FEMA Fact Sheet

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

This fact sheet summarizes the 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 "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).

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 Mechanical Code (IMC)
- 2021 International Plumbing Code (IPC)
- 2021 International Swimming Pool and Spa Code (ISPSC)
- ASCE 24-14, Flood Resistant Design and Construction
- ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures

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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." *(continue next page)*	**International Building Code (IBC) and ASCE 24.** IBC refers to ASCE 24 for design requirements [IBC 1612.2] ▪ Foundation Requirements. ASCE 24 requires design to prevent flotation, collapse, or permanent movement under load combinations, which are specified in ASCE 7 [ASCE Sec. 1.5.3] ▪ Geotechnical characteristics. ASCE 24 requires foundation designs to be based on geotechnical characteristics of the soils and strata below the structure [ASCE Sec. 1.5.3.1] ▪ Flood loads. ASCE 24 refers to ASCE 7 for flood loads (including hydrostatic loads, hydrodynamic loads, debris impact loads, wave loads) and load combinations [ASCE Sec. 1.6] ▪ Load Combinations. ASCE 24 requires flood loads be combined with other loads (e.g., seismic, wind) as specified in ASCE 7 Minimum Design Loads for Buildings and Other Structures [ASCE 1.6.2] ▪ Stability of fill. Requires fill to be designed to be stable under conditions of flooding [ASCE Sec. 1.5.4] Requires side slopes of structural fill to be no steeper than 1:1.5 and protected from scour and erosion; specifies lift thickness and compaction requirements for structural fill [ASCE Sec. 2.4; IBC 1804.5] ▪ Anchorage and Connections. ASCE 24 provides some specific requirements for anchorage and connections [ASCE Sec. 1.5.5] in addition to elsewhere in the standard.

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." *(continued)*	**International Residential Code (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 foundations in flood hazard areas other than coastal high hazard areas and Coastal A Zones to meet the requirements of Chapter 4; Chapter 4 requires construction to be capable of accommodating all loads specified in R301, which specifies design criteria (e.g., seismic, wind). Certain prescriptive foundation wall heights are specified, but use of those wall heights does not preclude compliance with Chapter 4 and R301 [R322.2.3] 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]
60.3(a)(3)(ii): Requires review to determine that all new construction and substantial improvements are constructed with materials resistant to flood damage.	**Flood damage-resistant materials.** ASCE 24 clearly specifies the elevations below which flood damage-resistant materials shall be used [ASCE 24-14 Table 5-1, see elevation summary below] ASCE 24 references third-party standards for certain materials, including metal connectors and fasteners, structural steel, concrete, masonry, wood and timber, and finishes and trim; ASCE requires materials used for dry floodproofing to be flood damage-resistant materials except on the interior [ASCE 24 Chapter 5] IRC specifies use of flood damage-resistant materials and installation methods for flooring and interior and exterior walls and wall coverings that conform to TB 2 below the elevations required for lowest floors (adjusting to match when freeboard is included) [R322.1.8]

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
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 (general).** IBC by reference to ASCE 24 and IRC specifically require equipment to be elevated to the lowest floor elevations or protected if located below that elevation (adjusting to match when freeboard is included) [ASCE 24 Chapter 7; R322.1.6] **Platforms for utility equipment.** ASCE 24 requires that exterior elevated platforms be supported on piles or columns, or cantilevered from or knee braced to the structure; if piles or columns are used, they shall be adequately embedded to account for erosion and local scour [ASCE Sec. 7.1] **Utilities and breakaway walls.** ASCE 24, IMC, IPC, and IRC specify that utilities and attendant equipment shall not be mounted on or pass through breakaway walls [ASCE Sec. 7.1; 1402.7; M301.13.1; P309.3; R322.1.6; R322.3.4] **Electric components required to meet life safety requirements.** ASCE 24 has specifications for exposed conduits and cables, electric meters, disconnect switches and circuit breakers, and other electric elements below the minimum elevations, including a statement that electric elements required to meet life safety provisions may be permitted within certain limitations [ASCE Sec. 7.2] **Duct systems.** ASCE 24, IMC, and IRC specifically require ductwork/duct systems to be above the required elevations or designed to resist loads and prevent water from entering or accumulating [ASCE Sec. 7.4; M602.4, M603.13; R322.1.6; M1601.4.9] **Fuel supply lines.** ASCE 24, IMC, and IRC specify that fuel supply lines below the required elevation shall be equipped with a float-operated automatic control valve [ASCE Sec. 7.4; M1305.2.1; G2404.7]
60.3(a)(5) and (6): Require 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, and onsite waste disposal systems are required to be located to avoid impairment.	**Underground plumbing system elements.** ASCE 24 specifies that if installed under-ground, piping and plumbing systems shall be buried to a depth sufficient to prevent movement, separation or loss due to flooding and erosion [ASCE Sec. 7.3.1]
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.

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
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]
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	**IBC/ASCE 24 Elevation requirements.** 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 higher for more important buildings (see Table 2 of this fact sheet for summary of ASCE 24 elevation requirements and Table 3 for description of Flood Design Classes). **IRC Elevation requirement (Zone AO).** Incorporates +1 ft (depth number plus 1 ft or at least 3 ft above highest adjacent grade) [R322.2.1] **Coastal A Zone (CAZ).** IBC/ASCE 24 and IRC require 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]

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
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]
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(c)(14): Has no limitations on location of recreational vehicles.	**Recreational vehicles.** IBC Appendix G prohibits placement of recreational vehicles in flood hazard areas subject to high velocity wave action (Zone V) and in floodways [G601.1]

[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.

NFIP: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
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.	**IBC/ASCE 24 Elevation requirements.** 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 (see Table 2 of this fact sheet for summary of ASCE 24 elevation requirements and Table 3 for description of Flood Design Classes). **IRC Elevation requirement (Zone V).** 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 or design flood elevation (DFE), whichever is higher [R322.3.2] **IRC Elevation requirement (Coastal A Zone[3]).** IRC requires dwellings in CAZ to be at or above the BFE + 1 ft or the DFE, whichever is higher [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. *(continue next page)*	**Foundations in Zone V and CAZ.** ASCE 24 allows buildings in coastal high hazard areas and Coastal A Zones to be supported on piles, columns, or walls serving as shear walls [ASCE Sec. 4.5.1] ASCE 24 foundation requirements include: ▪ Geotechnical considerations – account for instability and decreased structural capacity associated with erosion, scour, shoreline movement [ASCE Sec. 4.5.2] ▪ Foundation depth – sufficient to account for erosion, scour, and predicted shoreline movement [ASCE Sec. 4.5.3] ▪ Deep foundations – penetration depth, attachments, pile caps, wood piles, steel piles, concrete piles [ASCE Sec. 4.5.5] ▪ Pile design – lateral resistance, capacity of supporting soils, minimum penetration, spacing, caps, connections, splicing [ASCE Sec. 4.5.6] ▪ Posts, piers and columns – minimum spacing, minimum penetration [ASCE Sec. 4.5.7] ▪ Footings, mats, rafts, and slabs-on-grade – at or below grade, reinforced [ASCE Sec. 4.5.8] ▪ Grade beams – at or below grade; independent of decks, patios, concrete pads [ASCE Sec. 4.5.10] ▪ Shear walls – orientation to direction of wave approach; requires unobstructed areas between shear walls where those walls are not parallel to the direction of wave approach [ASCE Sec. 4.5.12] ▪ Stem walls – permitted in CAZ if designed to account for wave loads and scour and erosion [ASCE Sec. 4.13]

[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)(4): In coastal high hazard areas, the regulations specify that new construction and substantial improvements be elevated on pilings and columns. *(continued)*	IRC foundation requirements include: ▪ Spread footing, mat, raft or other foundations that support columns permitted under specific conditions and must be designed in accordance with ASCE 24 [R322.3.3] ▪ In CAZ, and exception to the requirement for pilings or columns permits backfilled stem walls if designed to account for wave loads and scour and erosion [R322.3.3] A requirement for construction to be capable of accommodating all loads specified in R301, which specifies design criteria (e.g., seismic, wind) [Chapter 4]
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 and IRC define: ▪ Addition: "An extension in floor area, number of stories or height of a building or structure." ▪ Crawl space: "An underfloor space that is not a basement." ▪ Repair: "The reconstruction, replacement or renewal of any part of an existing building for the purpose of its maintenance or to correct damage." ▪ ASCE 24 defines "flood damage-resistant materials," "residential," "nonresidential," "obstruction", "dry floodproofing", "wet floodproofing" (commentary defines "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: 44 CFR § 60 Criteria for Land Management and Use	2021 I-Codes/ASCE 24-14 "Higher Standards/More Specific"
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]
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]

[4] 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 have specific provisions for elements that may be obstructions below elevated buildings in Zone V and Coastal A Zone.	**Foundation Bracing.** ASCE 24 specifies requirements and limitations on use, size and orientation of foundation bracing [ASCE Sec. 4.5.11] **Decks, concrete pads, and patios (Zone V and CAZ).** ASCE 24 includes specifications for decks, concrete pads, and patios that are beneath or adjacent to structures in coastal high hazard areas and Coastal A Zones, including specific requirements for concrete pads that reinforcing shall not be used and limiting pad thickness [ASCE Sec. 9.2] IRC requires concrete slabs used for parking, floors of enclosures, landings, decks and walkways to be structurally independent of buildings, not more than 4 in. thick, no turned-down edges, no reinforcing, and isolated from pilings and columns, and with control or construction joints spaced not more than 4 ft apart to facilitate break away; or slabs must be self-supporting capable of remaining intact under flood conditions, including scour and erosion. IRC requires decks to meet the foundation requirements or be cantilevered/knee-graced and not enclosed by walls; self-supporting decks must be designed to resist flood loads or be breakaway [R322.3.4 and R322.3.8 – *both added 2021*] **Building envelope (Zone V and CAZ).** ASCE 24 and IRC require exterior doors at the top of stairways enclosed by breakaway walls [ASCE Sec. 4.6; R322.3.6.1] **Stairs and ramps (Zone V and CAZ).** ASCE 24 and IRC require stairs and ramps to have open risers and guards, be designed to break away, be retractable, or resist loads and minimize transfer of loads to the building [ASCE Sec. 8.1; R322.3.7]
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.** ASCE 24 requires tanks to be elevated or installed to resist flood loads, and have fill openings and vents elevated. Designs shall assume 1.5 times the potential buoyant and other flood forces acting on an empty tank [ASCE Sec. 9.7] IBC Appendix G requires tanks to be anchored to prevent flotation, collapse or lateral movement (underground and above-ground) or elevated; requires tank inlets and vents to be at or above DFE or fitted with covers to prevent inflow of floodwaters and outflow of contents [G701] In Zone A, IRC requires underground tanks to be anchored and above-ground tanks may be elevated or anchored [R322.2.4] and in Zone V and Coastal A Zone, IRC requires tanks to be underground or elevated [R322.3.10]

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 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 regulations do not have specific provisions for pools other than the 60.3(a)(3)(i) general stability under flood loads.	**Pools.** ASCE 24 requires pools in coastal high hazard areas and Coastal A Zones to be elevated, designed to breakaway, or to remain in the ground without obstructing flow [ASCE Sec. 9.6]. IBC requires compliance with the International Swimming Pool and Spa Code [3109.1] IRC requires pools to be designed in accordance with the International Swimming Pool and Spa Code [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: 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 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]

ASCE 24 Minimum Elevation Requirements and Flood Design Class

For buildings in flood hazard areas, ASCE 24 establishes minimum elevations based on Flood Design Class and flood zone. Table 2 compiles all minimum elevation requirements from ASCE 24. Table 3 is reproduced from ASCE 24 and shows the definitions of each Flood Design Class. Both tables are used with permission from ASCE.

Table 2: ASCE 24 minimum elevation requirements based on flood zone and Flood Design Class (from FEMA "Highlights of ASCE 24" used with permission from ASCE)

See next page for description of Flood Design Classes ➔		Flood Design Class 1	Flood Design Class 2	Flood Design Class 3	Flood Design Class 4
Minimum Elevation* of Lowest Floor (Zone A: ASCE 24-14Table 2-1)	Zone A not identified as Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Minimum Elevation of Bottom of Lowest Horizontal Structural Member (Zone V: ASCE 24-14 Table 4-1)	All Coastal High Hazard Areas (Zone V) and Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Minimum Elevation Below Which Flood-Damage-Resistant Materials Shall be Used (ASCE 24-14 Table 5-1)	Zone A not identified as Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
	All Coastal High Hazard Areas (Zone V) and Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Minimum Elevation of Utilities and Equipment** (ASCE 24-14 Table 7-1)	Zone A not identified as Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
	All Coastal High Hazard Areas (Zone V) and Coastal A Zone	DFE	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
Minimum Elevation of Dry Floodproofing of non-residential structures and non-residential portions of mixed-use buildings (ASCE 24-14 Table 6-1)	Zone A not identified as Coastal A Zone	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher
	Coastal High Hazard Areas (Zone V) and Coastal A Zone	Not permitted	Not permitted	Not permitted	Not permitted
Minimum Elevation* of Wet Floodproofing** (ASCE 24-14 Table 6-1)	Zone A not identified as Coastal A Zone; Coastal A Zone; Coastal High Hazard Areas (Zone V)	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +1 ft or DFE, whichever is higher	BFE +2 ft or DFE, or 500-year flood elevation, whichever is higher

* Flood Design Class 1 structures shall be allowed below the minimum elevation if the structure meets the wet floodproofing requirements of ASCE 24-14 Section 6.3.

** Unless otherwise permitted by ASCE 24-14 Chapter 7

*** Only if permitted by ASCE 24-14 Section 6.3.1

Table 3: ASCE 24 Flood Design Class of buildings and structures (used with permission from ASCE)

ASCE 24-14 Table 1-1 Flood Design Class of Buildings and Structures	
Use or Occupancy of Buildings and Structures	**Flood Design Class**
Buildings and structures that normally are unoccupied and pose minimal risk to the public or minimal disruption to the community should they be damaged or fail due to flooding. Flood Design Class 1 includes (1) temporary structures that are in place for less than 180 days, (2) accessory storage buildings and minor storage facilities (does not include commercial storage facilities), (3) small structures used for parking of vehicles, and (4) certain agricultural structures. [Note (a)]	1
Buildings and structures that pose a moderate risk to the public or moderate disruption to the community should they be damaged or fail due to flooding, except those listed as Flood Design Classes 1, 3, and 4. Flood Design Class 2 includes the vast majority of buildings and structures that are not specifically assigned another Flood Design Class, including most residential, commercial, and industrial buildings.	2
Buildings and structures that pose a high risk to the public or significant disruption to the community should they be damaged, be unable to perform their intended functions after flooding, or fail due to flooding. Flood Design Class 3 includes (1) buildings and structures in which a large number of persons may assemble in one place, such as theaters, lecture halls, concert halls, and religious institutions with large areas used for worship; (2) museums; (3) community centers and other recreational facilities; (4) athletic facilities with seating for spectators; (5) elementary schools, secondary schools, and buildings with college or adult education classrooms; (6) jails, correctional facilities, and detention facilities; (7) healthcare facilities not having surgery or emergency treatment capabilities; (8) care facilities where residents have limited mobility or ability, including nursing homes but not including care facilities for five or fewer persons; (9) preschool and child care facilities not located in one- and two-family dwellings; (10) buildings and structures associated with power generating stations, water and sewage treatment plants, telecommunication facilities, and other utilities which, if their operations were interrupted by a flood, would cause significant disruption in day-to-day life or significant economic losses in a community; and (11) buildings and other structures not included in Flood Design Class 4 (including but not limited to facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released. [Note (b)]	3
Buildings and structures that contain essential facilities and services necessary for emergency response and recovery, or that pose a substantial risk to the community at large in the event of failure, disruption of function, or damage by flooding. Flood Design Class 4 includes (1) hospitals and health care facilities having surgery or emergency treatment facilities; (2) fire, rescue, ambulance, and police stations and emergency vehicle garages; (3) designated emergency shelters; (4) designated emergency preparedness, communication, and operation centers and other facilities required for emergency response; (5) power generating stations and other public utility facilities required in emergencies; (6) critical aviation facilities such as control towers, air traffic control centers, and hangars for aircraft used in emergency response; (7) ancillary structures such as communication towers, electrical substations, fuel or water storage tanks, or other structures necessary to allow continued functioning of a Flood Design Class 4 facility during and after an emergency; and (8) buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released. [Note (b)]	4
[Note (a)] Certain agricultural structures may be exempt from some of the provisions of this standard; see Section C1.4.3. [Note (b)] Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for assignment to a lower Flood Design Class if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.3 of Minimum Design Loads for Buildings and Other Structures that a release of the substances is commensurate with the risk associated with that Flood Design Class.	

References

American Society of Civil Engineers (ASCE).

- ASCE 24-14, *Flood Resistant Design and Construction* (https://ascelibrary.org/doi/book/10.1061/asce24)
- ASCE 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (https://www.asce.org/asce-7/)

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:

- *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).