



FLORIDA DIVISION OF EMERGENCY MANAGEMENT

Office of Floodplain Management

GUIDANCE FOR Swimming Pools, Spas, and Similar Water Features in Flood Hazard Areas

Office of Floodplain Management

Florida Division of Emergency Management

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January 2024

OBJECTIVE: Provide guidance to help community officials, design professionals, pool contractors, and others understand the floodplain management requirements for pools, spas, and water features in special flood hazard areas (SFHAs). This guidance has three parts:

- **Part 1** provides guidance to address questions regarding how communities should review and regulate swimming pools (including spas and water features) constructed or installed in special flood hazard areas. The guidance also addresses pool enclosures; pool controls; appliances, chemical feeders, and equipment not rated for submersion; equipment buildings; tanks; and pool chemicals.
- **Part 2** addresses issues associated with infinity pools in Zone V and Coastal A Zones.
- **Part 3** provides excerpts of pertinent sections from the Florida Building Code (FBC), excerpts from a number of FEMA publications, and a Building Officials Association of Florida Nonbinding Interpretation (2004).

The National Flood Insurance Program (NFIP) establishes the minimum criteria for development in floodplains. Most Florida counties and municipalities participate in the NFIP. They adopt and enforce regulations that apply to “development,” a broadly defined term. Florida communities also enforce the Florida Building Code. Development must be “reasonably safe from flooding” and must be undertaken in ways that “minimize flood damage.” [44 Code of Federal Regulations, Section 60.3]

www.floridadisaster.org/dem/mitigation/floodplain/community-resources/
(Guidance, Ordinance Amendments, FBC Amendments, and Sample Forms).

Floodplain Management Requirements and Guidance

The Florida Building Code (FBC) and floodplain management regulations adopted by Florida communities apply to construction of buildings, structures, and other development in flood hazard areas.

FEMA publishes guidance for local officials, builders, and property owners to aid in the interpretation of, and compliance with, the requirements of the NFIP.

Regulation of All Development in SFHAs

Communities must regulate all development in SFHAs regardless of whether a structure or element of the development is or is not covered by federal flood insurance.

NFIP Flood Insurance Coverage

NFIP flood insurance policies include coverage for insurable buildings and machinery and equipment serving buildings. Coverage expressly excludes coverage for “hot tubs and spas, except where used as bathroom fixtures” and “indoor or outdoor and swimming pools.” NFIP Flood Insurance Manual (October 2022)

The FBC includes requirements that vary by flood zone (i.e., Zone A/AE, Coastal A Zone, and Zone V/VE). The primary way NFIP requirements are satisfied for buildings and structures is by elevating the lowest floors to or above the elevation required in the FBC, which is the base flood elevation (BFE) plus one foot of freeboard. Some Florida communities adopt FBC technical amendments to require more freeboard.

Floodplain management regulations adopted by communities in Florida have requirements for development other than buildings. Look in those regulations for the definition of “development” to verify the scope of the regulations.

The FBC has specific requirements for pools, including pools in flood hazard areas (see pages 7 and 8, below). In Zone V, pools must be designed and constructed in accordance with ASCE 24, *Flood Resistant Design and Construction*, a standard incorporated by reference and required by the FBC.

FBC Excerpts

Selected excerpts of the FBC that apply to pools are on pages 7 and 8.

Find excerpts of the flood provisions of the FBC and “Highlights of ASCE 24” online here:

www.floridadisaster.org/dem/mitigation/floodplain/community-resources/
(Building Code Resources)

PART 1. Guidance for Regulating Swimming Pools in Special Flood Hazard Areas

Florida’s NFIP communities are required to issue permits for all development in special flood hazard areas, including the installation of swimming pools (and spas and water features) and associated controls, equipment, and tanks. Local officials must examine these proposals and consider the following:

Pools. With respect to swimming pools in special flood hazard areas, several aspects must be considered as part of issuing permits:

- The type of flood zone where pools are located.
- The impact pools may have on flood conditions that may affect adjacent buildings and properties, specifically pools located in floodways along riverine waterways and pools located in flood hazard areas subject to wave action, which are coastal high hazard areas (Zone V) and Coastal A Zones.¹
- Whether alteration of sand dunes or mangrove stands is proposed (both prohibited in Zone V if alterations increase flood potential, and may also be regulated by the Florida Department of Environmental Protection).
- The impact of flood conditions on pools, specifically stability of pools and pool decks during conditions of flooding.
- The frequency of anticipated flooding, which may be more frequent than the base (1-percent-annual chance) flood.
- The impact of debris from frangible pools (designed to break away) on adjacent buildings.
- Floodborne debris from elsewhere that may adversely impact pools.

Flood Conditions

Flood conditions include the characteristics of flooding that must be accounted for in the siting and design of buildings and other structures, including pools.

Characteristic to consider include:

- Depth of water
- Flood frequency
- Velocity of flow
- Wave height and impacts
- Duration
- Potential for floodborne debris

¹ Coastal A Zones are areas subject to wave heights of 1.5 to 3 ft, located seaward of the Limit of Moderate Wave Action that FEMA delineates on many FIRMs for coastal communities.

- The obstruction of floodwater presented by pools in Zone V and Coastal A Zones that are not installed in-ground with the top edge flush with the existing grade. **Installations where a small portion of the pool extends above grade with minimal landscaping and nonstructural fill placed to make pools appear flush with grade are not fully in-ground and are obstructions.** Nonstructural fill is intended to wash away, which would expose obstructing elements such as a pool that is not fully in-ground. However, it is expected that pool decks and the ground surrounding pools may have a minimum slope to direct stormwater away from the pool to minimize contamination of the pool water during rain events.
- The impact of flood conditions on pool equipment and controls.

Pools and Coastal Construction Control Line (CCCL)

Swimming pools and water features located seaward of the CCCL are subject to requirements of the Florida Department of Environmental Protection. This guidance does not address the CCCL requirements.

Pools in Zone A/AE and Floodways. Residential pools in flood zones that start with the letter “A” other than those seaward of a Limit of Moderate Wave Action must comply with FBC, Residential Section R322.2.5, where the primary consideration is whether above-ground pools, in-ground pools that involve placement of fill are located in designated floodways. The FBC, Building has requirements in Sec. 454.1.1 (public pools) and Sec. 454.2.4.2.1 (private pools), which both require compliance with Section 1612, which refers to ASCE 24 (ASCE 24 Sec. 9.6 Pools).

Pools in Zone V and Coastal A Zone. Pools in Zone V and Coastal A Zones must comply with ASCE 24 (Sec. 9.6), which is intended to satisfy the free-of-obstruction performance required by ASCE 24 Chapter 4. The FBC, Residential Section R322.3.3.1, requires pools in Zone V and Coastal A Zone to comply with ASCE 24. ASCE 24 Sec. 9.6.2 requires pools in Zone V and Coastal A Zones to either:

- Be elevated such that the lowest horizontal structural member (supporting the pool) is at or above the design flood elevation,
- Be designed and constructed to breakaway during design flood conditions without producing debris capable of causing significant damage to any structure, or
- Be designed and constructed to remain in the ground during design flood conditions without obstructing flow that results in damage to any structure.

Design Professional Certification

NFIP Technical Bulletin 5 advises that registered design professionals “must certify to local officials that pools or spas beneath or near buildings in Zone V will not be subject to flotation or displacement that will damage building foundations during a base floor or lesser event.” Access TB 5: www.fema.gov/emergency-managers/risk-management/building-science/national-flood-insurance-technical-bulletins.

When the horizontal members (or slabs) supporting an elevated pool are not designed to breakaway, the foundation of the building must be designed to account for increased loads caused by flood loads on the supporting members. See ASCE 24 requirements for decks (Sec. 9.2) and concrete slabs (Sec. 9.3).

Significant obstructions may prevent the free passage of floodwater and waves, imposing increased flood loads on buildings and contributing to scour. NFIP Technical Bulletin 5, *Free-of-Obstruction Requirements* (2020) notes:

“Any construction or site development practice below the BFE (even piles and columns permitted by the NFIP) will cause a localized disruption of flow and waves during the base flood. The question is whether the localized disruption will be great enough to harm the elevated building or surrounding buildings.”

Engineering wave analyses of the effects of all obstructions not designed to break away must be thorough and must evaluate the **combination** of the velocity of the mass of moving water (both onshore and as surge recedes), wave loads, debris loads, and wind loads. The adverse effects of obstructions on scour and erosion must be documented. Wave analyses must consider waves from **all directions**, not just those directly approaching the shoreline. **While direct-approach waves may impose the greatest load on the obstruction itself, waves from other angles are more likely to concentrate and divert more flow toward adjacent properties and buildings.**

FDEM OFM Advice

If local officials are not qualified to evaluate engineering analyses of non-breakaway obstructions (including pools that extend below the BFE plus freeboard), FDEM OFM advises communities to retain outside experts to conduct reviews.

The FBC, Residential Section R322.3.6, and FBC, Building Section 1612.5 require construction documents to include documentation prepared and sealed by registered design professionals. When obstructions that are not designed to break away are proposed below elevated buildings, including pools, the documentation must certify the free of obstruction requirements are satisfied. This is accomplished by examining the characteristics described in the previous paragraph.

Pools and Enclosures.

- Pools may be inside non-residential buildings and below the BFE plus freeboard, provided the buildings are dry floodproofed (Zone A/AE only, subject to the FBC and ASCE 24 limitations on dry floodproofing). Pools in portions of buildings that are above the BFE plus freeboard are not subject to floodplain management regulations (e.g., rooftop pool).
- Pools in any flood zone may be surrounded by lattice, insect screening, decorative concrete block, or aluminum screening that allows the free passage of floodwater. Breakaway walls, walls with flood openings, and glass walls do not satisfy this requirement. The NFIP guidance for wet floodproofed accessory structures used solely for parking and storage is not applicable to structures enclosing pools because pools are a recreational use.
- Pools located under elevated buildings are permitted only if the top of the pool and accompanying deck or walkway are flush with the existing grade, and only if the space around the pool is not enclosed on all sides with walls. Enclosures below elevated buildings are only allowed for parking, storage, and building access.

Pool controls, appliances, chemical feeders, and equipment not rated for submersion. In the interest of meeting the expectation that the equipment is "reasonably safe from flooding" and to "minimize flood damage," communities must consider the impact of flooding on any pool equipment that is not rated for submersion. See the 8th Edition FBC (2023) amendments to FBC, Residential Section R322.1.6 and FBC, Building Section 1612 (to modify ASCE 24), shown starting below on page 7. Equipment is permitted below the BFE plus freeboard if:

- The equipment is elevated to the extent practical. Even partial elevation protects against low-level flooding. Factors to consider are safe functioning and access for services (see FBC, Building Section 454.2.23 and FBC, Residential Section R4501.23).
- The equipment is anchored to prevent flotation and resist flood forces.
- The equipment is supplied by branch circuits that have ground-fault circuit interrupter protection.
- Some guidance is in FEMA P-348, *Protecting Building Utility Systems From Flood Damage*.

Pool equipment buildings. Pool equipment buildings are structures built to contain pool equipment and no other uses or occupancy. The buildings must either be elevated or, if not elevated, constructed to comply with the pertinent requirements for accessory buildings based on the flood zone. The requirements for pool equipment apply to equipment inside pool equipment buildings.

Tanks. Tanks must meet the requirement to either be elevated or anchored to resist anticipated flood loads (e.g., see local floodplain management regulations, FBC, Residential Section R322, and ASCE 24, Sec. 9.7 Tanks).

Pool chemicals. Communities should specify that ready-to-use pool chemicals are stored above the BFE plus freeboard. Chemical feeders are considered part of pool equipment.

PART 2. Additional Guidance for Infinity Pools in Coastal High Hazard Areas (Zone V) and Coastal A Zones

Many owners of shorefront homes want to design homes so they can walk out of the elevated living level onto pool decks. In Coastal High Hazard Areas (Zone V) and Coastal A Zones, the lowest horizontal structural members supporting the lowest floor of homes must be elevated to or above the BFE plus freeboard. When pool decks are at the same height as the lowest floor, pool bodies extend below the BFE plus freeboard, which may create obstructions to the free flow of floodwater under the homes.

The defining feature of infinity pools is one or more edges over which water flows into a trough to collect for recirculation. The edge may be called zero edge, disappearing edge, negative edge, or vanishing edge. The pool water discharged over a zero edge typically flows down a vertical structure (wall), usually facing open water.

- In Zone V and Coastal A Zone, all pools must comply with ASCE 24, FBC, Residential Section R322.3.3.1, which refers to ASCE 24. The guidance in Part 1 of this guidance is also applicable.
- In Zone V and Coastal A Zone, proposed pool construction that includes obstructions to the free flow of floodwater and waves beneath and around buildings, including pools, must be analyzed to determine potential impacts to the building and nearby buildings and properties. Wave analyses must be prepared and signed by registered design professionals, preferably coastal engineers experienced with these analyses.
- In Zone V and Coastal A Zone, the vertical structure supporting and forming the zero edge of infinity pools is an obstruction to the building located landward of a waterside infinity pool. The free-of-obstruction requirements in the FBC and ASCE 24 must be satisfied. NFIP Technical Bulletin 5 offers guidance specifically for addressing the free-of-obstruction requirement (FEMA publication excerpts start on page 9).
 - Engineers must consider alteration of the physical characteristics of flooding, diversion of flow, redirected wave impacts, scour, and debris impact forces affecting adjacent buildings and properties, as well as the building where the pool is located.
 - Design professionals may account for increased flood-related loads on the building where the pool is located, for example, by increasing foundation embedment or other foundation design variations.
 - Design professionals must take into account the potential for obstructions causing increased flood loads, diverted flood flows, and erosion to nearby buildings and properties.
- Engineering wave analyses described in Part 1 must examine the effects of obstructions such as vertical walls forming the infinity pool zero edge. Waves from **all directions** must be considered in the analyses, not just those directly approaching the vertical walls forming the infinity pool zero edge. While direct-approach waves may impose the

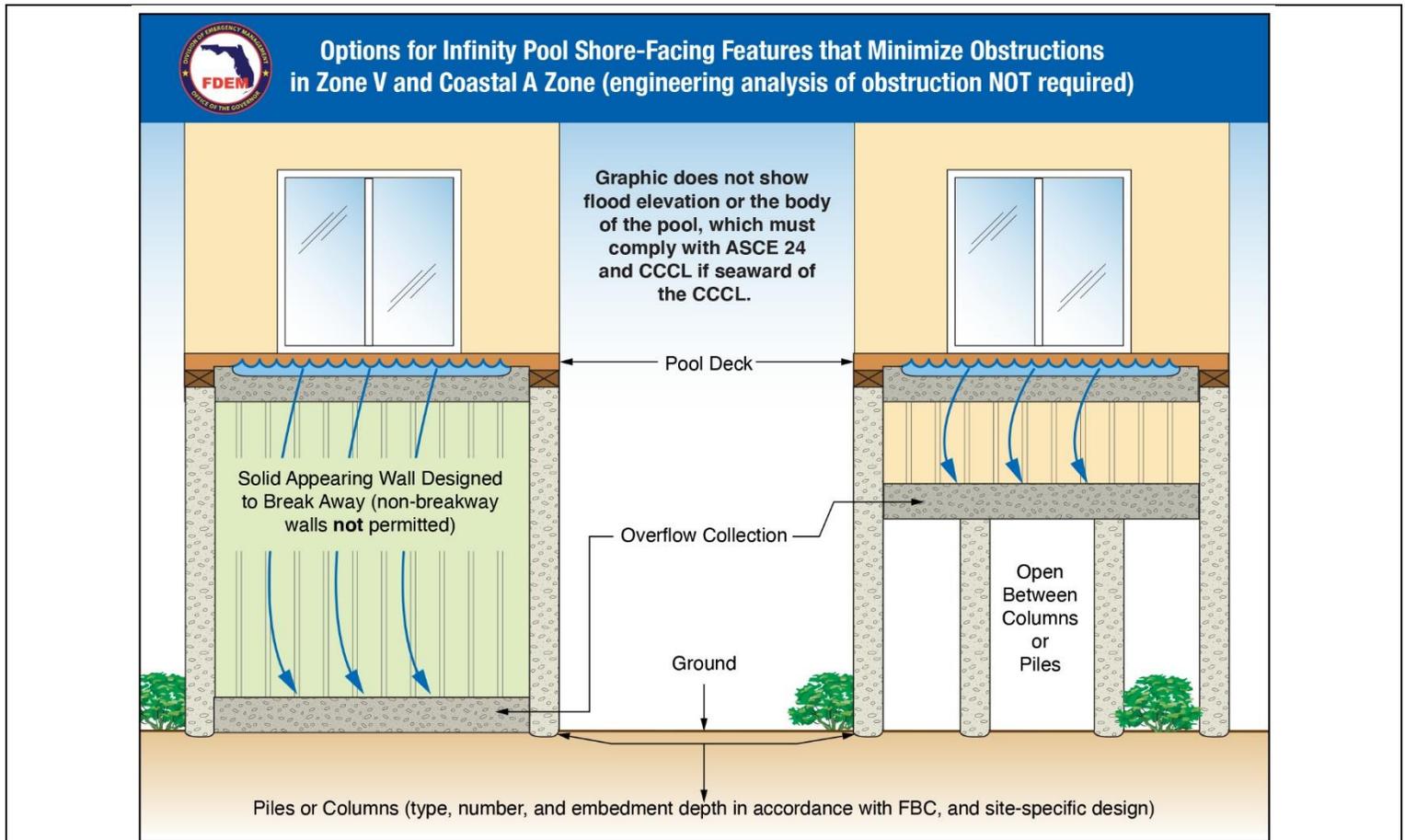
From FEMA TB 5 (2020):

SWIMMING POOLS AND SPAS

Pools and spas adjacent to coastal buildings are allowed only if they will not act as obstructions that could lead to damage to nearby buildings. This effectively means that most pools and spas must be installed in-ground (either frangible or immovable) or completely elevated above the BFE. Swimming pools, spas, and related equipment are not covered by NFIP flood insurance.

greatest load on the wall itself, waves from other angles are more likely to concentrate and divert more flow toward adjacent properties and buildings.

- The FDEM/OFM reviewed some engineering assessments developed by professional engineers of the obstructive effects of solid vertical walls associated with infinity pools. Some assessments suggest that the solid wall creates no adverse effects on the building or adjacent buildings and properties, which therefore allows pools to be installed behind the wall without complying with ASCE 24 Sec. 9.6.2 requirements for pools in Zone V and Coastal A Zone. However, flood zone designations on FIRMs (and associated requirements) **cannot be changed based solely on an engineering assessment**. Only FEMA can officially revise a FIRM through the Letter of Map Change process.
- The illustration below shows two options for infinity pools that do not require engineering analyses of obstructions. The illustration does not show the flood elevation or the body of the pool, which must comply with ASCE 24 (and CCCL if seaward of the CCCL). Other configurations must be evaluated to determine if they would be obstructions.



Option 1. The vertical breakaway wall spans between load-bearing columns/pilings and extends to the ground. The pool body itself (not shown) must comply with ASCE 24, including elevation requirements.

Option 2. The short vertical wall is supported by load-bearing columns/pilings, with a trough positioned a short distance below the zero edge to capture water, provided the **horizontal member supporting the zero edge element is at or above the required elevation** (not shown). The pool body itself (not shown) must comply with ASCE 24, including elevation requirements.

PART 3. Excerpts from the 8th Edition Florida Building Code (2023)², FEMA Guidance Documents, and BOAF’s Nonbinding Interpretation

8th Edition Florida Building Code, Residential³ (2023)	
<p>Sec. R322.1 applies in all flood zones.</p>	<p>Sec. R322.2 applies in flood zones other than coastal high hazard areas (Zone V) and Coastal A Zone.</p>
<p>R322.1.6 Protection of mechanical, plumbing and electrical systems. Electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall be located at or above the elevation required in Section R322.2 or R322.3. Replacement of exterior equipment and exterior appliances damaged by flood shall meet the requirements of this section. If replaced as part of a substantial improvement, electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances and plumbing fixtures; duct systems; and other service equipment shall meet the requirements of this section. Systems, fixtures, and equipment and components shall not be mounted on or penetrate through walls intended to break away under flood loads.</p> <p>Exception: Locating electrical systems, equipment and components; heating, ventilating, air conditioning; plumbing appliances and plumbing fixtures; duct systems; and other service equipment is permitted below the elevation required in Section R322.2 or R322.3 provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the required elevation in accordance with ASCE 24. Equipment for pools, spas and water features shall be permitted below the elevation required in Section R322.2 or R322.3 provided it is elevated to the extent practical and is anchored to prevent floatation and resist flood forces and is supplied by branch circuits that have ground-fault circuit interrupter protection. Electrical wiring systems are permitted to be located below the required elevation provided that they conform to the provisions of the electrical part of this code for wet locations.</p>	<p>R322.2.5 Pools in flood hazard areas. Pools that are located in flood hazard areas established by Table R301.2(1), including above-ground pools, on-ground pools, and in-ground pools that involve placement of fill, shall comply with Section R322.2.5.1 or R322.2.5.2.</p> <p>Exception: Pools located in riverine flood hazard areas which are outside of designated floodways.</p> <p>R322.2.5.1 Pools located in designated floodways. Where pools are located in designated floodways, documentation shall be submitted to the building official, which demonstrates that the construction of the pool will not increase the design flood elevation at any point within the jurisdiction.</p> <p>R322.2.5.2 Pools located where floodways have not been designated. Where pools are located in riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.</p> <p style="text-align: center;"><i>Note: If FIRM shows floodway and the pool location is not in the floodway, the R322.2.5 exception applies (i.e., no requirement for analysis).</i></p>

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³ Read-only online: <https://codes.iccsafe.org/codes/florida>

<p>Sec. R322.3 applies in coastal high hazard areas and Coastal A Zones (and Coastal A Zones).</p>	<p>FBCR Chapter 45, Private Swimming Pools.</p>
<p>R322.3.3.1 Pools. Pools in coastal high-hazard areas shall be designed and constructed in conformance with ASCE 24.</p>	<p>R4501.4.2.1. Flood hazard areas. Pools installed in flood hazard areas established in Section R322 shall comply with Section R322.2.4 (A Zones) or R322.3.3.1 in coastal high-hazard areas (V Zones).</p> <p>R4501.23 Accessibility and clearances. Equipment shall be so installed as to provide ready accessibility for cleaning, operating, maintenance and servicing.</p>
<p>8th Edition Florida Building Code, Building⁴ (2023)</p>	
<p>Sec. 454.1 Public swimming pools and bathing places.</p>	<p>Sec. 454.2 Private swimming pools.</p>
<p>454.1.1 Flood hazard areas. Public swimming pools installed in flood hazard areas established in Section 1612.3 shall comply with Section 1612.</p>	<p>454.2.4.2.1 Flood hazard areas. Private swimming pools installed in flood hazard areas established in Section 1612.3 shall comply with Section 1612.</p> <p>454.2.23 Accessibility and clearances. Equipment shall be so installed as to provide ready accessibility for cleaning, operating, maintenance and servicing.</p>
<p>Sec. 1612. Flood Loads</p>	
<p>1612.4 Design and construction. The design and construction of buildings and structures located in flood hazard areas, including coastal high hazard areas and Coastal A Zones, shall be in accordance with Chapter 5 of ASCE 7 and with ASCE 24.</p>	<p>Note: Sec. 1612 refers to ASCE 24, <i>Flood Resistant Design and Construction</i>, which includes provisions for pools in Sec. 9.6 and tanks in Sec. 9.7 (ASCE 24 is copyrighted):</p> <ul style="list-style-type: none"> • <i>Zone A: similar to R322.2.5 (above).</i> • <i>Zone V & CAZ: pools must either be elevated (lowest horizontal structural member at/above BFE plus freeboard); break away without producing damaging debris; or be in ground (account for scour).</i>
<p>1612.4.2 Modification of ASCE 24 9.6 Pools. Modify Section 9.6 in ASCE 24 by adding an exception as follows:</p> <p>9.6 Pools. In-ground and above-ground pools shall be designed to withstand all flood-related loads and load combinations. Mechanical equipment for pools such as pumps, heating systems and filtering systems, and their associated electrical systems, shall comply with Chapter 7.</p> <p>Exception: Equipment for pools, spas and water features shall be permitted below the elevation required in Table 7-1, provided it is elevated to the extent practical, is anchored to prevent flotation and resist flood forces, and is supplied by branch circuits that have ground-fault circuit-interrupter protection.</p>	

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EXCERPTS FROM FEMA GUIDANCE PUBLICATIONS RELATED TO POOLS AND POOL EQUIPMENT

- FEMA P-348. Protection Building Utility Systems from Flood Damage (2017), Sec. 4.3.4 Mitigation for Pools and Spas.
- NFIP Technical Bulletin 5. Free-of-Obstruction Requirements, (2020).
- FEMA P-55. Coastal Construction Manual (2011), Volume II, Sec. 9.5.3 Pools and Hot Tubs.
- FEMA P-499. Home Builder's Guide to Coastal Construction (2010), Technical Fact Sheet No, 8.2, Decks, Pools, and Accessory Structures.

FEMA P-348, Protection Building Utility Systems from Flood Damage (2017), Sec. 4.3.4 Mitigation for Pools and Spas (residential)

4.3.4 Mitigation for Pools and Spas

The material presented in this section focuses on the equipment needed to operate pools and spas, not on the operation of pools and spas. Several codes and standards govern the construction of pools and spas, many of which contain additional criteria for pools and spas placed in Special Flood Hazard Areas. Codes, standards and guides that relate to pools and spas include: The ICC's 2015 **Swimming Pool and Spa Code**, ASCE 24 *Flood Resistant Design and Construction*, FEMA P-55 *Coastal Construction Manual*, and FEMA P-499 Section 8.2 *Decks, Pools and Accessory Structures*.

The I-Code's flood provisions include relevant excerpts from the International Swimming Pools and Spas Code:

- [BS] 304.4 Protection of equipment. Equipment shall be elevated to or above the design flood elevation or be anchored to prevent floatation and protected to prevent water from entering or accumulating within components during conditions of flooding.
- 304.5 GFCI protection. Electrical equipment installed below the design flood elevation shall be supplied by branch circuits that have ground-fault circuit interrupter protection for personnel.

Chapter 9.6 of ASCE 24-14 specifies that:

In-ground and aboveground pools shall be designed to withstand all flood-related loads and load combinations. Mechanical equipment for pools such as pumps, heating systems and filtering systems, and their associated electrical systems shall comply with Chapter 7.

Pools and spas require equipment to maintain water quality and, in heated pools and spas, water temperatures. Pool and spa equipment includes pumps that circulate water, filters that remove particulate materials, and equipment that eliminates coliform bacteria and prevents waterborne pathogens. The equipment also includes piping that connects pumps and filters to pools or spas, water supply piping for filling pools and spas, piping for drainage, discharge and backwashing, and electrical supplies for pumps and sanitation equipment.

Mitigation recommendations for pool and spa equipment are similar to those for other MEP systems (Sections 4.1, 4.2 and 4.3). Equipment should be elevated above the regulatory flood elevation where possible. Equipment placed below the regulatory flood elevation should be flood resistant to prevent water entry and accumulation. Equipment elevation may be limited by functional requirements. For example, circulator pumps typically need a net positive suction head (i.e., a minimum amount of pressure at the pump inlet) to prevent cavitation and facilitate priming. Elevation of in-ground pool and spa pumps may experience problems with pump function and performance. In those cases, the equipment should be elevated as high as possible. When the pump and filtration system is replaced, provisions for pump elevation should be included in the new system design.

5.3.5 Mitigation for Pools and Spas

The material presented in this section focuses on protecting the equipment needed to operate pools and spas not on the actual operation of pools and spas. Several codes and standards govern the construction of pools and spas and many of them contain additional criteria for pools and spas placed in Special Flood Hazard Areas. Codes, standards and guides that relate to pools and spas include: The International Code Council's 2015 *Swimming Pool and Spa Code* (ISWPC), ASCE 24 *Flood Resistant Design and Construction*, FEMA P-55 *Coastal Construction Manual*, and FEMA P-499 Section 8.2 *Decks, Pools and Accessory Structures*.

The I-Code's flood provisions include relevant excerpts from the ISWPC:

- [BS] 304.4 Protection of equipment. Equipment shall be elevated to or above the design flood elevation or be anchored to prevent floatation and protected to prevent water from entering or accumulating within components during conditions of flooding.
- 304.5 GFCI protection. Electrical equipment installed below the design flood elevation shall be supplied by branch circuits that have ground-fault circuit interrupter protection for personnel.

Chapter 9.6 of ASCE 24-14 specifies that:

- In-ground and above-ground pools shall be designed to withstand all flood-related loads and load combinations. Mechanical equipment for pools such as pumps, heating systems and filtering systems, and their associated electrical systems shall comply with Chapter 7.
- Pools and spas require equipment that maintains water quality and, in heated pools and spas, water temperatures. Pool and spa equipment includes pumps that circulate water, filters that remove particulate materials, and equipment that eliminates coliform bacteria and prevents waterborne pathogens. The equipment also includes piping that connects pumps and filters to pools or spas; water supply piping for filling pools and spas; piping for drainage, discharge and backwashing; and electrical supplies for pumps and sanitation equipment.

Mitigation recommendations for pool and spa equipment are similar to those for other MEP systems (Sections 5.1, 5.2 and 5.3). Equipment should be elevated above the regulatory flood elevation where possible or should be flood-resistant to prevent water entry and accumulation when placed below the regulatory flood elevation. Equipment elevation may be limited by normal operation requirements. For example, circulator pumps typically need a net positive suction head (i.e., a minimum amount of pressure at the pump inlet) to prevent cavitation and facilitate priming. Elevation of in-ground pool and spa pumps may experience problems with pump function and proper operation. In those cases, the equipment should be elevated as high as possible. When the pump and filtration system is replaced, provisions for pump elevation should be included in the new system design. In some mixed-use apartments or non-residential buildings, pools and spas are located on the lowest level of the building, sometimes far below the flood protection level. In this case, dry floodproofing should be used to protect the filter and pump equipment; this is often accomplished by placing the equipment in a substantially impermeable vault.

The NFIP interprets the free-of-obstruction requirements to apply to certain site development practices that prevent the free flow of coastal floodwater and waves under or around buildings or increase flood loads on nearby buildings. Construction elements outside the perimeter (footprint) of and not attached to a coastal building (e.g., bulkheads, retaining walls, decks, swimming pools, accessory structures) and site development practices (e.g., addition of fill) may alter the physical characteristics of flooding or significantly increase wave or flood forces affecting nearby buildings. As part of the design certification process for a building in Zone V, the registered design professional must consider the effects these elements and practices will have on the building and on nearby buildings.

The NFIP requires buildings to be constructed using methods and materials that minimize the potential for flood damage. Therefore, any construction element placed on a building site in Zone V (see Sections 6 and 7) has the potential to affect the building and nearby buildings, which must be taken into account. In addition to potential wave and floodwater diversion effects, obstructions can break free and become floodborne debris that may strike and damage other buildings.

7.9 Swimming Pools and Spas

Three primary considerations relate to the placement of swimming pools and spas under or adjacent to buildings in Zone V:

- Whether the pool or spa will cause increased flood loads on buildings or exacerbate scour and erosion near buildings.
- Whether the pool or spa configuration is subject to NFIP use limitations for enclosed areas under elevated buildings.
- Whether a removable enclosure is placed around a pool or spa (usually in the winter) that will cause increased flood loads on buildings or exacerbate scour and erosion near buildings. NFIP flood insurance treats these enclosures as permanent enclosures even if they are only used seasonally or for short periods of time.

Pools, pool decks, and walkways that are placed under or adjacent to coastal buildings must be structurally independent of the buildings and their foundations and must not contribute to building or foundation damage during the base flood. Three options, also recognized by ASCE 24-14, Section 9.6.2, satisfy this requirement:

- The pool can be elevated so the bottom of the lowest horizontal structural member supporting the pool (and the pool itself) is at or above the required flood elevation, or

SWIMMING POOLS AND SPAS

Pools and spas adjacent to coastal buildings are allowed only if they will not act as obstructions that could lead to damage to nearby buildings. This effectively means that most pools and spas must be installed in-ground (either frangible or immovable) or completely elevated above the BFE. Swimming pools, spas, and related equipment are not covered by NFIP flood insurance.

Continued on the next page

- The pool can be designed and constructed to break away without producing debris capable of damaging nearby buildings, or
- The pool can be designed and constructed to remain in the ground and not divert flow or waves that can damage nearby buildings.

Registered design professionals must certify that pools or spas beneath or near buildings in Zone V will not be subject to flotation or displacement that will damage building foundations during a base flood or lesser event. In cases where pools are empty part of the year, flotation calculations should assume that pools are empty. Figure 28 shows a spa that was displaced and likely caused the failure of two piles that supported an elevated deck.



Figure 28:
Failure of two piles supporting an elevated deck that was likely caused by movement of a spa

The NFIP permits swimming pools and spas beneath elevated buildings only if the top of the pool or spa and accompanying deck or walkway are flush with the existing grade and the area around the pool or spa remains unenclosed. However, some states and communities may prohibit or restrict unenclosed pools and spas beneath elevated buildings. Designers should check with the local jurisdiction for any additional requirements.

The NFIP limits the use of enclosures under elevated buildings to parking of vehicles, building access, and storage. Because pools and spas do not satisfy these limitations, they are not allowed to be enclosed, even if enclosed by glass or breakaway walls. Use of lattice and insect screening is permitted around pools and spas below elevated buildings.

9.5.3 Pools and Hot Tubs

Many homes at or near the coast have a swimming pool or hot tub as an accessory. Some of the pools are fiberglass and are installed on a pile-supported structural frame. Others are in-ground concrete pools. The design professional should consider the following when a pool is to be installed at a coastal home:

- Only an in-ground pool may be constructed beneath an elevated Zone V building. In addition, the top of the pool and the accompanying deck or walkway must be flush with the existing grade, and the area below the lowest floor of the building must remain unenclosed.
- Enclosures around pools beneath elevated buildings constitute recreational use and are therefore not allowed, even if constructed to breakaway standards. Lattice and insect screening are allowed because they do not create an enclosure under a community's NFIP-compliant floodplain management ordinance or law.
- A pool adjacent to an elevated Zone V building may be either constructed at grade or elevated. Elevated pools must be constructed on an open foundation and the bottom of the lowest horizontal structural member must be at or above the DFE so that the pool will not act as an obstruction.
- The designer must assure community officials that a pool beneath or adjacent to an elevated Zone V building will not be subject to breaking up or floating out of the ground during a coastal flood and will therefore not increase the potential for damage to the foundations and elevated portions of any nearby buildings. If an in-ground pool is constructed in an area that can be inundated by floodwaters, the elevation of the pool must account for the potential buoyancy of the pool. If a buoyancy check is necessary, it should be made with the pool empty. In addition, the design professional must design and site the pool so that any increased wave or debris impact forces will not affect any nearby buildings.



NOTE

Check with local floodplain management officials for information about regulations governing the disturbance of primary frontal dunes. Such regulations can affect various types of coastal construction, including the installation of appurtenant structures such as swimming pools.



NOTE

The construction of pools below or adjacent to buildings in coastal high hazard areas must meet the requirements presented in FEMA NFIP Technical Bulletin 5. In general, pools must be (1) elevated above the BFE on an open foundation or (2) constructed in the ground in such a way as to minimize the effects of scour and the potential for the creation of debris.

Continued on the next page

- Pools and hot tubs have water pumps, piping, heaters, filters, and other equipment that is expensive and that can be damaged by floodwaters and sediment. All such equipment should be placed above the DFE where practical.
- Equipment required for fueling the heater, such as electric meters or gas tanks, should be placed above the DFE. It may also be necessary to anchor the gas tank to prevent a buoyancy failure.
- If buried, tanks must not be susceptible to erosion and scour and thus failure of the anchoring system.

The design intent for concrete pools includes the following:

- Elevation of an in-ground pool should be such that scour will not permit the pool to fail from either normal internal loads of the filled pool or from exterior loads imposed by the flood forces.
- The pool should be located as far landward as possible and should be oriented in such a way that flood forces are minimized. One way to minimize flood forces includes placing the pool with the narrowest dimension facing the direction of flow, orienting the pool so there is little to no angle of attack from floodwater, and installing a pool with rounded instead of square corners. All of these design choices reduce the amount of scour around the pool and improve the chances the pool will survive a storm. These concepts are illustrated in Figure 9-33.
- A concrete pool deck should be frangible so that flood forces create concrete fragments that help reduce scour. The concrete deck should be installed with no reinforcing and should have contraction joints placed at 4-foot squares to “encourage” failure. See Figure 9-34 for details on constructing a frangible concrete pad.
- Pools should not be installed on fill in or near Zone V. Otherwise, a pool failure may result from scour of the fill material.

For concrete pools, buoyancy failure is also possible when floodwaters cover the pool. In addition, flood flows can scour the soil surrounding a buried pool and tear the pool from its anchors. When this happens, the pieces of the pool become large waterborne debris.

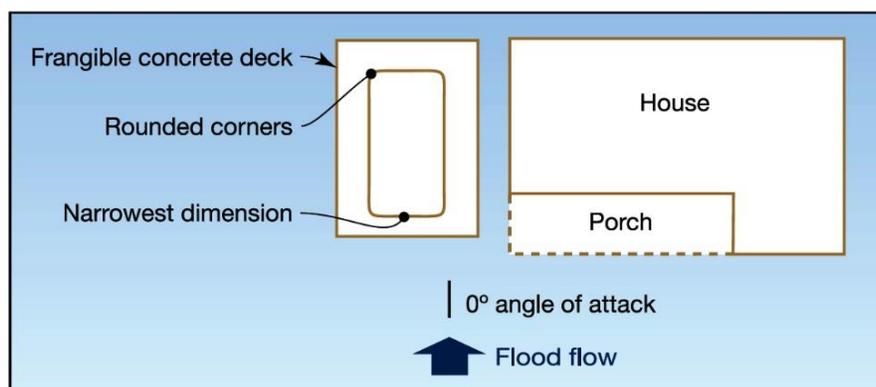


Figure 9-33.
Recommendations for
orientation of in-ground
pools

Swimming Pools

Requirements

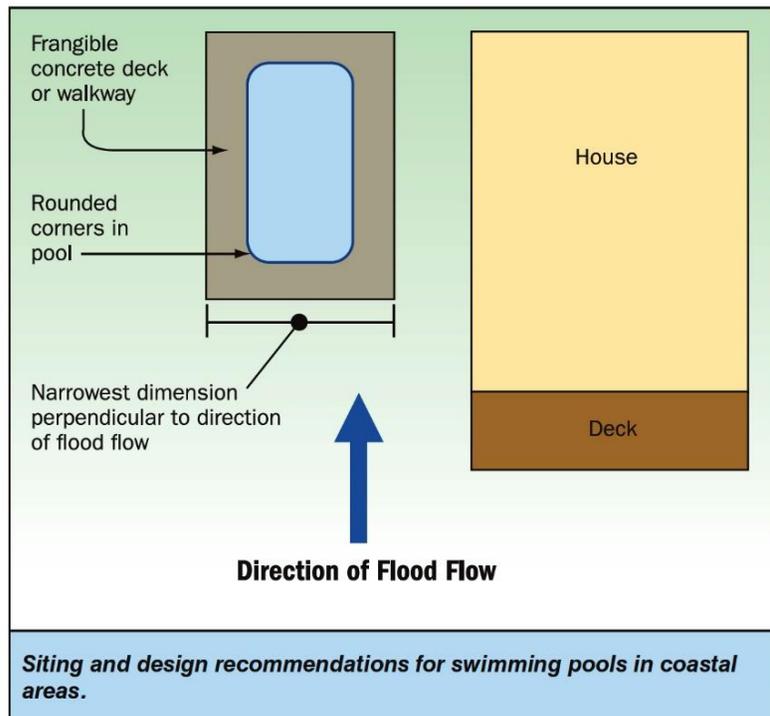
- An at-grade or elevated pool adjacent to a coastal building is allowed only if the pool will not act as an obstruction that will result in damage to the building or nearby buildings.
- When a pool is constructed near a building in Zone V, the design professional must assure community officials that the pool will not increase the potential for damage to the foundation or elevated portion of the building or any nearby

buildings. Pools can be designed to break up ("frangible pools") during a flood event, thereby reducing the potential for adverse impacts on nearby buildings.

- Any pool constructed adjacent to a coastal building must be structurally independent of the building and its foundation.
- A swimming pool may be placed beneath a coastal building only if the top of the pool and the accompanying pool deck or walkway are flush with the existing grade and only if the lower area (below the lowest floor) remains unenclosed. Under the NFIP lower-area enclosures around pools constitute a recreational use and are not allowed, even if constructed to breakaway standards.

Recommendations

- Pools should be oriented with their narrowest dimension perpendicular to the direction of flood flow.
- Concrete decks or walkways around pools should be frangible (i.e., they will break apart under flood forces).
- Molded fiberglass pools should be installed and elevated on a pile-supported structural frame.
- No aboveground pools should be constructed in V Zone unless they are above the DFE and have an open, wind- and flood-resistant foundation.
- Pool equipment should be located above the DFE whenever practical.
- Check with community officials before constructing pools in Zone V.



BOAF #3410 (2004). BOAF confirmed on November 19, 2021, that non-binding interpretations do not expire, provided the code provision is still part of the current effective edition.



Florida Building Code Informal Interpretation



Date: Tue Dec 28 2004

Report #: 3410

Code: Mechanical

Section: 301.14

Question:

Is it the intent of section 301.14 to require swimming pool equipment to be placed above the base flood elevation?

Answer:

B.O.A.F Informal Interpretation # 3305, has determined that heat pumps and gas heaters for swimming pools are to be considered "appliances", therefore FMC 301.13 would apply to such equipment with respect to wind resistance. §M301.14 requires those same appliances to be elevated above the BFE.

Commentary:

F.E.M.A. 12.8.2.2 states that a very short period of inundation may not destroy some types of mechanical equipment, but any inundation of electrical equipment will, at a minimum, cause significant damage to wiring and other components. Minimizing flood damage to mechanical equipment requires elevating it above the BFE.

Notice:

The Building Officials Association of Florida, in cooperation with the Florida Building Commission, the Florida Department of Community Affairs, ICC, and industry and professional experts offer this interpretation of the Florida Building Code in the interest of consistency in their application statewide. This interpretation is informal, non-binding and subject to acceptance and approval by the local building official.