

Florida Technical Guidance: Attached Garage or Enclosure Floors/Slabs and Flood Openings

State Floodplain Management Office
Florida Division of Emergency Management
Helpline: 850-815-4556 and floods@em.myflorida.com

Issue: Are flood openings required when the floor/slab of an attached garage or an enclosure below an elevated building is at or above the BFE, but below BFE plus freeboard required in the Florida Building Code (including additional freeboard if locally adopted)?

The short answer is Yes! This issue refers primarily to the Florida Building Code, *Residential* volume. But the same question could come up when using the FBC, *Building* volume and the referenced standard ASCE 24 *Flood Resistant Design and Construction*.

An important part of the answer is found by looking at how the FBC specifies elevation of the lowest floor – that requirement must be satisfied. Next, the requirements for enclosures must be examined – those requirements must also be satisfied.

Why is this guidance needed?

This guidance is important to help local officials apply the FBC lowest floor and enclosure requirements so that buildings are compliant. If not followed, communities could end up approving non-compliant construction with lowest floors below the FBC-required elevation (including freeboard). CRS communities could lose points if Elevation Certificates show lowest floors are lower than BFE plus freeboard.

1. How is the lowest floor elevation specified in the FBC, *Residential*?

Section R322.2.1 applies in flood zones that start with “A,” except SFHAs located seaward of a Limit of Moderate Wave Action (if delineated on the FIRM).¹ Section R322.2.1 phrases the elevation requirement as follows: “...shall have the lowest floors elevated to or above the base flood elevation plus 1 foot, or the design flood elevation, whichever is higher.”

- **Remember:** The floor/slab of an enclosure below an elevated building, and the slab of an attached garage, are not the “lowest floor” provided the enclosure/garage complies with the requirements for enclosures.
- Flood openings are required for compliance when areas below elevated buildings are enclosed (R322.2.2) and when attached garages are lower than elevated buildings (R309.3). Enclosures must also comply with R322.1.8 flood damage-resistant materials.
- The table on the next page summarizes when flood openings are required depending on the elevation of the garage or enclosure slab or floor. Figure 1a and Figure 1b (on

FBC Excerpts

Find excerpts of the flood provisions of the FBC and “Highlights of ASCE 24” online: <https://www.floridadisaster.org/dem/mitigation/floodplain/community-resources/>

¹ When a LiMWA is delineated, the area between that line and the Zone V boundary or shoreline is called the “Coastal A Zone.” Dwellings in Coastal A Zones must comply with the requirements of Section R322.3 (the FBC, *Building*, by reference to ASCE 24, has a similar requirement)

page 3) illustrate compliant lowest floors that meet the FBC requirement to be at or above BFE plus 1 foot and compliant enclosure/attached garage with flood openings.

2. What are the flood opening requirements in FBC, Residential when an enclosure slab is at or above the BFE, but below the BFE plus freeboard?

Section R322.2.2 in the 6th Edition (2017) and the 7th Edition (2020) apply the requirements for enclosures “below the design flood elevation.” See Question #8 for a discussion of the relationship between BFE and DFE.

- If Section R322.2.2 is considered by itself, the conclusion might be flood openings are not required below BFE plus freeboard (because BFE equals DFE in communities that use only FIRMs to establish flood hazard areas).
- However, construction must satisfy ALL of the requirements, which means community officials must examine the requirements for lowest floor alongside requirements for enclosures and attached garages.
- The summary table and Figure 2a and Figure 2b illustrate noncompliance when flood openings are not installed in walls of enclosures and walls of attached garages, regardless of how little the slabs are below BFE plus freeboard.
- FEMA guidance for openings in areas with “shallow flooding” changed in the 2020 edition of NFIP Technical Bulletin 1, *Requirements for Flood Openings in Foundation Walls and Walls of Enclosures* (excerpt shown on page 6).
- See Question #6 to see how R322.2.2 will be modified in the 8th Edition FBC.

Summary Table	
If the Elevation of Garage/Enclosure Floor or Slab is:	Are Flood Openings Required for Compliance?
Below BFE	Yes Why? Without flood openings, the slab/floor is the lowest floor and therefore the building does not comply with the requirement for the lowest floor to be elevated to or above BFE plus freeboard.
At or above BFE, <u>but below</u> required lowest floor elevation (BFE plus freeboard)	Yes Why? Without flood openings, the slab/floor becomes the lowest floor and therefore the building does not comply with the requirement for the lowest floor to be elevated to or above BFE plus freeboard.
At or above the required lowest floor elevation (BFE plus freeboard)	No However, the elevation of the slab/floor is recorded on the Elevation Certificate in C2.a and <u>might</u> be used by the NFIP for flood insurance rating purposes (not the next higher floor).

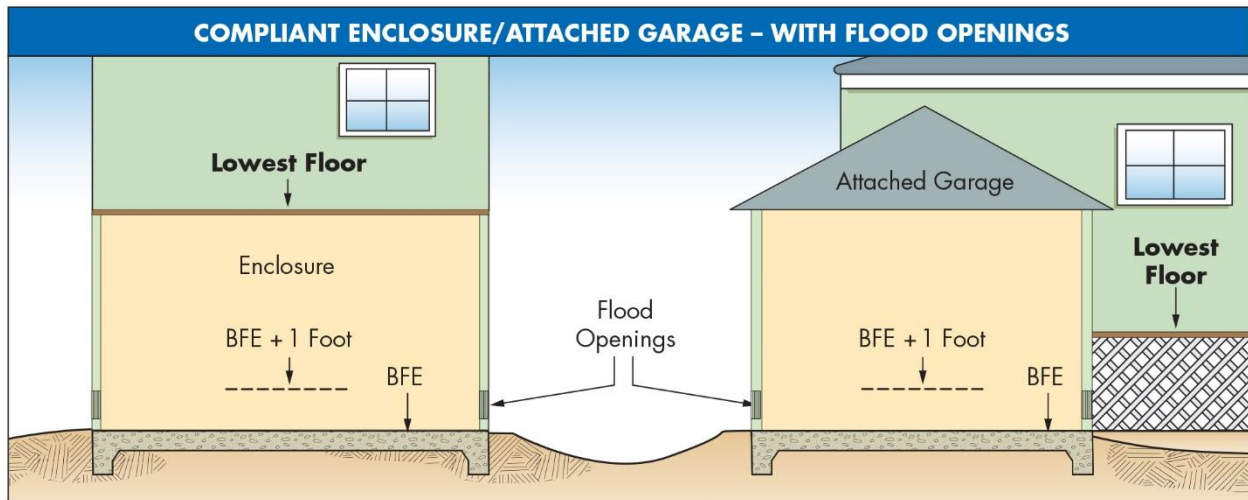


Figure 1a. Compliant enclosure, with flood openings

Figure 1b. Compliant attached garage, with flood openings

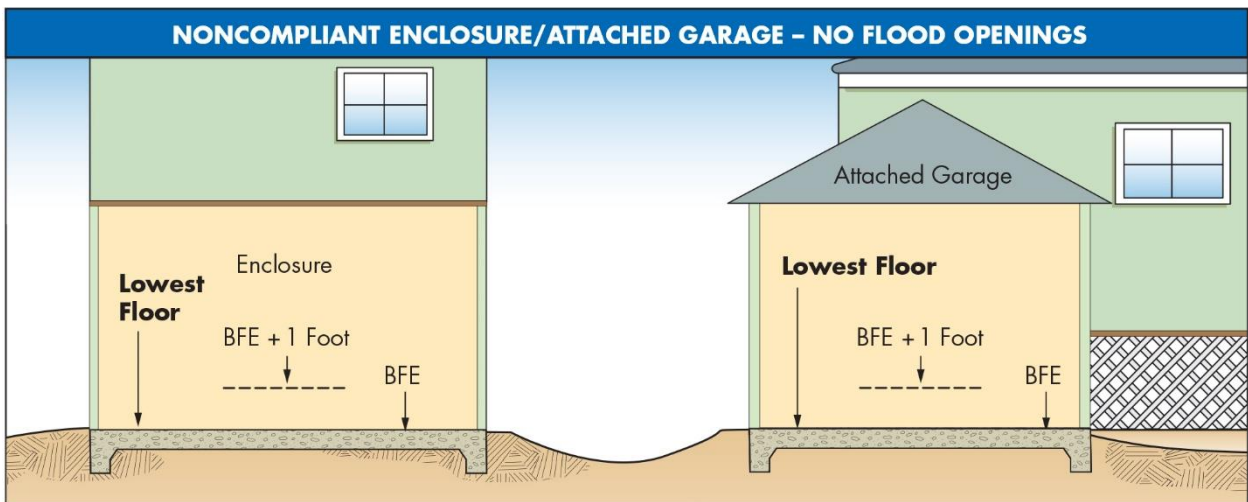


Figure 2a. Noncompliant enclosure (without flood openings) is the lowest floor

Figure 2b. Noncompliant attached garage (without flood openings) is the lowest floor

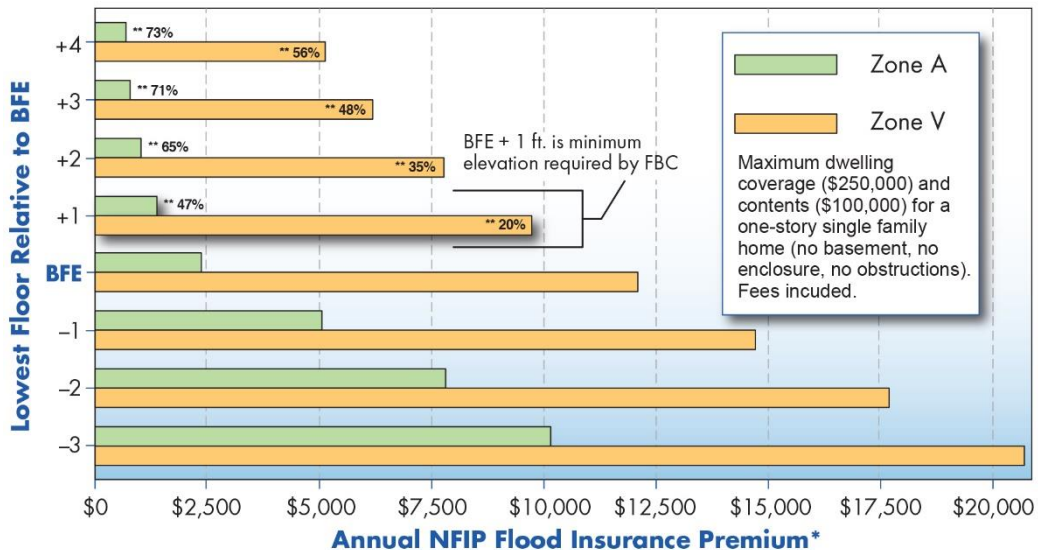
3. Does this question come up only in flood zones that start with “A” that have relatively shallow base flood depths?

Yes. Base flood depth refers to the base flood elevation (BFE) minus the ground elevation. Many SFHAs identified on FIRMs as flood zones that start with “A” will have relatively shallow flooding during the base flood (100-year). Those areas are found near the landward boundary of the SFHA and elsewhere when base flood depths are about 12 to 18 inches and shallower. SFHAs subject to ponding and sheet flow may also be shallow (often shown on FIRMs as Zone AO or AH).

In areas with base flood depths deeper than about 18 inches, garage slabs and enclosure floors/slabs typically will be too far below BFE for the question to arise. Because the Zone V boundary is drawn where wave heights are greater than 3 feet (which occurs where stillwater depths are more than about 4 feet deep), garage slabs and enclosure floors/slabs will not be close enough to BFE for the question to arise.

4. Is there an NFIP insurance consequence if attached garages and enclosures below elevated buildings have slabs at or above the BFE, but below the BFE plus freeboard, and don't have flood openings?

- Perhaps. The State Floodplain Management Office cannot definitively answer questions about how the NFIP does – or does not – take various building characteristics into account when rating individual buildings for NFIP flood insurance coverage. However, it is important to emphasize that local officials are responsible for enforcing floodplain management requirements for compliance, not based on whether a specific configuration does or does not “get credited” by the NFIP for insurance purposes.
- Enclosures below elevated buildings. The SFMO understands that without flood openings, the slab or floor of an enclosure (or crawlspace) becomes the bottom/lowest floor for rating NFIP flood insurance policies. The NFIP Elevation Certificate requires the certifier to measure the square footage of enclosures and identify how many flood openings are “within 1.0 foot above the adjacent grade” (instructions clarify “above the higher of the exterior or interior grade or floor immediately below the opening”). Without flood openings, it is likely an NFIP policy will be rated with the floor of the enclosure as the “lowest floor,” rather than the next higher floor. This means the premium would not account for freeboard, much less the fact that the next higher floor could be 8 or 9 feet above the slab. This could result in the owner paying considerably more each year (see graphic for Zone A; premiums are not further reduced for lowest floors higher than BFE plus 4 feet).
- Attached garages. The SFMO understands that without flood openings, the slab or floor of an attached garage is not the bottom/lowest floor for rating NFIP flood insurance policies. Thus, an elevated building with an attached garage without openings is rated based on the elevated floor of the building (not on the garage slab).



* Unofficial estimates using April 2020 rates; use only for comparison purposes
 ** Savings over at-BFE premium

5. Is there a consequence for CRS communities if enclosures below elevated buildings have slabs at or above the BFE, but below the BFE plus freeboard, and don't have flood openings? What about if attached garages have slabs at or above the BFE, but below the BFE plus freeboard, and don't have flood openings?

The State Floodplain Management Office cannot definitively speak to this question.

The CRS Class 8 Prerequisite FAQs released in June and subsequently revised at least twice suggest that ISO Specialists will view the two scenarios differently when they examine elevation certificates. The difference is based on how NFIP flood insurance is rated:

- Enclosures below elevated buildings. It seems likely that CRS credits for freeboard (FRB) would be adjusted if an Elevation Certificate shows there are no flood openings in the walls when an enclosure floor/slab is at or above the BFE, but below the FBC or community's required freeboard elevation. The reason for a credit adjustment is those floors/slabs would be deemed the "lowest floors," which means they would not comply with the freeboard requirement.
- Attached garages. It seems likely that CRS credits for freeboard (FRB) would not be adjusted if an Elevation Certificate shows there are no openings in the walls when a garage slab is at or above the BFE, but below the FBC or community's required freeboard elevation.

6. How will R322.2.2 change in the 8th Edition FBC, *Residential* (2023) and why did FEMA propose that change?

The NFIP regulations for enclosures "Require...that fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access or storage....[describes flood openings]." [44 CFR § 60.3(c)(5)]

- A proposal submitted by FEMA to make the 2021 International Residential Code consistent with the NFIP regulations was approved to change where R322.2.2 (enclosures) applies "below the design flood elevation" to apply "below the elevation required in Section R322.2.1." Section R322.2.1 is where the lowest floor elevation is required to be at or above the BFE plus 1 foot. This change is shown on page 5.
- The same change will be made in other FBC, *Residential* sections, including R322.1.6 (exception); R322.2.1 (exception); R322.2.2.1; R322.3.2; R322.3.5; R322.3.6; and R322.2.7.
- Many Florida communities modify the FBC, *Residential* and FBC, *Building* to adopt 1.5 feet or more of freeboard. By referencing the elevation required in Sec. R322.2.1, the requirements for enclosures will always apply below the BFE plus freeboard.
- Because of a statutory requirement that the Florida Building Commission maintain consistency with the NFIP, this change should appear in the 8th Edition. This will eliminate the issue by making it clear the requirements for flood openings apply below the lowest floor, which is at least BFE plus 1 foot, even if the slab or floor of an enclosure/attached garage is at the BFE.

7. How will R309.3, garages in flood hazard areas, change in the 8th Edition (2023)?

In the 8th Edition FBC, *Residential*, R309.3 will be changed to refer to Section R322, and provisions are added to R322.2.1 and R322.3.2. Both allow garages to either be elevated (BFE plus freeboard) or, if not elevated, they must be enclosed with walls that comply with the requirements for enclosures.

8. Doesn't the DFE equal BFE plus freeboard?

Technically, no, the DFE does not equal BFE plus freeboard. The FBC R322.1.4 establishes (defines) the DFE as the higher of the BFE or the elevation “of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally adopted.” Also see definitions in FBC, *Building* and ASCE 24. The concept of the DFE originated in the 1998 edition of ASCE 24.

- **Bottom line:** The BFE equals the DFE when communities adopt and regulate flood hazard areas based on the FEMA Flood Insurance Study and Flood Insurance Rate Map.

DEM/SFMO

NFIP vs I-Code

Reducing Flood Losses Through the International Codes is jointly issued by FEMA and the International Code Council. Chapter 3 describes the differences between the NFIP minimum and the I-Codes, including BFE vs DFE and more than 30 other topics:

<https://shop.iccsafe.org/topics/building-departments/reducing-flood-losses-through-the-international-codesr.html>

FEMA Proposal to Amended 2021 IRC, Section R322.2.2

R322.2.2 Enclosed area below required design flood elevation. Enclosed areas, including crawl spaces, that are below the design flood elevation required in Section R322.2.1 shall:

1. Be used solely for parking of vehicles, building access or storage.
2. Be provided with flood openings that meet the following criteria and are installed in accordance with Section R322.2.2.1:
 - 2.1. The total net area of nonengineered openings shall be not less than 1 square inch (645 mm²) for each square foot (0.093 m²) of enclosed area where the enclosed area is measured on the exterior of the enclosure walls, or the openings shall be designed as engineered openings and the *construction documents* shall include a statement by a registered *design professional* that the design of the openings will provide for equalization of hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters as specified in Section 2.7.2.2 of ASCE 24.
 - 2.2. Openings shall be not less than 3 inches (76 mm) in any direction in the plane of the wall.
 - 2.3 The presence of louvers, blades, screens and faceplates or other covers and devices shall allow the automatic flow of floodwater into and out of the enclosed areas and shall be accounted for in the determination of the net open area.

R322.2.2.1 Installation of openings. The walls of enclosed areas shall have openings installed such that:

1. There shall be not less than two openings on different sides of each enclosed area; if a building has more than one enclosed area below the design flood elevation, each area shall have openings.
2. The bottom of each opening shall be not more than 1 foot (305 mm) above the higher of the final interior grade or floor and the finished exterior grade immediately under each opening.
3. Openings shall be permitted to be installed in doors and windows; doors and windows without installed openings do not meet the requirements of this section.

NFIP Technical Bulletin 1 (2020)

8.3.6 Flood Openings in Areas with Shallow Flooding

Some FIRMs show mapped SFHAs where the depth of floodwater above grade will be shallow (2 feet or less during the base flood). Shallow flooding occurs toward the landward boundary of SFHAs and in areas identified as being subject to sheet flow or ponding. The NFIP regulations require flood openings in enclosures even if the depth of flooding is only 1 foot and the difference in water depth between the inside and outside of enclosures is 1 foot or less.

Depending on the depth of floodwater in areas with shallow flooding, flood openings may extend above the BFE if the bottom of the opening is no higher than 1 foot above the higher of the final interior grade or floor and the finished exterior grade of the crawspace or enclosure. When flood openings extend above the BFE, alternatives to satisfy the requirements include:

- Raise the floor of the enclosure to be at or above the BFE, perhaps by using a thicker slab, resulting in no need for openings. Although this alternative satisfies the construction requirement, for NFIP flood insurance rating purposes, the top of the slab is the elevation of the lowest floor, not the next higher floor (see the text box “Interior Grade or Floor above BFE” in Section 8.3.1).
- Install openings as close to grade (or floor) as possible to maximize the open area available for inflow and outflow of floodwater (see Figure 16). The total net open area of the openings must be based on the enclosed area even if some portion of the opening is above the BFE.

NFIP ELEVATION CERTIFICATE AND SHALLOW FLOODING

The NFIP Elevation Certificate requires users to input the number of flood openings within 1.0 foot above the adjacent grade or floor. The certificate does not require users to determine how much of a flood opening is above or below the BFE.

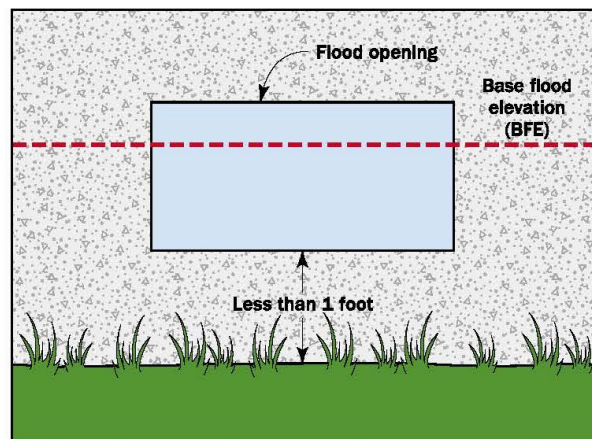


Figure 16: Bottom of the flood opening positioned as close as possible to grade (or floor) when any portion of the opening extends above the BFE