Significant Building Code Requirements That Exceed or Are More Specific Than the National Flood Insurance Program

This fact sheet summarizes the more significant flood-resistant provisions of the 2021 International Codes (I-Codes) and American Society of Civil Engineers (ASCE) 24-14, *Flood Resistant Design and Construction*, that are "higher standards" and that are more specific than the National Flood Insurance Program (NFIP) requirements.

Comparing NFIP and More Significant "Higher Standards" in Building Codes

Table 1 compares the requirements of the National Flood Insurance Program (NFIP) for buildings and structures to the flood-resistant provisions of the 2021 International Codes (I-Codes) and the referenced standards by the American Society of Civil Engineers (ASCE). Only the more significant "higher standards" or areas where the I-Codes are more specific are shown. A full comparison can be found in the companion fact sheet "Building Code Requirements That Exceed or Are More Specific Than the National Flood Insurance Program (NFIP)."

The left column summarizes the NFIP requirements for buildings and structures, with the specific citations referring to Title 44 Code of Federal Regulations (CFR) Part 60 for land management and use. The right column summarizes the provisions of the I-Codes and referenced standards that are either "higher standards" or more specific than the corresponding NFIP requirement. The I-Codes and ASCE standards referenced in Table 1 are:

- 2021 International Building Code (IBC)
- 2021 International Residential Code (IRC)
- 2021 International Existing Building Code (IEBC)
- 2021 International Swimming Pool and Spa Code (ISPSC)
- ASCE 24-14, *Flood Resistant Design and Construction*

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Table 1: Flood provisions of the 2021 I-Codes/ASCE 24-14 that are "higher standards" or more specific than NFIP requirements

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
60.3(a)(3)(i): Requires communities to review to determine that all new construction and substantial improvements are "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."	**IBC and ASCE 24.** IBC refers to ASCE 24 for design requirements [IBC 1612.2] ASCE 24 has specific requirements for: Foundation Requirements; Geotechnical characteristics; Flood loads; Stability of fill; and Anchorage and Connections [ASCE Secs. 1.5, 1.6, and 2.4]. **IRC:** ▪ Requires dwellings in floodways to be designed per IBC/ASCE 24 [301.2.4; R322.1] ▪ Permits use of ASCE 24 as alternative in all flood areas [R301.2.4.1; R322.1.1] ▪ Requires fill soils supporting footings and foundations to be "designed, installed and tested in accordance with accepted engineering practice [R401.2] and requires fill to be compacted to ensure uniform support of the slab and specifies lift thickness [R506.2.1] ▪ Requires foundations to be capable of accommodating all loads specified in R301, which specifies design criterial (e.g., seismic, wind) [R322.2.3; Chapter 4]
60.3(a)(3)(iv): Requires review to determine that all new construction and substantial improvements have equipment and service facilities "designed and/or located."	**Equipment:** IBC by reference to ASCE 24 and IRC have specific requirements for platforms for utility equipment; utilities and breakaway walls; electric components required to meet life safety requirements; duct systems; and fuel supply lines. [ASCE 24 Chapter 7; R322.1.6; R322.3.4]
60.3(b): Communities are required to regulate only flood hazard areas delineated by FEMA, unless other maps are approved for use. The NFIP currently delineates and maps flood hazard areas along riverine and coastal areas. The only "high risk" areas mapped are the floodway, coastal high hazard areas Zone (V), and alluvial fan flood hazard areas.	**High Risk Flood Hazard Areas.** ASCE 24 defines High Risk Flood Hazard Area to include flood hazard areas where one or more of the following occur: alluvial fan flooding, flash flooding, mudslides, ice jams, high velocity flows (greater than 10 ft/sec), high velocity wave action (Zone V), Coastal A Zones, or erosion. Specific requirements for high risk flood hazard areas are in ASCE 24 Chapter 3 and ASCE 24 Chapter 4.
60.3(b)(5): Requires communities to obtain the elevation to which the lowest floor (or bottom of the lowest horizontal structural member of the lowest floor) is elevated, without specifying when such information is to be obtained.	**Inspections.** IBC and IRC call for inspections "upon placement of the lowest floor, including basement, and prior to further vertical construction," at which time elevation documentation shall be submitted [110.3.3; R109.1.3] IBC and IRC require submission of elevation documentation prior to the final inspection [110.3.11.1; R109.1.6.1; R322.1.10] IBC Appendix G specifies inspections for development issued permits under the appendix [G103.9]

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
60.3(c)(2) and (c)(3): Requires buildings in Zone A/AE to be elevated to or above the base flood elevation (BFE): ▪ 60.3(c)(2): Zone A reference level is lowest floor ▪ 60.3(c)(3): Zone A height of floodproofing, nonresidential only	**Elevation:** ▪ IBC/ASCE 24 requires the elevation of the lowest floor or floodproofing level as a function of Flood Design Class, with a minimum of BFE + 1 ft and BFE + 1 ft. or 500-year elevation for Flood Design Class 4 (includes most buildings typically considered "critical facilities" [1612.2; ASCE 24 Sec. 2.3] ▪ IRC requires lowest floors to be at or above BFE + 1 ft, and in Zone AO, incorporates +1 ft (depth number plus 1 ft or at least 3 feet above highest adjacent grade) [R322.2.1] ▪ IBC/ASCE 24 and IRC require Coastal A Zone (CAZ) to be regulated like Zone V, if Limit of Moderate Wave Action (LiMWA) is delineated or CAZ designated by communities. See notes for 60.3(e)(2), (4), and (5).
60.3(c)(4): Has a single statement regarding acceptable performance of floodproofing measures, without listing factors to be considered in the design of such measures. Requires design to be developed or reviewed by a registered professional, and the design, specifications and plans are to be certified as being in accordance with accepted standards of practice.	**Dry floodproofing.** ASCE 24 lists several elements that are to be accounted for in the design of dry floodproofing measures. Some of these elements bear on the practicality of certain types of floodproofing measures, notably those that require human intervention to activate or implement [ASCE Sec. 6.2]
60.3(c)(5): Requires at least two flood openings and requires flood openings that do not meet certain minimum criteria to be certified by a registered professional.	**Location of openings.** ASCE 24 and IRC specify minimum of two openings on different sides of each enclosed area and if there is more than one enclosed area, each must have openings; specify the bottom of each opening to relative to the higher of interior or exterior grade or floor; permits flood openings in doors and windows [ASCE Sec. 2.7.3; R322.2.2.1] **Non-engineered (prescriptive) openings:** ASCE 24 and IRC require openings to be no less than 3 inches in any direction in the plane of the wall. Louvers, blades, screens, and faceplates or other covers and devices must be accounted for in the determination of the net open area [ASCE Sec. 2.7.2.1; R322.2.2] **Engineered openings.** ASCE 24 provides specific design guidance for engineered openings in enclosures, to allow inflow/outflow of floodwaters [ASCE Sec. 2.7.2.2] **Openings in breakaway walls.** ASCE 24 and IRC require openings in breakaway walls [ASCE Sec. 2.7.1.1; R322.3.5]

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
60.3(c)(6) and (b)(8): Specify anchoring of manufactured home to adequately anchored foundation systems to resist flood loads and elevation of manufactured homes. **60.3(c)(12):** Allows replacement manufactured home units or substantially improved units in existing manufactured home parks and subdivisions to be supported by reinforced foundation elements no less than 36 inches above grade and anchored to adequately anchored foundation systems.	**Manufactured homes:** ▪ IRC requires all manufactured homes to meet the foundation and elevation requirements for dwellings, regardless of location or loss history [R322.1.91; IRC Appendix E, AE101.22] ▪ IBC Appendix G requires all manufactured homes to meet the elevation requirements, regardless of location or loss history [G501.1] ▪ IBC Appendix G requires all manufactured homes to be placed on a permanent, reinforced foundation that is designed in accordance with Section 1612 [G501.2]
60.3(e)(2): Requires buildings in Zone V to have the bottom of the lowest horizontal structural member of the lowest floor to be at or above the BFE.	**Elevation:** ▪ ASCE 24 requires the elevation of the bottom of the lowest horizontal structural member of lowest floor as a function of Flood Design Class, with a minimum of BFE + 1 ft and higher for more important buildings BFE + 1 ft. or 500-year elevation for Flood Design Class 4 (includes most buildings typically considered "critical facilities" [1612.2; ASCE 24 Sec. 4.4] ▪ IRC requires dwellings in coastal high hazard areas to be elevated with the bottom of the lowest horizontal structural member at or above the BFE + 1 ft [R322.3.2] ▪ IRC requires dwellings in CAZ3 to be at or above the BFE + 1 ft [R322.3.2]
60.3(e)(4): In coastal high hazard areas, the regulations specify that new construction and substantial improvements be elevated on pilings and columns.	ASCE 24 foundation requirements include geotechnical considerations; foundation depth; deep foundations; pile design; footings, mats, rafts, and slabs-on-grade; grade beams; shear walls; and stem walls [ASCE Sec. 4.5] IRC foundation requirements specify spread footing, mat, raft or other foundations that support columns permitted under specific conditions must be designed in accordance with ASCE 24; permits backfilled stem walls in CAZ if designed to account for wave loads and scour and erosion [R322.3.3]

[1] Many states do not apply building codes to regulate installation of manufactured homes.
[2] IRC Appendix E, Manufactured Housing Used as Dwellings, refers to the applicable requirements of R322.
[3] If LiMWA on FIRM or otherwise designated by community.

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
60.3(e)(5): In coastal high hazard areas, the regulations specify that be "free of obstruction" or have non-supporting breakaway walls.	**Free of Obstruction in Zone V and CAZ.** ASCE 24 free-of-obstruction requirements include: ▪ Use of fill – minor amounts for minimal site grading, landscaping, and drainage; dune construction/reconstruction [ASCE Sec. 4.5.4] ▪ Bracing – limitations based on orientation to primary direction of waves [ASCE Sec. 4.5.11] The IRC free-of-obstruction requirements include: ▪ Limitations on minor grading and placement of minor quantities of fill "for landscaping and drainage purposes under and around buildings and for support of parking slabs, pool decks, patios and walkways" [R322.3.2] ▪ Partitions must be breakaway and have flood openings [R322.3.5]
NFIP regulations do not define certain terms.	**Definitions.** The IBC/ASCE 24 and/or IRC define addition; crawl space; repair; flood damage-resistant materials; residential; nonresidential; obstruction; dry floodproofing; wet floodproofing; mixed use; and residential portions of mixed-use buildings.
See NFIP definition for "substantial improvement" and "substantial damage;" making determinations not articulated in NFIP regulations.	**Substantial improvement and substantial damage determinations.** IBC, IEBC and IRC require the building official to examine construction documents to determine whether the proposed work is substantial improvement or repair of substantial damage [104.2.1; EB104.2.1; R105.3.1.1]
NFIP regulations do not specify the Information to be shown on plans or included in applications.	**Information for construction in flood hazard areas.** The IBC and IRC specify information required to be included in construction documents, including delineation of flood hazard areas, floodway boundaries, flood zones, DFE[4]/BFE, elevation proposed lowest floors/bottom of lowest horizontal structural members [107.2.6; 1603.1.7; 1612.4; R106.1.4] IBC Appendix G specifies information that must be included in applications [G104.2]
NFIP regulations to not specify when buildings are affected by more than one flood zone.	**More than one flood hazard area.** IBC and IRC explicitly state that buildings in more than one flood hazard area must comply with the more restrictive requirements [1612.1; R322.1]

[4] Design flood elevation (DFE) is the elevation of the Base Flood, or the elevation of a higher flood (defined 'design flood') if other maps are adopted, or if the design flood is otherwise legally designated.

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
NFIP regulations do not specify any limits on subdivision layout.	**Subdivisions.** IBC Appendix G requires residential building lots to be provided with buildable area outside of the floodway [G301.2(3)]
NFIP regulations do not have provisions for Coastal A Zones. Starting in 2009, revised coastal Flood Insurance Rate Maps (FIRMs) for coastal communities may show the Limit of Moderate Wave Action (LiMWA), which delineates the landward limit of the CAZ.	**Coastal A Zones.** ASCE 24 and IBC define Limit of Moderate Wave Action and Coastal A Zone and specify that such areas are treated as coastal high hazard areas (Zone V), except backfilled stem wall foundations are permitted if designed to account for wave loads and scour and erosion [ASCE Sec. 4.13] IRC describes Coastal A Zone [R322.2] and specifies that such areas are treated as coastal high hazard areas (Zone V), except backfilled stem wall foundations are permitted if designed to account for wave loads and scour and erosion [R322.3; R322.3.3]
NFIP regulations do not require evaluation of potential for scour and erosion in designs in Zone V, although certification is required that "the foundation is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components."	**Erosion and scour in Zone V and CAZ.** ASCE 24 requires consideration of erosion and scour in coastal high hazard areas and Coastal A Zones [ASCE Sec. 4.2] IRC requires consideration of scour and erosion in coastal high hazard areas and Coastal A Zones [R322.3.3]
NFIP regulations do not have specific provisions for elements that may be obstructions below elevated buildings in Zone V and Coastal A Zone.	**Obstructions.** IBC, by reference to ASCE 24, and IRC have specific requirements Zone V and CAZ, for foundation bracing; decks, concrete pads, and patios; building envelope (door at the top of stairs); and stairs and ramps [ASCE 24 Chapter 9; R322.3.4, R322.3.6.1, R322.7, R322.3.8]
NFIP regulations do not use the term "wet floodproofing." Guidance describes wet floodproofing to include measures required for enclosures below elevated buildings.	**Wet floodproofing.** ASCE 24 includes specifications for wet floodproofing and limits its use to certain structures [ASCE Sec. 6.3]
NFIP regulations do not have specific provisions for tanks other than the 60.3(a)(3)(i) general stability under flood loads.	**Tanks.** IBC, by reference to ASCE 24, IRC, and IBC Appendix G have requirements for tanks based on flood zone (underground, above-ground, elevated) [ASCE 24 Sec. 9.7; G701; R322.2.4, R322.3.10]
NFIP regulations do not have specific provisions for elevators other than the 60.3(a)(3)(i) general stability under flood loads.	**Elevators.** ASCE 24 has specifications for elevators that require use of flood damage resistant materials. For hydraulic elevators, electric control panels and hydraulic pumps and tanks shall be elevated. For traction elevators, machine rooms shall be elevated. In certain circumstances, controls shall prevent elevator cabs from descending into floodwaters [ASCE Sec. 7.5]

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
NFIP regulations do not have specific provisions for pools other than the 60.3(a)(3)(i) general stability under flood loads.	**Pools.** IBC and IRC require pools to be designed in accordance with the International Swimming Pool and Spa Code, and IBC, by reference to ASCE 24, has requirements for pools based on flood zone) [ASCE Sec. 9.6; 3109.1; R326.1]
NFIP regulations do not have specific provisions for multistory parking structures.	**Multistory parking structures.** ASCE 24 has requirements for multistory parking structures based on flood zone [ASCE Sec. 9.4.3]
NFIP regulations do not specify how to evaluate additions when making substantial improvement determinations.	**IEBC and Additions:** ▪ Prescriptive compliance method – additions that are substantial improvement shall comply and the existing building should be brought into compliance [EB502.3] ▪ Work area compliance method – requirements for horizontal additions and existing buildings depend on whether additions are "structurally interconnected"; also specifies requirements for vertical additions, raised or extended foundations, and new or replacement foundations (compliance regardless of whether substantial improvement) [EB1103.3]
NFIP regulations do not specify requirements for relocated or moved buildings.	**IEBC and Relocated or Moved Buildings.** Requires buildings relocated or moved into flood hazard areas to comply regardless of whether substantial improvement [EB1301.3.3]
NFIP regulations do not have specific provisions for fences; oil derricks; retaining walls, sidewalks and driveways; swimming pools; decks, porches, and patios; nonstructural concrete slabs (Zone V and CAZ); roads and watercourse crossings in floodways; and temporary structures and temporary storage. All of these are development and subject to the 60.3(a)(3)(i) general stability under flood loads.	**IBC Appendix G and Development.** ▪ Fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, must meet the requirements for floodway encroachments in G103.5 [G801.2] ▪ Oil derricks must be designed to conform to flood loads [G801.3] ▪ Retaining walls, sidewalks and driveways must comply with requirements for grading and fill [G801.4] ▪ Swimming pools must comply with ASCE 24 and floodway requirements [G801.5] ▪ Decks, porches and patios must comply with ASCE 24 [G801.6] ▪ Nonstructural concrete slabs in Zone V and CAZ must comply with ASCE 24 [G801.7] ▪ Roads and watercourse crossings in floodways must comply with the encroachment requirements [G801.8] ▪ Temporary structures must be anchored to prevent flotation, collapse, or lateral movement and have openings [G901.1]; temporary storage permitted for 180 days and must not include hazardous materials [G901.2]; temporary structures and temporary storage in floodways must comply with encroachments requirements [G901.3]

References

American Society of Civil Engineers (ASCE). ASCE 24-14, *Flood Resistant Design and Construction* (https://ascelibrary.org/doi/book/10.1061/asce24)

Federal Emergency Management Agency (FEMA). Title 44 of the Code of Federal Regulations Part 60 (https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=b882e95a6f9036587d71b2927e9d1f2e&mc=true&n=pt44.1.60&r=PART&ty=HTML)

International Code Council (ICC). 2021 International Codes (https://codes.iccsafe.org/codes/i-codes).

FEMA Resources

The following resource documents were prepared by FEMA and are available at https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes/flood:

- *Building Code Requirements That Exceed or Are More Specific Than the National Flood Insurance Program*
- *Flood Resistant Provisions of the International Codes* (excerpts of the flood provisions) and checklists that identify, for each NFIP requirement, sections of the codes and ASCE 24 that contain equivalent requirements.
- *Highlights of ASCE 24, Flood Resistant Design and Construction*
- *Reducing Flood Losses Through the International Codes: Coordinating Building Codes and Floodplain Management Regulations*. The 5th edition includes descriptions of several differences between I-Code provisions and NFIP requirements (Chapter 3).