	(1) Require the standards of paragraph (b) of this section within all A1-30 zones, AE zones, A zones, AH zones, and AO zones, on the community's FIRM;	[Prior provisions cumulative.]
18	(2) Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (including basement) elevated to or above the base flood level, unless the community is granted an exception by the Administrator for the allowance of basements in accordance with Sec. 60.6 (b) or (c);	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.2.1 [Flood hazard areas (including A Zones)] Elevation requirements.** 1. Buildings and structures shall have the lowest floors elevated to or above the design flood elevation. 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 (mm) on the FIRM, or at least 2 feet (51 mm) if a depth number is not specified. 3. 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 R324.2.2. **R324.1.4 Lowest floor.** The lowest floor shall be the floor of the lowest enclosed area, including basement, but excluding any unfinished flood-resistant enclosure that is useable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the building or structure in violation of this section. **R408.5 (Under-Floor Space) Finished grade.** . . . where there is evidence that the surface water does not readily drain from the building site, the grade in the under-floor space shall be as high as the outside finished grade, unless an approved drainage system is provided. **Appendix J Existing Buildings and Structures, Section AJ102.5 Flood hazard areas.** SEE BLOCK 4

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
19	(3) Require that all new construction and substantial improvements of non-residential structures within Zones A1-30, AE and AH zones on the community's FIRM: (i) have the lowest floor (including basement) elevated to or above the base flood level or, (ii) together with attendant utility and sanitary facilities, be designed so that below the base flood level the structure is watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;	[NFIP requirement 60.3(c)(3) applies to non-residential construction, see IBC.]
20	(4) Provide that where a non-residential structure is intended to be made watertight below the base flood level, (i) A registered professional engineer or architect shall develop and/or review structural design, specifications, and plans for the construction, and shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the applicable provisions of paragraph (c)(3)(ii) or (c)(8)(ii) of this section, and (ii) A record of such certificates which includes the specific elevation (in relation to mean sea level) to which such structures are floodproofed shall be maintained with the official designated by the community under Sec. 59.22(a)(9)(iii);	[NFIP requirement 60.3(c)(4) applies to non-residential construction, see IBC.]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
21	(5) Require, for all new construction and substantial improvements, that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered professional engineer or architect or meet or exceed the following minimum criteria: A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R309.5 [Garages] Flood hazard areas.** For buildings located in flood hazard areas as established by Table 301.2(1), garage floors shall be: 1. Elevated to or above the design flood elevation as determined in Section R324; or 2. Located below the design flood elevated provided they are at or above grade on at least one side, are used solely for parking, building access, or storage, meet the requirements of Section R324, and are otherwise constructed in accordance with this code. **R324.2.2 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 which shall 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 that the design and installation will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters. 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. **R408.6 [Under-Floor Space] Flood resistance.** For buildings located in areas prone to flooding as established in Table R301.2(1): 1. Walls enclosing the underfloor space shall be provided with flood openings in accordance with Section R324.2.2. 2. The finished ground level of the underfloor space shall be equal to or higher than the outside finished ground level. **Exception:** Underfloor spaces that meet the requirements of FEMA/FIA TB 11-1. [TB 11-1 is *Crawl Space Construction in Special Flood Hazard Areas*]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
22	(6) Require that manufactured homes that are placed or substantially improved within Zones A1-30, AH, and AE on the community's FIRM on sites: (i) Outside of a manufactured home park or subdivision, (ii) In a new manufactured home park or subdivision, (iii) In an expansion to an existing manufactured home park or subdivision, or (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation collapse and lateral movement.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.1.8 Manufactured housing.** SEE BLOCK 16 **Appendix E Manufactured Housing, Section AE101, Exception** SEE BLOCK 4
23	(7) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of residential structures have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified);	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.2.1 [Flood hazard areas (including A Zones)] Elevation requirements.** SEE BLOCK 18
24	(8) Require within any AO zone on the community's FIRM that all new construction and substantial improvements of nonresidential structures (i) have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified), or (ii) together with attendant utility and sanitary facilities be completely floodproofed to that level to meet the floodproofing standard specified in Sec. 60.3(c)(3)(ii);	[NFIP requirement 60.3(c)(8) applies to non-residential construction, see IBC.]

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
25	(9) Require within any A99 zones on a community's FIRM the standards of paragraphs (a)(1) through (a)(4)(i) and (b)(5) through (b)(9) of this section;	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.2.1 [Flood hazard areas (including A Zones)] Elevation requirements.** SEE BLOCK 18
26	(10) Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.	**R106.1.3 Information for construction in areas prone to flooding.** SEE BLOCK 4
27	(11) Require within Zones AH and AO, adequate drainage paths around structures on slopes, to guide floodwaters around and away from proposed structures.	**R401.3 [Foundations] Drainage.** Surface drainage shall be diverted to a storm sewer connection or other approved point of collection so as to not create a hazard. Lots shall be graded so as to drain surface water away from foundation walls. . . .
28	(12) Require that manufactured homes to be placed or substantially improved on sites in an existing manufactured home park or subdivision within Zones A-1-30, AH, and AE on the community's FIRM that are not subject to the provisions of paragraph (c)(6) of this section be elevated so that either: (i) The lowest floor of the manufactured home is at or above the base flood elevation, or (ii) The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and be securely anchored to an adequately anchored foundation system to resist floatation, collapse, and lateral movement.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.1.8 Manufactured housing.** SEE BLOCK 16 **Appendix E Manufactured Housing, Section AE101.1 General. Exception.** SEE BLOCK 4

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
29	(13) Notwithstanding any other provisions of Sec. 60.3, a community may approve certain development in Zones Al-30, AE, and AH, on the community's FIRM which increase the water surface elevation of the base flood by more than one foot, provided that the community first applies for a conditional FIRM revision, fulfills the requirements for such a revision as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.	[Not addressed in IRC, see IBC Appendix G.]
30	(14) Require that recreational vehicles placed on sites within Zones A1-30, AH, and AE on the community's FIRM either (i) Be on the site for fewer than 180 consecutive days, (ii) Be fully licensed and ready for highway use, or (iii) Meet the permit requirements of paragraph (b)(1) of this section and the elevation and anchoring requirements for "manufactured homes" in paragraph (c)(6) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.	**R107 Temporary structures.**
(d) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AO zones, AH zones, A99 zones, and A zones on the community's FIRM, and has provided data from which the community shall designate its regulatory floodway, the community shall:		
31	(1) Meet the requirements of paragraphs (c) (1) through (14) of this section;	[Prior provisions cumulative.]
32	(2) Select and adopt a regulatory floodway based on the principle that the area chosen for the regulatory floodway must be designed to carry the waters of the base flood, without increasing the water surface elevation of that flood more than one foot at any point;	**Table R301.2(1) Climatic and Geographic Design Criteria. Flood Hazards.** SEE BLOCK 3

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
33	(3) Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge;	**R106.1.3 Information for construction in areas prone to flooding.** SEE BLOCK 4 **R301.2.4 Floodplain construction. Exception.** SEE BLOCK 3
34	(4) Notwithstanding any other provisions of Sec. 60.3, a community may permit encroachments within the adopted regulatory floodway that would result in an increase in base flood elevations, provided that the community first applies for a conditional FIRM and floodway revision, fulfills the requirements for such revisions as established under the provisions of Sec. 65.12, and receives the approval of the Administrator.	[IRC not applicable to floodway construction; refer to IBC.]
(e) When the Administrator has provided a notice of final base flood elevations within Zones A1-30 and/or AE on the community's FIRM and, if appropriate, has designated AH zones, AO zones, A99 zones, and A zones on the community's FIRM, and has identified on the community's FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall:		
35	(1) Meet the requirements of paragraphs (c)(1) through (14) of this section;	[Prior provisions cumulative.] ***R301.2.4.1 Alternative provisions.*** *As an alternative to the requirements in Section R324.3 for buildings and structures located in whole or in part in coastal high-hazard areas (V Zones), ASCE 24 is permitted subject to the limitations of this code and the limitations therein.*

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
36	(2) Within Zones V1-30, VE, and V on a community's FIRM, (i) obtain the elevation (in relation to mean sea level) of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and (ii) maintain a record of all such information with the official designated by the community under Sec. 59.22(a)(9)(iii);	**R104.7 Department records.** **R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R106.1.3 Information for construction in areas prone to flooding.** SEE BLOCK 13 **R109.1.3 Floodplain inspections.** SEE BLOCK 13 **R324.1.9 As-built elevation documentation.** SEE BLOCK 13 **R324.3 Coastal high-hazard areas (including V Zones).** 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. All buildings and structures constructed in whole or in part in coastal high-hazard areas shall be designated and constructed in accordance with Sections R324.3.1 through R324.3.6. **R324.3.2 [Coastal high-hazard areas (including V Zones)] 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 located at or above the design flood elevation. 2. Basement floors that are below grade on all sides are prohibited. 3. The use of fill for structural support is prohibited. 4. The placement of fill beneath buildings and structures is prohibited. **Exception:** Walls and partitions enclosing areas below the design flood elevation shall meet the requirements of Sections R324.3.4 and R324.3.5.
37	(3) Provide that all new construction within Zones V1-30, VE, and V on the community's FIRM is located landward of the reach of mean high tide;	**R324.3.1 Location and site preparation.** 1. *New buildings and buildings that are determined to be substantially improved pursuant to Section 105.3.1.1,* shall be located landward of the reach of mean high tide. 2. Site preparations shall not alter sand dunes and mangrove stands if an engineering analysis demonstrates that the potential for flood damage is increased.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
38	(4) Provide that all new construction and substantial improvements in Zones V1-30 and VE, and also Zone V if base flood elevation data is available, on the community's FIRM, are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level; and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. A registered professional engineer or architect shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4)(I) and (ii) of this section.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.3.2 [Coastal high-hazard areas (including V Zones)] Elevation requirements.** SEE BLOCK 36 **R324.3.3 Foundations.** All buildings and structures erected in coastal high-hazard areas shall be supported on pilings or columns and shall be adequately anchored to such pilings or columns. 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 R324.3.6. 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 mat, raft or other foundation is subject to scour or erosion from wave-velocity flow conditions. 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. **R324.3.6 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.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
39	(5) Provide that all new construction and substantial improvements within Zones V1-30, VE, and V on the community's FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system. For the purposes of this section, a breakaway wall shall have a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot. Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions: (i) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and, (ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural). Water loading values used shall be those associated with the base flood. Wind loading values used shall be those required by applicable State or local building standards. Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.	**R105.3.1.1 Substantially improved or substantially damaged existing buildings and structures in areas prone to flooding**. SEE BLOCK 4 **R324.3.4 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 pounds per square foot (0.48 kN/m^2) and no more than 20 pounds per square foot (0.96 kN/m^2); or 4. Where wind loading values of this code exceed 20 pounds per square foot (0.96 kN/m^2), 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. **R324.3.5 Enclosed areas below design flood elevation.** Enclosed areas below the design flood elevation shall be used solely for parking of vehicles, building access or storage.
40	(6) Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community's FIRM;	**R324.3.2(3) and (4) [Coastal high-hazard areas (including V zones)] Elevation requirements.** SEE BLOCK 36

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
41	(7) Prohibit man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage.	**R324.3.1 Location and site preparation.** SEE BLOCK 37
42	(8) Require that manufactured homes placed or substantially improved within Zones V1-30, V, and VE on the community's FIRM on sites (i) Outside of a manufactured home park or subdivision, (ii) In a new manufactured home park or subdivision, (iii) In an expansion to an existing manufactured home park or subdivision, or (iv) In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, meet the standards of paragraphs (e)(2) through (7) of this section and that manufactured homes placed or substantially improved on other sites in an existing manufactured home park or subdivision within Zones VI-30, V, and VE on the community's FIRM meet the requirements of paragraph (c)(12) of this section.	**R324.1.8 Manufactured housing.** SEE BLOCK 16 **Appendix E Manufactured Housing AE101, Exception.** SEE BLOCK 4
43	(9) Require that recreational vehicles placed on sites within Zones V1-30, V, and VE on the community's FIRM either (i) Be on the site for fewer than 180 consecutive days, (ii) Be fully licensed and ready for highway use, or (iii) Meet the requirements in paragraphs (b)(1) and (e) (2) through (7) of this section. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached additions.	**R107 Temporary structures.**

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
Sec. 60.6 Variance and exceptions		
44	(a) The Administrator does not set forth absolute criteria for granting variances from the criteria set forth in Secs. 60.3, 60.4, and 60.5. The issuance of a variance is for flood plain management purposes only. Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance. The community, after examining the applicant's hardships, shall approve or disapprove a request. While the granting of variances generally is limited to a lot size less than one-half acre (as set forth in paragraph (a)(2) of this section), deviations from that limitation may occur. However, as the lot size increases beyond one-half acre, the technical justification required for issuing a variance increases. The Administrator may review a community's findings justifying the granting of variances, and if that review indicates a pattern inconsistent with the objectives of sound flood plain management, the Administrator may take appropriate action under Sec. 59.24(b) of this subchapter.	**R104.10.1 [Modifications] Areas prone to flooding.** The building official shall not grant modifications to any provision related to flood hazard areas as established by Table R301.2(1) without the granting of a variance to such provisions by the board of appeals.

NFIP Regulations		2006 IRC® *[annotated with 2007 Supplement]*
45	Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.	**R112.2.1 Determination of substantial improvement in areas prone to flooding.** When the building official provides a finding required in Section R105.3.1.1, the board of appeals shall determine whether the value of the proposed work constitutes a substantial improvement. A substantial improvement means any repair, reconstruction, rehabilitation, addition, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. If the building or structure has sustained substantial damage, all repairs are considered substantial improvement regardless of the actual repair work performed. The term does not include: 1. Improvements of a building or structure required to correct existing health, sanitary, or safety code violations identified by the building official and which are the minimum necessary to assure safe living conditions; or 2. Any alteration of a historic building or structure provided that the alteration will not preclude the continued designation as a historic building or structure. For the purposes of this exclusion, a historic building is: 2.1 Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or 2.2 Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or 2.3 Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.
46	Procedures for the granting of variances by a community are as follows: (1) Variances shall not be issued by a community within any designated regulatory floodway if any increase in flood levels during the base flood discharge would result;	**R301.2.4 Floodplain construction. Exception.** [Floodway approvals not allowed, refer to IBC.] SEE BLOCK 3
47	(2) Variances may be issued by a community for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, in conformance with the procedures of paragraphs (a) (3), (4), (5) and (6) of this section;	**R112.2.2 Criteria for issuance of a variance for areas prone to flooding.** A variance shall only be issued upon: 1. A showing of good and sufficient cause that the unique characteristics of the size, configuration, or topography of the site render the elevation standards of Section 324 inappropriate. 2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable. 3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, ~~*nor create nuisances,*~~ cause fraud on or victimization of the public, or conflict with existing laws or ordinances. 4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard. 5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
48	(3) Variances shall only be issued by a community upon (i) a showing of good and sufficient cause, (ii) a determination that failure to grant the variance would result in exceptional hardship to the applicant, and (iii) a determination that the granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisances, cause fraud on or victimization of the public, or conflict with existing local laws or ordinances;	**R112.2.2(2)** and **(3) Criteria for issuance of a variance for areas prone to flooding.** SEE BLOCK 47
49	(4) Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief;	**R112.2.2(4) Criteria for issuance of a variance for areas prone to flooding.** SEE BLOCK 47
50	(5) A community shall notify the applicant in writing over the signature of a community official that (i) the issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage and (ii) such construction below the base flood level increases risks to life and property. Such notification shall be maintained with a record of all variance actions as required in paragraph (a)(6) of this section; and	**R104.7 Department Records.** **R112.2.2(5) Criteria for issuance of a variance for areas prone to flooding.** SEE BLOCK 47
51	(6) A community shall (i) maintain a record of all variance actions, including justification for their issuance, and (ii) report such variances issued in its annual or biennial report submitted to the Administrator.	**R104.7 Department Records.** **R112.1 [Board of Appeals] General.**

Crosswalk of the NFIP Regulations to the Flood Resistance Provisions of the IRC®.

	NFIP Regulations	2006 IRC® *[annotated with 2007 Supplement]*
52	(7) Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that (i) the criteria of paragraphs (a)(1) through (a)(4) of this section are met, and (ii) the structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threats to public safety.	[Functionally dependent uses are non-residential uses; refer to IBC.]

Appendix D. Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC & IEBC

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Mechanical Code*	**M301.13 [B] Flood hazard**. For structures located in flood hazard areas, mechanical systems, equipment and appliances shall be elevated at or above the design flood elevation. **Exception:** Mechanical systems, equipment and appliances are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood-resistant construction requirements of the *International Building Code.* **M301.13.1 Walls below buildings in flood hazard areas subject to high-velocity wave action.** In flood hazard areas subject to high-velocity wave action, mechanical systems and equipment shall not be mounted on or penetrate walls intended to break away under flood loads. **M401.5.3 Flood hazard.** For structures located in flood hazard areas, outside air exhaust openings and air intake openings shall be located at or above the design flood elevation. **M602.4 Flood hazard.** For structures located in flood hazard areas, plenum spaces shall be located above the design flood elevation or shall be located above the design flood elevation or shall be designed and constructed to prevent water from entering or accumulating within the plenum spaces during floods up to the design flood elevation. If the plenum spaces are located below the design flood elevation, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation. **M603.13 Flood hazard areas.** For structures in flood hazard areas, ducts shall be located above the design flood elevation or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to the design flood elevation. If the ducts are located below the design flood elevation, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation. **M1206.9.1 Flood hazard.** Piping located in a flood hazard area zone shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation. **M1305.2.1 Flood hazard.** All fuel oil pipe, equipment and appliances located in flood hazard areas shall be located above the design flood elevation or shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation.

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Plumbing Code*	**P309.1 General**. Plumbing systems and equipment in structures erected in flood hazard areas shall be constructed in accordance with the requirements of this section and the *International Building Code*. **P309.2 Flood hazard.** For structures located in flood hazard areas, the following systems and equipment shall be located above the design flood elevation: **Exception:** The following systems are permitted to be located below the design flood elevation provided that the systems are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation. 1. All water service pipes. 2. Pump seals in individual water supply systems where the pump is located below the base flood elevation. 3. Covers on potable water wells shall be sealed, except where the top of the casing well or pipe sleeve is elevated to at least 1 foot (304.8 mm) above the design flood elevation. 4. All sanitary drainage piping. 5. All storm drainage piping. 6. Manhole covers shall be sealed, except where elevated to or above the design flood elevation. 7. All other plumbing fixtures, faucets, fixture fittings, piping systems and equipment. 8. Water heaters. 9. Vents and vent systems. **P309.3 Flood hazard areas subject to high-velocity wave action.** Structures located in flood hazard areas subject to high-velocity wave action shall meet the requirements of Section 309.2 and the plumbing systems, pipes and fixtures shall not be mounted on or penetrate through walls intended to breakaway under flood loads.
2006 *International Fuel Gas Code*	**FG301.11 Flood hazard.** For structures located in flood hazard areas, the appliance, equipment and system installations regulated by this code shall be located at or above the design flood elevation and shall comply with the flood resistant construction requirements of the *International Building Code*. **Exception:** The appliance, equipment and system installations regulated by this code are permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation and shall comply with the flood-resistant construction requirements of the *International Building Code.*

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Private Sewage Disposal Code* **continued on next page**	**PSDC106.2.3 Site plan**. Site plans shall be filed showing to scale the location of all septic tanks, holding tanks or other treatment tanks, building sewers, wells, water mains, water service, streams and lakes, flood hazard areas, dosing or pumping chambers, distribution boxes, effluent systems, dual disposal systems, replacement system areas, and the location of all buildings or structures. All separating distances and dimensions shall be shown, including any distance to adjoining property. A vertical elevation reference point and a horizontal reference point shall be indicated. For other than single-family dwellings, grade slope with contours shall be shown for the grade elevation of the entire area of the soil absorption system and the area on all sides for a distance of 25 feet (7620 mm). **PSDC108.7 Unsafe systems.** Any private sewage disposal system regulated by this code that is unsafe or that constitutes a health hazard, insanitary condition or is otherwise dangerous to human life is hereby declared unsafe. Any use of private sewage disposal systems regulated by this code constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, disaster, damage or abandonment is hereby declared an unsafe use. Any such unsafe equipment is hereby declared to be a public nuisance and shall be abated by repair, rehabilitation, demolition or removal **PSDC303.1 General.** Soil absorption sites shall be located outside of flood hazard areas. **Exception:** Where suitable soil absorption sites outside of the flood hazard area are not available it is permitted for the soil absorption site to be located within the flood hazard area. The soil absorption site shall be located to minimize the effects of inundation under conditions of the design flood. **PSDC303.2 Tanks.** In flood hazard areas, tanks shall be anchored to counter buoyant forces during conditions of the design flood. The vent termination and service manhole of the tank shall be a minimum of 2 feet (610 mm) above the design flood elevation or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood. **PSDC303.3 Mound systems**. Mound systems in flood hazard areas shall be prohibited. **PSDC401.2 Site evaluation.** Site evaluation shall include soil conditions, properties and permeability, depth to zones of soil saturation, depth to bedrock, slope, landscape positions, all setback requirements and the presence of flood hazard areas. Soil test data shall relate to the undisturbed elevations, and a vertical elevation reference point or benchmark shall be established. Evaluation data shall be reported on approved forms. Reports shall be filed for all sites investigated with 30 days of the completion of testing. **PSDC403.4 Alluvial and colluvial deposits.** Subsurface soil absorption systems shall not be placed in alluvial and colluvial deposits with shallow depths, extended periods of saturation or possible flooding.

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Private Sewage Disposal Code* **continued from previous page**	**PSDC406.1 Soil absorption site locations.** The surface grade of all soil absorption systems shall be located at a point lower than the surface grade of any nearby water well or reservoir on the same or adjoining property. Where this is not possible, the site shall be located so surface water drainage from the site is not directed toward a well or reservoir. The soil absorption system shall be located with a minimum horizontal distance between various elements as indicated in Table 406.2. Private sewage disposal systems in compacted areas, such as parking lots and driveways, are prohibited. Surface water shall be diverted away from any soil absorption site on the same or neighboring lots. **PSDC406.1.1 Flood hazard areas.** The site shall be located outside of flood hazard areas. **Exception:** Where suitable sites outside of the flood hazard area are not available it is permitted for the site to be located within the flood hazard area. The site shall be located to minimize the effects of inundation under conditions of the design flood. **PSDC902.2 Prohibited locations.** A mound system shall be prohibited on sites not having the minimum depths of soil specified in Table 902.2. The installation of a mound in a filled area shall be prohibited. A mound shall not be installed in a compacted area or over a failing conventional system.
2006 *International Existing Building Code* **continued on next page**	**101.2 Scope.** The provisions of the I*nternational Existing Building Code* shall apply to the repair, alteration, change of occupancy, addition, and relocation of existing buildings. **101.3 Intent.** The intent of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety, and welfare insofar as they are affected by the repair, alteration, change of occupancy, addition and relocation of existing buildings. **101.5 Compliance methods.** The repair, alteration, change of occupancy, addition or relocation of all existing buildings shall comply with one of the methods listed in Sections 101.5.1 through 101.5.3 as selected by the applicant. Application of a method shall be the sole basis for assessing the compliance of work performed under a single permit unless otherwise approved by the code official. Sections 101.5.1 through 101.5.3 shall not be applied in combination with each other. **Exception:** Subject to the approval of the code official, alterations complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code unless the building is undergoing more than a limited structural alteration as defined in Section 807.5.3. New structural members added as part of the alteration shall comply with the *International Building Code*. Alterations of existing buildings in flood hazard areas shall comply with Section 601.3.

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Existing Building Code* **continued from previous page** **continued on next page**	**104.10 Modifications.** Wherever there are practical difficulties in carrying out the provisions of this code, the code official shall have the authority to grant modifications for individual cases, upon application of the owner or owner's representative, provided the code 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. The details of action granting modifications shall be recorded and entered in the files of the department of building safety. **104.10.1 Flood hazard areas.** For existing buildings located in flood hazard areas for which the repairs, alterations, and additions constitute substantial improvement, the code official shall not grant modifications to provisions related to flood resistance unless a determination is made that 1. The applicant has presented good and sufficient cause that the unique characteristics of the size, configuration, or topography of the site render compliance with the flood resistant construction provisions inappropriate. 2. Failure to grant the modification would result in exceptional hardship. 3. The granting of the modification will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public, or conflict with existing laws or ordinances. 4. The modification is the minimum necessary to afford relief, considering the flood hazard. 5. A written notice will be provided to the applicant specifying, if applicable, the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property. **109.3.3 Lowest floor elevation.** For additions and substantial improvements to existing buildings in flood hazard areas, upon placement of the lowest floor, including basements, and prior to further vertical construction, the elevation documentation required in the *International Building Code* shall be submitted to the code official. **DEFINITIONS** **Flood Hazard Area.** The greater of the following two areas: 1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year, or 2. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated. **Historic Buildings.** Any building or structure that is (a) listed in the State or National Register of Historic Places, (b) designated as a historic property under local or state designation, law, or survey, (c) certified as a contributing resource within a National Register listed or locally designated historic district, or (d) with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places.

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Existing Building Code* **continued from previous page**	**Substantial Damage.** For the purpose of determining compliance with the flood provisions of this code, 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.** For the purpose of determining compliance with the flood provisions of this code, any repair, alteration, addition, or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. 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 code 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. **Chapter 3 Prescriptive Compliance Method** **[B] Section 302 Additions, Alterations or Repairs** **[B] 302.1.1 Flood hazard areas.** For buildings and structures in flood hazard areas established in Section 1612.3 of the *International Building Code,* any additions, alterations or repairs that constitute substantial improvement of the existing structure, as defined in Section 1612.2 of the *International Building Code,* shall comply with the flood design requirements for new construction and all aspects of the existing structure shall be brought into compliance with the requirements for new construction for flood design. **[B] Section 306 Historic Buildings** **306.2 Flood hazard areas.** Within flood hazard areas established in accordance with Section 1612.3 of the *International Building Code*, where the work proposed constitutes substantial improvement as defined in Section 1612.2 of the *International Building Code*, the building shall be brought into conformance with Section 1612 of the *International Building Code*. **Exception:** Historic buildings that are: 1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or 2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or 3. Designed as historic under a state or local historic preservation program that is approved by the Department of Interior. **continued on next page**

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Existing Building Code* **continued from previous page**	**Chapter 5 Repairs** **501.4 Flood hazard areas.** In flood hazard areas, repairs that constitute substantial improvement shall require that the building comply with the *International Building Code* Section 1612. **507.3 Damaged buildings.** **507.3.5 Flood hazard areas.** In flood hazard areas, damaged buildings that have sustained substantial damage shall be brought into compliance with Section 1612 of the *International Building Code*. **Chapter 6 Alterations – Level 1** **601.3 Flood hazard areas.** In flood hazard areas, alterations that constitute substantial improvement shall require that the building comply with the *International Building Code* Section 1612. **Chapter 7 Alterations – Level 2** **701.2 Alteration level 1 compliance.** In addition to the requirements of this chapter, all work shall comply with the requirements of Chapter 6. **Chapter 8 Alterations – Level 3** **801.2 Compliance.** In addition to the requirements of this chapter work shall comply with the requirements of Chapters 6 and 7. **Chapter 9 Change of Occupancy** **901.1 Repair and alteration with no change of occupancy classification.** Any repair or alteration work undertaken in connection with a chance of occupancy that does not involve a change of occupancy classification as described in the *International Building Code* shall conform to the requirements of Chapters 5, 6, 7, and 8 respectively for the applicable occupancy group and the requirements of Section 902 through 911. **Sec. 912 Change of Occupancy Classification** **912.1 Compliance with Chapter 8.** The occupancy classification of an existing building may be changed, provided the building meets all the requirements of Chapter 8 applied throughout the building for the new occupancy group, and complies with the requirements of Sections 902 through 912. **Chapter 10 Additions** **1001.1 Scope.** An addition to a building or structure shall comply with the building, plumbing, electrical, and mechanical codes, without requiring the existing building or structure to comply with any requirements of those codes or of these provisions except as required by this chapter. **continued on next page**

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Existing Building Code* **continued from previous page** **continued on next page**	**1003.1 Compliance with *International Building Code*.** **1003.5 Flood Hazard Areas.** In flood hazard areas: 1. For horizontal additions that are structurally interconnected to the existing building: 1.1. If the addition and all other proposed work, when combined, constitute substantial improvement, the existing building and the addition shall comply with *International Building Code* Section 1612. 1.2. If the addition constitutes substantial improvement, the existing building and the addition shall comply with *International Building Code* Section 1612. 2. For horizontal additions that are not structurally interconnected to the existing building: 2.1. The addition shall comply with *International Building Code* Section 1612. 2.2. If the addition and all other proposed work, when combined, constitute substantial improvement, the existing building and the addition shall comply with *International Building Code* Section 1612. 3. For vertical additions and all other proposed work, when combined, that constitute substantial improvement, the existing building shall comply with *International Building Code* Section 1612. 4. For a new, replacement, raised or extended foundation, if the foundation work and all other proposed work, when combined, constitute substantial improvement, the existing building shall comply with *International Building Code* Section 1612. **Chapter 11 Historic Building** **1101.4 Flood hazard areas.** In flood hazard areas, if all proposed work, including repairs, work required due to a change of occupancy, and alterations, constitutes substantial improvement then the existing building shall comply with *International Building Code* Section 1612. **Exception.** If a historic building will continue to be a historic building after the proposed work is completed, then the proposed work is not considered to be a substantial improvement. For the purposes of this exception, a historic building is: 1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places; or 2. Determined by the Secretary of the U.S. Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district; or 3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior. **Chapter 12 Relocated or Moved Buildings** **1202.6 Flood hazard areas.** If relocated or moved into a flood hazard area, structures shall comply with *International Building Code* Section 1612.

Flood Resistance Provisions of the IMC, IPC, IFGC, IPSDC and the IEBC.

Code	Excerpts From 2006 editions of IMC, IPC, IFGC, IPSDC, and the IEBC
2006 *International Existing Building Code* **continued from previous page**	**Chapter 13 Compliance Alternatives** **1301.3 Acceptance.** For repairs, alterations, additions and changes of occupancy to existing buildings that are evaluated in accordance with this section, compliance with this section shall be accepted by the code official. **1301.3.3 Compliance with flood hazard provisions.** In flood hazard areas, buildings that are evaluated in accordance with this section shall comply with *International Building Code* Section 1612 if the work covered by this section constitutes substantial improvement.

Appendix E. FEMA Regional Offices and NFIP State Coordinators

FEMA's Regional Offices

FEMA HEADQUARTERS
Office of the Assistant Administrator, Mitigation
500 C Street, S.W.
Washington, DC 20472
(202) 646-2781

REGION I – CT, MA, ME, NH, RI, VT
Mitigation Division
99 High St, 6th Floor
Boston, MA 02110
(617) 832-4761

REGION II – NJ, NY, PR, VI
Mitigation Division
26 Federal Plaza, Ste 1337
New York, NY 10278-0002
(212) 680-3600

REGION III – DE, DC, MD, PA, VA, WV
Mitigation Division
615 Chestnut Street, Sixth Floor
Philadelphia, PA 19106-4404
(215) 931-5530

REGION IV – AL, FL, GA, KY, MS, NC, SC, TN
Mitigation Division
3003 Chamblee-Tucker Road, Rm 270
Atlanta, GA 30341
(770) 220-5200

REGION V – IL, IN, MI, MN, OH, WI
Mitigation Division
536 S. Clark Street, 6th Floor
Chicago, IL 60605-1521
(312) 408-5500

REGION VI – AR, LA, NM, OK, TX
Mitigation Division
Federal Regional Center
800 North Loop 288
Denton, TX 76209-3698
(940) 898-5399

REGION VII – IA, KS, MO, NE
Mitigation Division
9221 Ward Pkwy, Ste 300
Kansas City, MO 64114-3372
(816) 283-7002

REGION VIII – CO, MT, ND, SD, UT, WY
Mitigation Division
Denver Federal Center
Building 710, Box 25267
Denver, CO 80225-0267
(303) 235-4800

REGION IX – AZ, CA, GU, HI, NV
Mitigation Division
1111 Broadway, Ste 1200
Oakland, CA 94607-4053
(415) 923-7100

REGION X – AK, ID, OR, WA
Mitigation Division
Federal Regional Center
130 228th Street, SW.
Bothell, WA 98021-8627
(425) 487-4600

NFIP State Coordinators

ALABAMA
Alabama Department of Economic & Community Affairs
NFIP State Coordinator
P.O. Box 5690
Montgomery, AL 36103-5690
(334) 353-0853

ALASKA
Alaska Department of Commerce, Community & Economic Development
NFIP State Coordinator
550 W. 7th Avenue, Suite 1770
Anchorage, AK 99501-3510
(907) 269-4583

ARIZONA
Arizona Department of Water Resources
NFIP State Coordinator
3550 N Central Avenue
Phoenix, AZ 85012-2105
(602) 771-8657

ARKANSAS
Arkansas Natural Resources Commission
NFIP State Coordinator
101 E. Capitol, Suite 350
Little Rock, AR 72201
(501) 682-3969

CALIFORNIA
California Department of Water Resources
NFIP State Coordinator
3310 El Camino Ave
Sacramento, CA 95821
(916) 574-0611

COLORADO
Colorado Water Conservation Board
NFIP State Coordinator
1313 Sherman St, Room 721
Denver, CO 80203
(303) 866-3803

CONNECTICUT
Connecticut Department of Environmental Protection
NFIP State Coordinator
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3706

DELAWARE
Delaware Division of Soil and Water
NFIP State Coordinator
89 Kings Highway
Dover, DE 19901
(302) 739-9921

DISTRICT OF COLUMBIA
District of Columbia Department of Health
NFIP State Coordinator
51 N Street, NE Room 5021
Washington, DC 20002
(202) 535-2248

FLORIDA
Florida Department of Community Affairs
NFIP State Coordinator
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(850) 413-9960

GEORGIA
Georgia Department of Natural Resources
NFIP State Coordinator
7 Martin Luther King, Jr. Dr Ste 440
Atlanta, GA 30334
(404) 656-6382

HAWAII
Hawaii Department of Land and Natural Resources
NFIP State Coordinator
PO Box 373
Honolulu, HI 96809
(808) 587-0267

IDAHO
Idaho Department of Water Resources
NFIP State Coordinator
322 E Front Street
Boise, ID 83720
(208) 287-4928

ILLINOIS
Illinois Department of Natural Resources
Office of Water Resources
NFIP State Coordinator
One Natural Resources Way
Springfield, IL 62702-1271
(217) 782-4428

INDIANA
Indiana Division of Water
NFIP State Coordinator
402 W. Washington Street,
Room W264
Indianapolis, IN 46204-2748
(317) 234-1107

IOWA
Iowa Department of Natural Resources
NFIP State Coordinator
Wallace State Office Building
Des Moines, IA 50319
(515) 281-8942

KANSAS
Kansas Department of Agriculture
Division of Water Resources
NFIP State Coordinator
109 SW 9th Street, 2nd Floor
Topeka, KS 66612-1283
(785) 296-5440

KENTUCKY
Kentucky Division of Water
NFIP State Coordinator
14 Reilly Road
Frankfort, KY 40601
(502) 564-3410

LOUISIANA
Louisiana Department of Transportation & Development
Floodplain Management Section
NFIP State Coordinator
P.O. Box 94245, Capitol Station
Baton Rouge, LA 70804-9425
(225) 274-4354

MAINE
Maine State Planning Office
NFIP State Coordinator
38 State House Station
Augusta, ME 04333-0038
(207) 287-8063

MARYLAND
Maryland Department of Environment
NFIP State Coordinator
1800 Washington Boulevard, Ste 430
Baltimore, MD 21230
(410) 537-3775

MASSACHUSETTS
Massachusetts Department of Conservation & Recreation
NFIP State Coordinator
251 Causeway Street, Suite 700
Boston, MA 02114
(617) 626-1406

MICHIGAN
Michigan Department of Environmental Quality
NFIP State Coordinator
P.O. Box 38458
Lansing, MI 48909-7958
(517) 335-3448

MINNESOTA
Minnesota Department of Natural Resources - Waters
NFIP State Coordinator
500 Lafayette Road
St. Paul, MN 55155-4032
(651) 259-5691

MISSISSIPPI
Mississippi Emergency Management Agency
NFIP State Coordinator
P.O. Box 5644
Pearl, MS 39208
(601) 933-6844

MISSOURI
Missouri State Emergency Management Agency
NFIP State Coordinator
P.O. Box 116
Jefferson City, MO 65102
(573) 526-9116

MONTANA
Montana Floodplain Management Program
NFIP State Coordinator
1424 9th Avenue
Helena, MT 59620-1601
(406) 444-6654

NEBRASKA
Nebraska Division of Natural Resources
NFIP State Coordinator
301 Centennial Mall South
Lincoln, NE 68509-4876
(402) 471-3936

NEVADA
Nevada Division of Water Planning
NFIP State Coordinator
901 S Steward Street Ste 2002
Carson City, NV 89701
(775) 684-2860

NEW HAMPSHIRE
New Hampshire Office of Energy & Planning
NFIP State Coordinator
57 Regional Dr, Ste 3
Concord, NH 03301-8519
(603) 271-2155

NEW JERSEY
New Jersey Department of Environmental Protection
Flood Plain Management Section
NFIP State Coordinator
P.O. Box 419
Trenton, NJ 08625
(609) 984-0859

NEW MEXICO
New Mexico Office of Emergency Management
NFIP State Coordinator
P.O. Box 1628
Santa Fe, NM 87504-1628
(505) 476-9617

NEW YORK
New York State Department of Environmental Conservation
NFIP State Coordinator
625 Broadway
Albany, NY 12233-3507
(518) 402-8146

NORTH CAROLINA
North Carolina Division of Emergency Management
NFIP State Coordinator
4713 Mail Service Center
Raleigh, NC 27699-4713
(919) 715-8000

NORTH DAKOTA
North Dakota State Water Commission
NFIP State Coordinator
900 East Boulevard Avenue
Bismarck, ND 58505-0850
(701) 328-4898

OHIO
Ohio Department of Natural Resources
Division of Water
NFIP State Coordinator
2045 Morse Rd, Bldg B-2
Columbus, OH 43224
(614) 265-6754

OKLAHOMA
Oklahoma Water Resources Board
NFIP State Coordinator
3800 N. Classen Boulevard
Oklahoma City, OK 73118
(918) 581-2924

OREGON
Oregon Department of Land Conservation & Development
NFIP State Coordinator
635 Capitol Street, NE, Suite 150
Salem, OR 97301-2540
(503) 373-0050, ext. 250

PENNSYLVANIA
Pennsylvania Department of Community and Economic Development
Floodplain Management Division
NFIP State Coordinator
400 N Street, 4th Floor
Harrisburg, PA 17120
(717) 720-7445

PUERTO RICO
Puerto Rico Planning Board
NFIP Coordinator
Minillas Government Center
P.O. Box 41119
Santurce, PR 00940-1119
(787) 723-6200

RHODE ISLAND
Rhode Island Emergency Management Agency, MURI
NFIP State Coordinator
645 New London Avenue
Cranston, RI 02920
(401) 949-9996

SOUTH CAROLINA
South Carolina Department of Natural Resources
NFIP State Coordinator
1000 Assembly Street, Room 345C
Columbia, SC 29201
(803) 734-9120

SOUTH DAKOTA
South Dakota Division of Emergency Management
NFIP State Coordinator
118 W Capitol Avenue
Pierre, SD 57501
(605) 773-3238

TENNESSEE
Tennessee Department of Economic & Community Development
NFIP State Coordinator
312 8th Avenue, 10th Floor
Nashville, TN 37243-0405
(615) 741-2211

TEXAS
Texas Commission of Environmental Quality
NFIP State Coordinator
P.O. Box 13087-MC 160
Austin, TX 78711-3087
(512) 239-6155

U.S. VIRGIN ISLANDS
Virgin Islands Department of Planning & Natural Resources
NFIP Coordinator
CE King Airport, Terminal Bldg 2nd
St. Thomas, VI 00802
(340) 774-3320

UTAH
Utah Division of Comprehensive Emergency Management
NFIP State Coordinator
State Office Building, #1110
Salt Lake City, UT 84114
(801) 538-3750

VERMONT
Vermont Agency of Natural Resources
NFIP State Coordinator
1229 Portland St Ste 201
St. Johnsburg, VT 05819
(802) 751-0129

VIRGINIA
Virginia Department of Conservation & Recreation
NFIP State Coordinator
203 Governor Street, Suite 206
Richmond, VA 23219-2019
(804) 786-3914

WASHINGTON
Washington Department of Ecology
Land Resources Program
NFIP State Coordinator
P.O. Box 47600
Olympia, WA 98504-7600
(360) 407-6796

WEST VIRGINIA
West Virginia Office of Emergency Services
NFIP State Coordinator
1900 Kanawha Boulevard, Room EB-80
Charleston, WV 25305-0360
(304) 965-2331

WISCONSIN
Wisconsin Department of Natural Resources
NFIP State Coordinator
101 S. Webster
Madison, WI 53702
(608) 266-8039

WYOMING
Wyoming Emergency Management Agency
NFIP State Coordinator
122 West 25th Street
Cheyenne, WY 82002
(307) 777-4910

Appendix F. Sample Plan Review and Inspection Checklists

SAMPLE

Application #: _____

Applicant: _____

Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – A ZONES

Terms: FHA = Flood Hazard Area; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps ***NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.***
	Is proposed development consistent with zoning? ☐ NO, Applicant to request a zoning amendment. ☐ YES, proceed with review.
FIRM Panel # and date _____ FLOODWAY Panel # and date _____ DFE _____	Check FIRM, floodplain/floodway boundaries, base flood elevations, and map revisions and LOMRs issued by FEMA. Is proposal in the floodplain and/or floodway? ☐ NO, sign and date this form and put in file. ☐ YES, must meet the flood resistant provisions of the code. ☐ YES, FLOODWAY. All residential structures (including Manufactured Housing units) in floodways to comply with IBC. ☐ YES, FLOODWAY. Require engineer's "no rise" analysis and supporting hydraulic data in file before continuing review. ☐ YES, in FHA without DFEs. Check other sources, use estimating methods, or require applicant to determine. ☐ YES, in FHA, but applicant has elevation data that shows natural site elevation above DFE. Advise applicant to obtain LOMA and submit copy for the file. ☐ YES, in Coastal A Zone; refer to V Zone Checklist if V Zone requirements are applied. ☐ 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. ☐ YES, continue review. ☐ NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid floodplain? ☐ YES, explain flood hazards to applicant and make recommendations to modify proposal to minimize flood hazards and damage potential. ☐ 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? ☐ NO, advise applicant which agencies to contact. ☐ YES, require copies for the file.
	Will a watercourse be altered? ☐ NO, continue review. ☐ YES, Applicant to provide copies of notices to adjacent communities, federal agencies, and the NFIP State Coordinator. ☐ 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? ☐ NO fill, continue review. ☐ YES, fill used to elevate building will be compacted, sloped, and stabilized. ☐ YES, but not for building elevation. Purpose for fill: _____

SAMPLE

Application #: _____

Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – A ZONES

Initials and Date	Review Steps
	Is the application for improvement or addition to an existing building? ☐ NO, a new structure is proposed, continue review. ☐ YES, but building is documented in file as a "historic structure" and proposed work will not change historic designation; encourage flood resistance. ☐ YES, costs of work are documented and compared to market value. ☐ If costs equal or exceed 50% of market value of structure, provide finding to Board of Appeals for determination of Substantial Improvement. ☐ Proposed work is not a Substantial Improvement. 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 Elevation Certificate. ☐ NO – STOP! A permit cannot be issued for non-elevated residential buildings. ☐ NO, non-residential may be floodproofed (see design documentation requirements) ☐ YES, on fill. Basements into fill are <u>not</u> allowed. ☐ YES, on piers, pilings, or columns. ☐ YES, on solid foundation walls (see Enclosed areas below DFE).
	Check the following for Manufactured Housing units: ☐ Are flood hazards avoided as much as possible? ☐ In Floodway, refer to IBC® for foundation design. ☐ Foundation is reinforced (dry-stack block NOT allowed). ☐ Ground anchors and tie-downs shown on plans? ☐ Elevated above the DFE?
	Check the following for utility support systems: ☐ Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ Septic designed to minimize inflow/discharge under flood conditions? ☐ On-site water supply designed to minimize inflow under flood conditions? ☐ Above-ground tanks are anchored/elevated? ☐ Below-ground tanks are designed to resist flotation?
	If new, non-residential structure is not elevated, will it be floodproofed? ☐ YES, non-residential building will be floodproofed to not less than 1' above DFE, and signed and sealed design documentation is in file. ☐ YES, agricultural building to be wet floodproofed. ☐ NO, permit shall not be approved.
	Enclosed areas below DFE (stairwells, sheds, garages, storage areas, crawl spaces)? ☐ NO, continue review. ☐ YES, number, total net open area, and location of flood openings shown on plan. ☐ YES, plan shows acceptable use (parking, limited storage, and access). ☐ YES, flood resistant materials specified. ☐ YES, utilities, if any, are all elevated above DFE.
	☐ Record permit in log of floodplain permits. ☐ Make sure that all necessary documents are in the file. ☐ 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 – A ZONES

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: ☐ REVIEW permit file before going in the field. ☐ ASK permit reviewer questions to understand requirements. ☐ Are other State and federal permits in the file?
	Measure stake out distances from waterway or landmark. Is development in the right place? Is fill correct distance from waterway or landmark? ☐ YES, check fill compaction and side slopes. Basements into fill not allowed. ☐ NO, take enforcement action to correct problems.
	Elevation of lowest floor checked during framing or foundation inspection after lowest floor is in place. Elevations checked and acceptable? ☐ YES, maintain copy of documentation of final elevations in permanent records. ☐ NO, take enforcement action to correct problems.
	Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ YES. ☐ NO, take enforcement action to correct problems.
	For enclosures below DFE (including crawl spaces): Are flood damage resistant materials used? Does use of enclosure appear to be limited to crawl space, parking, building access, or limited storage? Are flood openings no more than 12" above grade? Are there enough flood openings (based on net open area provided by the flood openings or certification of engineered openings), are they on at least two sides, and do they allow automatic entry/exit of floodwater (disable air vents in open position)? ☐ YES. ☐ Building does not have enclosures below DFE. ☐ NO, take enforcement action to correct problems.
	Other Notes Based on Inspection:
	Issue Occupancy Certificate only if final inspection shows compliance with floodplain requirements.

FINAL INSPECTION COMPLETED BY: _____ DATE: _____

SAMPLE

Application #: _____

Applicant: _____

Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – V ZONES

Terms: FHA = Flood Hazard Area; DFE = Design Flood Elevation

Reviewer's Initials and Date of Review	Review Steps ***NOTE: For variance requests, use this form to document efforts to achieve the greatest degree of compliance.***
	Is proposed development consistent with zoning? ☐ NO, Applicant to request a zoning amendment. ☐ YES, proceed with review.
	Is proposal in Coastal Barrier Resources Area (CoBRA) or Otherwise Protected Area? ☐ NO, continue review. ☐ YES, advise applicant that Federal flood insurance is not available, document to file, continue review (must comply with flood provisions).
FIRM Panel # and date _____ 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 subject to high velocity wave action (V Zone)? ☐ NO, not in Flood Hazard Area; sign and date this form and put in file. ☐ NO, in "Coastal A Zone" (apply V Zone requirements). ☐ NO, in riverine A Zone. Use A Zone checklist. ☐ YES, in V Zone, must meet flood resistant provisions of the code.
	Site plan shows development proposal, location, dimensions, wetlands, FHA / V Zone boundaries, DFE, and ground elevations (NGVD or other datum on FIRM). ☐ YES, continue review. ☐ NO, return to applicant to revise application and site plan.
	Can the proposed development be modified to avoid FHA / V Zone? ☐ YES, explain flood hazards to applicant and make recommendations to modify proposal to minimize flood hazards and damage potential. ☐ NO, can floodplain impacts be further minimized? Maximize setback from the water? Buildings moved to higher elevation?
	Has the applicant provided copies of all necessary State and federal permits, e.g., wetlands, coastal zone consistency? ☐ NO, advise applicant which agencies to contact. ☐ YES, require copies in the file.
	Will a dune be altered? ☐ NO, continue review. ☐ YES, if applicable, require State coastal zone approval before continuing.
	Is a pool proposed? ☐ NO, continue review. ☐ YES, not attached to the building; continue review. ☐ YES, attached to the building. Continue review only if included in foundation design.

SAMPLE

Application #: _____

Plan Review Checklist

FLOOD HAZARD AREA APPLICATION REVIEW – V ZONES

Initials and Date	Review Steps
	Is the application for improvement or addition to an existing building? ☐ NO, a new structure is proposed, continue review. ☐ YES, but building is documented in file as a "historic structure" and proposed work will not change historic designation; encourage flood resistance. ☐ YES, costs of improvements are documented and compared to market value. ☐ If costs of proposed addition equal or exceed 50% of market value of structure, provide finding to Board of Appeals for determination of Substantial Improvement. ☐ Proposed work is not a Substantial Improvement. Flood hazard review not required.
	Are new buildings proposed to be elevated? Give applicant a blank Elevation Certificate. ☐ NO – STOP! A permit cannot be issued for non-elevated buildings. ☐ YES, on fill. STOP! Structural fill not allowed in V Zones, require redesign. ☐ YES, on piers, pilings, or columns; signed and sealed design certification submitted? ☐ YES, on parallel shear walls (parallel to expected direction of flow?); signed and sealed design certification submitted?
	Check the following for utility support systems: ☐ Electrical, mechanical, plumbing, heating/air conditioning components elevated? ☐ Septic designed to minimize inflow/discharge under flood conditions? ☐ On-site water supply designed to minimize inflow under flood conditions? ☐ Above-ground storage tanks are anchored/elevated? ☐ Below-ground storage tanks are designed to resist flotation/erosion?
	Enclosed area below DFE proposed (stairwells, sheds, garages, storage areas)? ☐ NO, continue review. ☐ YES, enclosed by insect screening or lattice. Continue review. ☐ YES, applicant has provided signed and sealed documentation of breakaway wall design. ☐ YES, design not documented. Advise applicant to obtain signed and sealed documentation of breakaway wall design from registered design professional. ☐ YES, flood resistant materials will be used. ☐ YES, utilities <u>not</u> penetrating or attached to breakaway walls.
	☐ Record permit in log of floodplain permits. ☐ Make sure that all necessary documents are in the file. ☐ 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 – V ZONES

Inspector's Initials and Date of Inspection	Inspection Steps
	Before site inspection: ☐ REVIEW permit file before going in the field. ☐ ASK permit reviewer questions to understand requirements. ☐ Are other State and federal permits in the file?
	Measure distances from landmark. Is development in the right place? ☐ NO, take enforcement action to correct problems. ☐ YES, continue inspection.
	Elevation of lowest floor checked during framing or foundation inspection after lowest floor is in place. Elevations checked and acceptable? ☐ YES. ☐ NO, take enforcement action to correct problems.
	For enclosures below 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? ☐ YES. ☐ Building does not have enclosures. ☐ NO, take enforcement action to correct problems.
	Other Notes Based on Inspection:
	Issue Occupancy Certificate only if final inspection shows compliance with floodplain requirements.

FINAL INSPECTION COMPLETED BY: _____ DATE: _____