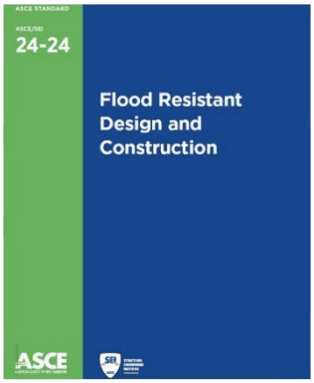
FEMA Building Science Highlights

Highlights of ASCE 24-24 Flood Resistant Design and Construction



Developed and published by the American Society of Civil Engineers (ASCE), *Flood Resistant Design and Construction,* ASCE 24, is in accordance with a consensus standards development process that has been accredited by the American National Standards Institute. The development process includes balloting by a balanced standards committee representing different interests. The standard is finalized after a public review and comment period.

ASCE 24 establishes the minimum requirements and expected performance for the siting, design, and construction of buildings and structures located in flood hazard areas that are subject to building code, floodplain management, or other requirements that cite ASCE 24. ASCE 24 defines the minimum requirements for flood hazard areas, materials, dry and wet floodproofing, utilities, building access, and other design and construction elements. The first edition of ASCE 24 was published in 1998, with updates in 2005, 2014, and 2024.

ASCE 24-24 incorporates ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, Supplement 2 (ASCE 7-22-S2), which was published in May 2023. ASCE 7-22-S2 expands the flood hazard areas to include the 100-year floodplain and the 500-year floodplain. ASCE 7-22-S2 also revised determination of flood loads as a function of a building's Risk Category.

ASCE 24-24 meets or exceeds the minimum National Flood Insurance Program (NFIP) requirements for buildings and structures. ASCE 24 includes more specific requirements, requires higher standards for new construction and substantially improved (including substantially damaged) structures, and includes some additional requirements and limitations that are not specified in NFIP regulations. Buildings and structures designed in accordance with ASCE 24 are typically more resistant to the effects of flooding than those designed to meet the minimum NFIP requirements.

Since 2000, ASCE 24 has been referenced in model building codes. The International Codes (I-Codes), published by the International Code Council, is a family of codes that includes the International Building Code (IBC), International Residential Code (IRC), and International Existing Building Code® (IEBC®), among others. Buildings and structures within the scope of the IBC and proposed to be located in designated flood hazard areas must be designed in accordance with ASCE 24. The 2015 through 2024 I-Codes reference ASCE 24-14, while the 2006 through 2012 I-Codes reference ASCE 24-05. The IRC requires dwellings in floodways to be designed in accordance with ASCE 24. In addition, beginning with the 2015 edition of the IRC, the use of ASCE 24 is allowed for dwellings in any flood hazard area. The 2012 and 2009 editions of the IRC allow use of ASCE 24 in Coastal High Hazard Areas. ASCE 24-24 has been submitted as a code change proposal for incorporation into the 2027 I-Codes.

Excerpts from ASCE 24-24, beginning on Page 11 of these Highlights, include the following:

- Flood Design Class of Buildings and Structures
- Required Minimum Elevations for Buildings and Structures
- Significant Technical Revisions, as summarized in the ASCE 24-24 Preface

ASCE 24-24 also contains commentary with information and guidance that is useful in complying with, clarifying, and interpreting requirements.

Highlights of ASCE 24-24 that complement the NFIP minimum requirements are described below. Overall, ASCE 24-24 has modified and removed the minimum elevation requirements from the individual chapters and placed them in Chapter 1. The references and their formatting have also been updated throughout the standard and commentary.

Flood Hazard Areas in Which ASCE 24-24 Applies

The Flood Hazard Area was expanded to include lands in the 500-year floodplain (where delineated on Flood Insurance Rate Maps) for buildings and structures that are assigned to Flood Design Classes 2, 3, and 4. For buildings and structures assigned to Flood Design Class 1, the standard applies in the 100-year floodplain (Section 1.3).

Siting Considerations

New and substantially improved buildings must not be built seaward of the reach of mean high tide. In addition, new and substantially improved buildings are not allowed in many High Risk Flood Hazard Areas unless protective works are in place. High Risk Flood Hazard Areas include: (1) alluvial fan areas, (2) flash flood areas (floodwater rises 3 feet or more above banks in less than 2 hours), (3) mudslide areas (determined by analysis), (4) erosion-prone areas (determined by analysis), (5) high-velocity flow areas (faster than 10 feet/second), or (6) ice jam and debris areas.

Buildings in proximity to flood protective works (dams, levees, floodwalls, diversions, channels, flood control structures) must not have adverse effects on, or conflict with, maintenance and repairs of those protective works.

Building Performance

The Flood Design Class is the classification of buildings and other structures based on use or occupancy. The classification is used to determine the minimum requirements for design and construction. Flood Design Classes are described in ASCE 24-24, Table 1-1, and include residential, commercial, industrial, educational, healthcare, critical facilities and other occupancy types.

The 2024 edition gives clarification for the Flood Design Classes and specifies size limitations applicable to accessory storage structures and structures used for parking of vehicles, thereby being consistent with FEMA Policy #104-008-03 issued February 2020 and with FEMA Floodplain Management Bulletin P-2140, *Floodplain Management Requirements for Agricultural Structures and Accessory Structures* issued July 2020. A definition for Agricultural Structure was also added. Clarification for the Flood Design Classes applicable to hospitals, healthcare facilities and ambulatory care facilities was also included along with the addition of corresponding definitions for Ambulatory Care Facilities and Hospitals.

Flood loads and other loads and load combinations are specified in ASCE 7-22-S2, which sets the minimum design loads based on Mean Recurrence Intervals (MRI) tied to the Risk Category (RC) assigned to individual buildings and structures. To align with ASCE 7-22-S2, the definitions of 500-Year Flood Elevation and Design Flood were modified, and definitions were added for 10-Year Flood Elevation, 100-Year Flood Elevation, 750-Year Flood Elevation, 1,000-Year Flood Elevation, Coastal Flood Source, Noncoastal Flood Source, MRI, and Site-Specific/Local Study.

ASCE 24-24 sets required minimum elevations based on the MRI assigned to each Flood Design Class associated with individual buildings and structures. While Risk Category (RC) and Flood Design Class vary in how the two are assigned to buildings, the MRI is assigned consecutively and consistently between both the RC and Flood Design Class. For example, RC I and Flood Design Class 1 have the same MRI requirements, while RC II and Flood Design Class 2 have the same but higher MRI requirements than RC I and Flood Design Class 1, and so forth. The assigned MRI is 100-year for Flood Design Class 1, 500-year for Flood Design Class 2, 750-year for Flood Design Class 3, and 1,000-year for Flood Design Class 4, the 1%, 0.2%, 0.13% and 0.1% annual exceedance probabilities, respectively.

Design Flood is redefined in ASCE 24-24 as the flood corresponding to the required minimum elevations in Section 1.5.2 of ASCE 24-24, which acts over the flood hazard areas specified in Section 1.3 of ASCE 24-24. The design flood cannot be less restrictive than the base flood for communities that participate in the NFIP. Most communities use the base flood determined in the Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FISs), shown as special flood hazard areas (SFHAs) on Flood Insurance Rate Maps (FIRMs).

Design Flood Elevation (DFE) is the greater of the elevations set by the community or the elevation associated with the MRI flood event for the Flood Design Class of the building or structure plus Sea Level Rise over a service life of no less than 50 years, as determined by Section 1.5.2 of ASCE 24-24. This aligns with ASCE 7-22-S2.

Required minimum elevations for lowest floors, lowest horizontal structural members of the lowest floors, flood-damage-resistant materials, utilities and dry floodproofing measures depend on four factors:

1. Flood hazard area.
2. Flood Design Class.
3. The higher of the flood elevation established by the community or the studied/calculated MRI-based flood elevation established for each Flood Design Class.
4. The required minimum elevation based on the base flood elevation (BFE) plus freeboard (as specified in Table 1-2 of ASCE 24-24).

FEMA P-2345, *Building Designer's Guide to Calculating Flood Loads Using ASCE 7-22, Supplement 2* presents instructional design guidance in helping design professionals determine flood loads and required minimum elevation requirements in accordance with ASCE 7-22-S2. In addition, this detailed guidance contains worked examples, extended guidance on topics such as coastal erosion, and an overview of floodplain management requirements; this guidance can be used by local officials.

A tool to help determine the ASCE 24-24 required minimum elevations was developed by Louisiana State University Agricultural Center and is available at https://floodelev.lsuagcenter.com/.

Performance of foundations exposed to flooding is specified in ASCE 24. Soil characteristics and underlying strata, including soil consolidation, expansion or movement, erosion and scour, and liquefaction and subsidence must be considered, as applicable.

Fill is required to be stable under conditions of flooding, including rapid rise and rapid drawdown, prolonged inundation, and erosion and scour. Compaction of structural fill is specified unless otherwise required by a building code or in a geotechnical or engineering report and approved by the authority having jurisdiction. Fill side slopes must not be steeper than 1:1.5.

To allow for the automatic entry and exit of floodwater, the following two methods are specified to meet the requirements for flood openings in walls of enclosures below elevated buildings: non-engineered flood openings that do not require certification and have no moving parts that depend on the presence of water (1 square inch per square foot of enclosed area) and engineered flood openings that must be certified by a registered design professional. The bottom of each flood opening must be no more than 1 foot above the higher of the interior grade or floor and the finished exterior grade immediately under each opening.

Both non-engineered and engineered flood openings must ensure that the difference between exterior and interior floodwater levels does not exceed 1 foot. In addition, the performance of engineered flood openings must account for the presence of louvers, blades, screens, grilles, faceplates or similar elements and devices. Except for buildings on sloping sites and where enclosed areas have only one exterior wall, installation of all flood openings must be in at least two walls.

All breakaway walls in all flood hazard areas must have flood openings.

Provisions are specified for concrete slabs-on-ground, depending on the purpose and location of the slabs. An existing slab-on-ground that is proposed to be elevated to become the lowest floor of an elevated building must be assessed in accordance with American Concrete Institute (ACI) provisional standard ACI 562, *Code Requirements for Assessment, Repair, and Rehabilitation of Existing Concrete Structures and Commentary*, and, if required by the assessment, strengthened in accordance with ACI 562 and ACI 318, *Building Code for Structural Concrete and Commentary*, to meet the load requirements of ASCE 7-22-S2 and ASCE 24 (see Figure 1).



Figure 1. Slab-on-ground structures with visible reinforcement

Stairways and ramps must be designed and constructed to resist flood loads and to minimize transfer of flood loads to foundations, or to break away without causing damage to the main structure, or to be retractable/able to be raised. Stairs and ramps that are retractable or able to be raised must be able to resist wind loads in the retracted or raised position.

Where building access, defined in the 2024 edition, is located within wet floodproofed enclosures, an additional exterior door—that satisfies the same performance and building code requirements as the exterior door of the enclosure—is required above the required minimum elevation to allow an elevated area to be secured if the enclosed area is damaged. When enclosures have breakaway walls, the additional door minimizes entry of wind-driven rain and wave run-up after breakaway walls have failed. Figure 2 illustrates the addition of an exterior door at the top of the stairs to protect the higher floor and its contents from wind and water damage, should the enclosed area below become damaged.



Figure 2. Outside of structure (left); inside of structure before an exterior door has been added (middle); inside of structure after exterior door has been added at the top of the stairs (right)

In Coastal High Hazard Areas (Zone V) and Coastal A Zones:

- Coastal A Zones are treated like Coastal High Hazard Areas where FEMA has delineated a Limit of Moderate Wave Action, or if the community has designated a Coastal A Zone.
- Buildings must be supported on piles, drilled shafts, caissons or other deep foundations (including columns and shear walls), and foundation embedment depth must take into account erosion and local scour.
- “Column” is defined in ASCE 24 for purposes of floodplain management requirements to distinguish between what is classified as a “column” and a “wall” based on a height-to-width (lateral dimension) ratio. This helps clarify the criteria that constitutes an open foundation in V Zones and Coastal A Zones.
- Stem walls supporting slab floors and backfilled with soil or gravel are allowed in Coastal A Zones if designs account for the effects of local scour and erosion. The bottom of the lowest horizontal structural member supporting the lowest floor is the top of the wall or portion of the wall supporting the slab.
- Requirements are included for shallow foundations in circumstances where soil conditions prevent deep foundations.
- Provisions are specified for pile foundations, attachment to piles, and different types of piles (wood, steel H, concrete-filled steel pipe, prestressed concrete, precast concrete, cast-in-place concrete, helical piles and anchors).

- Provisions are specified for pile design (capacity, capacity of supporting soils, minimum penetration, spacing, connections, splicing and mixed and multiple types of piles).
- Provisions are specified for footings, mats, rafts, slabs-on-ground, pile caps, grade beams, bracing and shear walls.
- Walls designed to break away must not produce debris that is capable of damaging structures.
- Erosion control structures (bulkheads, seawalls, revetments) must not be attached to new buildings, and new buildings must not be supported by or bear on erosion control structures. Erosion control structures must not direct floodwater into or increase flood forces or erosion impacts onto structures.
- Pools must be elevated, designed to break away without producing damaging debris, or designed to remain in the ground without obstructing flow that causes damage. Pools must be structurally independent of buildings and structures, unless pools are located in or on elevated floors or roofs that are above the DFE. Pool equipment must follow the standards contained in Chapter 7.

Dry Floodproofing

The 2024 edition includes significant changes to the requirements for dry floodproofed non-residential buildings and non-residential portions of mixed-use buildings. Some of the more significant changes include:

- The terms “mixed-use” and “residential portions of mixed-use buildings” are defined in the standard (previously defined in commentary).
- Dry floodproofing limitations for residential and non-residential portions of mixed-use structures have been clarified.
- New definitions are included for “flood opening,” “non-flood opening,” “wall” and “shield.” Definitions for various shields were added to better describe the substantially impermeable protective flood barriers used for non-flood openings when buildings are dry floodproofed.
- Dry floodproofing measures are not permitted in Coastal High Hazard Areas, Coastal A Zones, and High-Risk Flood Hazard Areas.
- At least one exit door or emergency escape/rescue opening must be included above the required minimum elevation specified for dry floodproofing. In addition, Flood Design Class 3 and Class 4 structures must have electrical connections above the required minimum elevation to allow for connection of temporary power sources for specific uses (e.g., exit signs, means of egress illumination, fire alarm systems, elevator) for at least 72 hours.
- Clarification was added in the 2024 edition to define what are considered non-flood openings in walls and what is part of a substantially impermeable wall. Non-flood openings in walls that are below the required minimum elevation are limited to those necessary to meet building code requirements.
- Shields, tested and certified to meet the requirements of the American National Standards Institute (ANSI) and FM Approvals (FM) standard ANSI/FM 2510, *American National Standard for Flood Mitigation Equipment*, are permitted to render the non-flood openings substantially impermeable to floodwater.

- Allowable shield types are dependent on the Flood Design Class of the building and whether the work is new construction or substantial improvement. Allowable shield types are listed in Table 6-1 of the standard.
- Requirements for flood mitigation valves are specified to mitigate the passage of water into protected areas.
- Requirements for flood mitigation pumps are specified to remove accumulation of water in dry floodproofed areas.
- Marking and identification requirements are specified for substantially impermeable walls and other areas of a dry floodproofed building required to have protected non-flood openings or penetrations (see Figure 3).

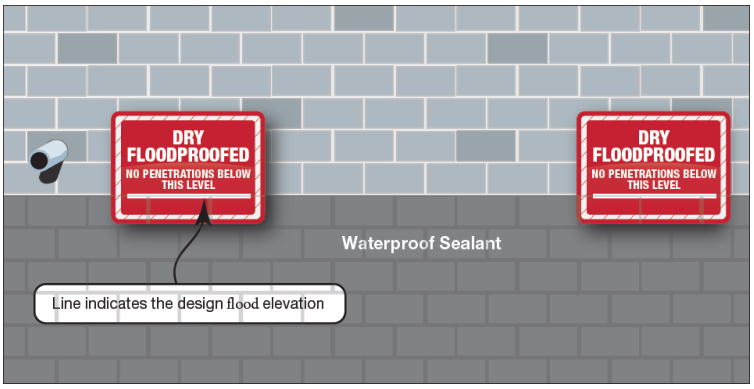


Figure 3. Example marking and identification requirements for substantially impermeable walls

- Depending on the Flood Design Class of the building, maximum time requirements are specified for implementation of flood protection measures that require human intervention to activate or implement. In such cases, there must be a minimum warning time of 12 hours for Flood Design Class 1 and Class 2 buildings, 8 hours for Flood Design Class 3 buildings, and 4 hours for Flood Design Class 4 buildings.
- Flood emergency operations plans must be developed and must be posted in at least two conspicuous locations. The plans must include annual “full-scale deployment inspection.”
- Maintenance plans must include specific elements necessary for periodic maintenance of the components necessary to maintain dry floodproofing measures.
- Inspection plans must include annual inspections, which must be documented and shared with communities.

Materials

Flood damage-resistant materials must be used below required minimum elevations. The materials, both structural and nonstructural, must resist damage, deterioration, corrosion or decay from direct and prolonged contact with floodwater.

Metal connectors and fasteners exposed to salt water, salt spray or other corrosive agents must be stainless steel or an equivalent corrosion-resistant material, or hot-dipped galvanized after fabrication. When uncovered as part of substantial improvements, connectors and fasteners that provide a continuous load path and are found to be unsound or deficient are required to be replaced.

Where preservative treated wood is required, treatment must be in accordance with American Wood Protection Association (AWPA) standard AWPA U1, *Use Category System: User Specification for Treated Wood*. The standard sets requirements based on the use, wood species, and types of wood products and outlines the treatment process, preservative method, retention basis, and any other special requirements.

ASCE 24-24 includes specifications for concrete with steel reinforcement and the use of glass fiber-reinforced polymer (GFRP) reinforcing bars in concrete.

Sources of information to assist in the selection of flood damage-resistant materials include NFIP Technical Bulletin 2, *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas* (2025) and NFIP Technical Bulletin 8, *Corrosion Protection for Metal Connectors and Fasteners in Coastal Areas* (2019). In addition, ASTM International (ASTM) standards ASTM E3075, *Standard Test Method for Water Immersion and Drying for Evaluation of Flood Damage Resistance* (2018), and ASTM E3369, *Standard Specification for Determining the Flood Damage Resistance Rating of Building Materials* (2024), when used together, offer an alternative method for determining the resistance of materials to damage caused by floodwater. (Note that ASTM E3075 was updated in 2024 after the deadline for final proposals to be considered to be incorporated into ASCE 24-24.)

Attendant Utilities and Equipment

Attendant utilities and equipment must be at or above required minimum elevations, or must be specifically designed, constructed and installed to prevent floodwater from entering or accumulating within components. Plumbing fixtures and rough-in plumbing for future connection of plumbing fixtures are not allowed below the required minimum elevations.

The 2024 edition clarifies that attendant utilities and equipment serving the dry floodproofed non-residential portions of a mixed-use building can be located in the dry floodproofed portion of the building. Attendant utility systems serving the residential portions of mixed-use buildings must be located above the required minimum elevation. Figure 4 illustrates attendant utilities and equipment placement for both the residential and non-residential portions of a building.

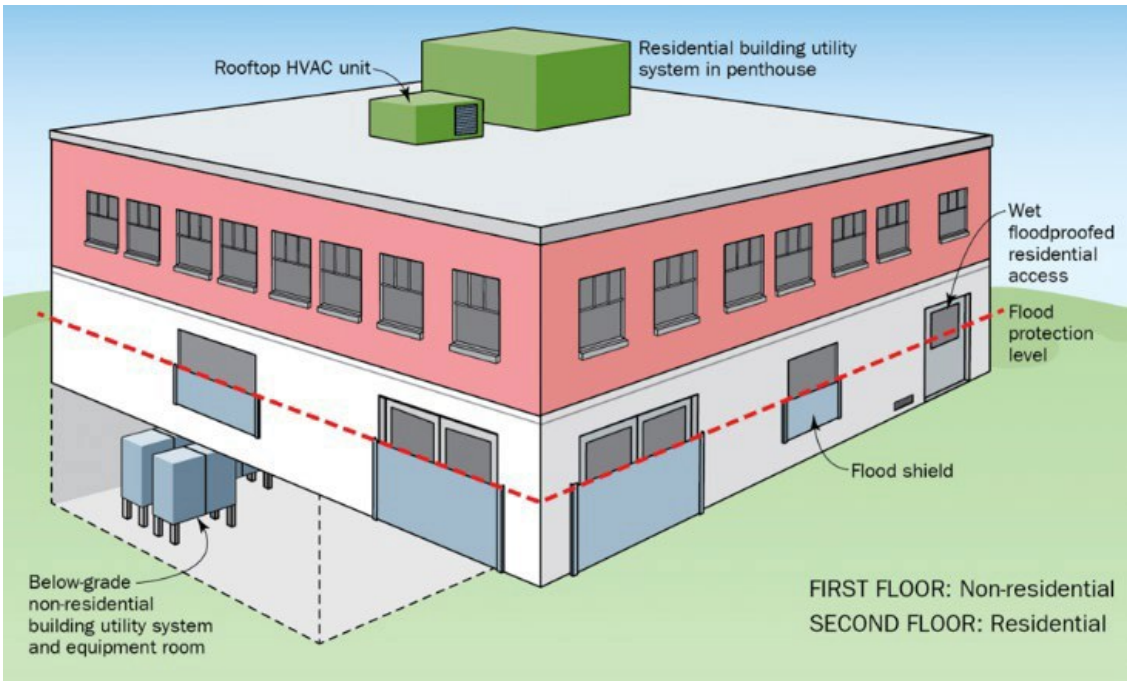


Figure 4. Attendant utilities and equipment placement for building with both residential and non-residential areas

Flammable gas and fuel supply lines below the required minimum elevation must be equipped with automatic pressure control valves.

Where required to meet life safety provisions of the code, certain electrical components may be installed below the required minimum elevation, provided they are the minimum necessary, suitable for wet locations, and meet the other requirements listed in Section 7.2.5 of ASCE 24-24.

Tanks that are below the required minimum elevation and that are attached to or beneath buildings must be installed and anchored to resist all flood-related loads, including floating debris.

Elevator cabs that descend below the required minimum elevation must be equipped with controls that prevent the cab from descending into floodwater. Elevator shafts must be designed to resist flood loads but are not required to have flood openings or breakaway walls.

Utility chases are not required to have flood openings or breakaway walls, provided the chases are the minimum size necessary for protection and service. The design and construction of utility chases is required to meet the load requirements within the flood hazard area in which it is located.

Electric meters, if required by the supplying electric utility, may be below the required minimum elevation (if sealed between the meter enclosure and the service equipment) to prevent floodwater or moisture from entering the service equipment.

Garages, Accessory Storage Structures, and Other Construction

Provisions are included for garages, carports and accessory storage structures, as well as multi-story parking structures, attached and self-supporting (detached) decks and porches, concrete slabs, chimneys and fireplaces, pools, tanks and tents and membrane structures.

Clarification was added in the 2024 edition that self-supporting decks and porches in Coastal High Hazard Areas and Coastal A Zones must be located to avoid obstructing the free flow of floodwater.

A new section was added to relocate provisions for tents and membrane structures because both are erected for uses other than pools, such as tennis courts.

The 2024 edition incorporates FEMA Floodplain Management Bulletin P-2140, *Floodplain Management Requirements for Agricultural Structures and Accessory Structures*, which recognizes that wet floodproofing of certain detached garages and accessory structures that represent minimal investment and have low damage potential may be designed and constructed below the required minimum elevations.

Table 1. ASCE 24-24 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 structures and structures used for parking of vehicles, provided those structures satisfy the criteria in Section 9.4.2, and 3. Certain agricultural structures[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	3

Use or Occupancy of Buildings and Structures	Flood Design Class
7. Healthcare facilities other than hospitals not having emergency surgery or emergency treatment capabilities 8. Ambulatory care facilities 9. Hospitals not having surgery or emergency treatment facilities 10. Care facilities where residents have limited mobility or ability, including nursing homes but not including care facilities for five or fewer persons 11. Preschool and childcare facilities not located in one- and two-family dwellings 12. 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 13. 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[b]	
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 having surgery or emergency treatment facilities 2. Health care facilities having emergency surgery or emergency treatment capabilities 3. Fire, rescue, ambulance, and police stations and emergency vehicle garages 4. Designated emergency shelters 5. Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response 6. Power generating stations and other public utility facilities required in emergencies 7. Critical aviation facilities such as control towers, air traffic control centers, and hangars for aircraft used in emergency response 8. 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 9. 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[b]	4

[a] Certain agricultural structures may be exempt from some of the provisions of this standard. See Section C1.4.3.

[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 shown to the satisfaction of the authority having jurisdiction by a hazard assessment, as described in Section 1.5.3 of ASCE/SEI 7, that a release of the substances is commensurate with the risk associated with that Flood Design Class.

Table 2. Adapted from ASCE 24-24, Table 1-2. Required Minimum Elevations for Buildings and Structures (by Design Class)

Required Minimum Elevation Reference Location	Applicable Area	Flood Design Class 1 Required Minimum Elevation	Flood Design Class 2 Required Minimum Elevation	Flood Design Class 3 Required Minimum Elevation	Flood Design Class 4 Required Minimum Elevation
Lowest Floor	Flood Hazard Areas Other than CHHAs and CAZs	DFE	BFE + 1 ft (0.3 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher
Bottom of the Lowest Horizontal Structural Member of the Lowest Floor	CHHAs and CAZs	DFE	BFE + 1 ft (0.3 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher
Top of Dry Floodproofing	Flood Hazard Areas Other than CHHAs and CAZs	BFE + 1 ft (0.3 m) or DFE, whichever is higher	BFE + 1 ft (0.3 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher	BFE + 2 ft (0.6 m) or DFE, whichever is higher
Top of Dry Floodproofing	CHHAs and CAZs	Not Allowed	Not Allowed	Not Allowed	Not Allowed

CHHA = Coastal High Hazard Area
CAZ = Coastal A Zone

Significant Technical Revisions Summarized in the ASCE 24-24 Preface

The 2024 edition contains a number of significant changes, including alignment with the "sweeping changes introduced in ASCE 7-22 Supplement 2 and changes to floodplain management." The Supplement "set minimum loads based on Mean Recurrence Intervals tied to a buildings' Risk Category and increased the area of applicability to the 500-year floodplain." The preface lists additional revisions to the 2024 edition from the 2014 edition, including:

1. The Flood Hazard Area was expanded to include land in the 500-year floodplain.
2. The Design Flood Elevation now corresponds to the greater of the elevation set by the community or the elevation pertaining to a Mean Recurrence Interval corresponding to the Flood Design Class plus Sea Level Rise. This change aligns ASCE 24 with ASCE 7-22 Supplement 2.
3. Incorporating Sea Level Rise criteria corresponding to the minimum historic rate.
4. The Mean Recurrence Interval for Flood Design Class 1 is 100-year.
5. The Mean Recurrence Interval for Flood Design Class 2 is 500-year.
6. The Mean Recurrence Interval for Flood Design Class 3 is 750-year.

7. The Mean Recurrence Interval for Flood Design Class 4 is 1,000-year.
8. The elevation requirements have been removed from individual chapters and have been relocated and modified to Chapter 1.
9. Elevation requirements now correspond to the higher of the DFE or the BFE plus a specified freeboard amount.
10. Flood loads for use in design are now calculated in accordance with ASCE 7-22 Supplement 2.
11. Requirements for Agricultural Structures were updated to align with FEMA Floodplain Management Bulletin P-2140.
12. Clarifications were made to the Flood Design Class applicable to Hospitals, Health Care Facilities, and Ambulatory Care Facilities.
13. Residential Portions of Mixed-Use Buildings is now a defined term in the standard used in the limitations for dry floodproofing provisions.
14. Definitions have been added for flood barriers and shields along with testing and certification requirements and criteria for use.
15. Flood mitigation pumps are required to remove accumulated water in dry floodproofed spaces.
16. Inspection and maintenance requirements, flood emergency operation plans, and limits of human intervention for dry floodproofed areas are identified.
17. Flood mitigation valves are required to mitigate the passage of water into protected areas.
18. Exceptions in the location of flood vents have been made for buildings on sloped sites and interior areas with a single exterior wall.
19. Provisions are added to prevent slabs on grade from being elevated without an assessment and, if required by the assessment, strengthening.
20. For wet floodproofed building access, an additional exterior door is required above the DFE to allow for an elevated area to be secured.
21. Criteria for helical piles and anchors have been added.
22. Criteria for the distinction between columns and walls have been added.
23. New buildings and structure shall not be supported by or bear on bulkheads, seawalls, revetments and other erosion control structures.
24. GFRP reinforcement has been added to Chapter 5 Materials.
25. Attendant utilities and equipment serving residential buildings and residential portions of mixed-use buildings are not permitted in dry floodproofed enclosures.
26. Automatic pressure control valves are required for flammable gas and fuel supply lines.
27. Self-supporting decks and porches shall be located to avoid obstructing the free flow of floodwater under structures.

28. Tents and membrane structures have been added to Chapter 9.
29. References and their formatting have been updated.

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