

PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT TECHNICAL POLICY

POLICY NO.: Technical Policy, TECH-022

EFFECTIVE DATE: November 2, 2009

REVISED DATE: 5/18/21

POLICY NAME: Use of Flood Openings, Applicability and Requirements

PURPOSE: To clarify 16.26.030.E of the Ordinance regarding the applicability of the requirement to provide flood openings/vents (hereafter, openings) in crawl spaces, detached non-habitable structures or attached non-habitable portions of structures such as attached garages, that have enclosed areas with finished floor elevation(s) below the Regulatory Flood Elevation (RFE). This policy also provides guidance on types of allowable screens, grates, louvers or other engineered coverings for these flood openings.

BACKGROUND: A structure with a fully enclosed area below the Base Flood Elevation (BFE) may be subject to flood damage due to the hydrostatic or hydrodynamic force of the flood waters unless the structure is designed and constructed to address these safety concerns, such as through the use of flood openings. Pursuant to the Code of Federal Regulations (CFR) 44CFR 60.3(C)(5), the District is required to ensure that any new structure or substantial improvement with fully enclosed areas below the BFE that is used solely for the parking of vehicles, building access, or storage in an area other than a basement be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the automatic entry and exit of floodwaters. In addition, A.R.S. § 48-3609 requires any residential structure to be elevated at or above the RFE, which is one foot above the BFE. Section 16.26.030.E of the Floodplain Management Ordinance (Ordinance) reiterates this requirement, including the provisions prescribing some minimum design criteria for flood openings including:

- A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding,
- The bottom of each opening shall be no higher than one foot above grade,
- The openings may be equipped with screens, louvers, valves or other coverings provided that they permit the automatic entry and exit of floodwaters.

The one foot of freeboard required by A.R.S. § 48-3609 is more restrictive than the CFR, and has the potential to create a situation in which the flood openings do not serve the intended purpose, such as cases where a residence is constructed to the RFE but its attached garage, due to the tire stop, falls just below the RFE.

After discussion with Arizona Department of Water Resources, this Policy needed to be changed to comply with minimum Arizona Revised Statute freeboard requirements. As such, the 2021 revision requires attached garages with floors below the RFE to be constructed of floodproof materials up to the RFE and have flood openings. The previous guidance did not require flood openings if the floor elevation of an attached garage was within six inches of the RFE.

The 2021 revision is also modified to address FEMA Technical Bulletin 1 which specifies that, “Note that the openings (or those portions that count towards the required net open area) must be located below the BFE. In areas with shallow flood depths, this may require positioning the openings closer to grade than the maximum 1 foot allowed.” Technical Bulletin 1 further states that communities with a

freeboard requirement may regulate to the Design Flood Elevation (DFE), which is equivalent to the Regulatory Flood Elevation, and that references to BFE in the bulletin should be construed as references to the DFE (RFE). Due to the additional foot of freeboard required by the state of Arizona, for structures with a floor elevation below the RFE, the required net open area of flood openings must be located below the RFE.

Additionally, both the CFR and the Ordinance allows the openings to be screened as long as they continue to allow the automatic entry and exit of floodwaters, but no guidance exists regarding the types of screens or louvers that are acceptable. A screen with too fine a mesh has the potential to reduce the effective size of the opening, especially when debris accumulation is considered.

This policy is intended to ensure that flood openings, when required, serve their intended purpose, and to provide guidance on acceptable design and screening of flood openings. It is supplemental to FEMA Technical Bulletin 1, *Openings in Foundation Walls and Walls of Enclosures*, which should be used for additional information, as it provides guidance on the use of specific types of flood openings.

POLICY:

I. Applicability

This policy applies to non-habitable structures or non-habitable portions of structures (collectively, enclosed areas) that are used solely for the parking of vehicles, building access, or limited storage in an area other than a basement, with an enclosed area below the RFE. Additional applicability information is found in *Technical Policy TECH-023*.

Structures that have only three walls are not subject to hydrostatic forces and as such flood openings are not required by FEMA for this purpose. However, the placement of flood openings may be required by the District in order to provide relief of hydrodynamic flood forces. To be considered a three-walled structure, the open side must contain only the minimum amount of structural support for that side of the building, with no additional wall enclosure proposed. Walls that contain openings that are sized to allow for possible installation of a garage door(s) are not considered to be either open nor a three-walled structure.

Structures that have a dirt floor are subject to this policy if the floor elevation is lower than the RFE.

II. Flood Opening Use

If allowed pursuant to *Technical Policy TECH-023*, structures with an enclosed area below the RFE shall be constructed with flood openings as described in Section III. Flood openings are not allowed in habitable structures or portions of habitable structures, except for crawl spaces, attached garages and storage spaces that are accessed solely by an exterior entrance with no doorway between the habitable space and the storage area.

III. Flood Opening Requirements

When flood openings are required the following standards shall apply:

- A. Flood openings must allow for the automatic entry and exit of floodwaters.
- B. Doorways do not qualify as an opening because they do not allow for the automatic entry and exit of floodwaters. Overhead garage-type doors also do not qualify as flood openings.

However, while discouraged, flood openings may be placed in overhead garage doors at the discretion of the District based on the availability of other locations for openings. If flood openings are placed in garage doors, this must be noted in the specific covenants to be signed by the property owner.

- C. Flood openings are only allowed in human doorway doors when retrofitting nonconforming uses, but are discouraged.
- D. Every enclosed area is required to have at least two flood openings on exterior walls. Flood openings must be installed on at least two sides of each enclosed area.
 - 1. If possible, openings should be placed on opposing walls, preferably in line with the direction of flow.
 - 2. Flood openings should be evenly distributed to ensure the most effective entry and exit of flood waters.
 - 3. In the case of an attached garage in which there are not two opposing walls exposed to flow because of the house, flood openings may be placed on adjacent walls.
- E. Any portion of an opening above the RFE is not considered to be effective for the purpose of providing relief from hydrostatic and hydrodynamic forces and shall not be included in the total opening area calculation necessary to meet the 1 square inch of opening per square foot of enclosed area requirement. This may require the bottom of the openings to be less than the maximum 1 foot above grade.
- F. The bottom of all openings shall be:
 - 1. less than 12 inches above adjacent natural grade, as measured at the location of the opening, **or**
 - 2. as close as possible to the floor elevation of an enclosure having a floor elevated above the BFE.
- G. The interior grade or floor along the lowest side of the building must be at or above the exterior grade across the entire length of the lowest side, and there must be positive surface drainage away from the building; otherwise, the enclosure will be considered a basement and thus not allowed.
- H. If a structure is elevated on a stem wall and the area behind the stem wall is not backfilled, fill may not be placed against the outside of the stem wall unless openings are placed through the fill. Otherwise the area within the limits of the stem wall is considered to be a basement, which is not allowed within a regulatory floodplain.

IV. Submittal Requirements

Permit applications for structures that will not be elevated at or above RFE shall contain the following detailed information:

- A. The size, location, height above natural grade of the top and bottom of the flood openings and the type of opening cover (if used). Alternatively, the opening size, top/bottom height above natural grade and covering type (if any) may be presented as a note or as an annotated side-view detail but locations of all openings shall be shown on the site plan and all relevant plan sheets.
- B. Flood openings and covers shall comply with Sections V and VI below.
- C. The specification of flood-resistant materials to be used for all construction materials below the RFE (as addressed in *Technical Policy TECH-021*). All materials used below the RFE must be flood-resistant materials.
- D. A signed and notarized covenant, to be prepared by the District after permit application for signature by the property owner(s), which states that the structure or enclosed area is not elevated to the RFE and shall remain non-habitable unless brought into compliance with the rules and regulations for habitable structures or areas.

V. Flood Opening Covers

NFIP rules allow flood openings to be covered with louvers, grates, screens or engineered vents. The following options are acceptable for use. See Section VI for requirements to document compliance.

- A. Screen, provided:
 - 1. The mesh openings are at least:
 - a. 1/4 inch for BFEs 1 foot or less in depth
 - b. 1/2 inch for BFEs greater than 1 foot and up to 2 feet in depth
 - c. 1 inch for BFEs greater than 2 feet and up to 3 feet in depth.
 - d. For flow greater than 3 feet, screen size must be determined by an Arizona registered civil engineer.
- B. Grates or Louvers, provided:
 - 1. The louvers are permanently open (no hinged or closeable louvers except if designed to automatically open when exposed to floodwaters as demonstrated by a report from an Arizona registered civil engineer or as approved by FEMA).
 - 2. The minimum opening size of grates or spacing between louvers is at least:
 - a. 1/2 inch apart for BFEs 1 foot or less in depth
 - b. 1 inch apart for BFEs greater than 1 foot and up to 2 feet in depth
 - c. 2 inches apart for BFEs greater than 2 feet and up to 3 feet in depth.
 - d. For flow depths of greater than 3 feet, covers must be designed by an Arizona registered civil engineer.
 - 3. The area taken up by the solid portion of the grates or louvers must be subtracted from the total opening size so that only the total area open to flow is considered.
- C. Smartvents™, USA Flood Air Vents, FloodFlaps® or other FEMA approved opening covers.
- D. Other methods of covering flood openings may be used if supported by a report from an Arizona registered civil engineer.

VI. Documentation of Compliance

It is the responsibility of the registered professional completing the Elevation Certificate to accurately measure the number of flood openings and the total amount of space open to flow. This requirement includes calculating the area of the openings that are taken up by grates, louvers, etc. and are thus ineffective to flow.

- A. Documentation of Openings with No Covers
If no flood opening covers are used the four required color photographs taken for the Elevation Certificate may be sufficient documentation of compliance provided that they clearly show all four sides of the structure and all of the flood openings are visible.
- B. Documentation of Openings with Covers
If flood opening covers are used, in addition to the color photographs outlined in Section VI.A, at least one additional color photograph shall be required that shows a close-up view of a typical opening. If more than one flood opening cover type is used, a color photograph of each type must be provided. The surveyor must state that the close-up photo is typical of all openings or of a specified number of the openings. The close-up photo(s) of the opening cover(s) may not be used as a substitute for one of the four required photographs for the Elevation Certificate.
- C. Documentation of Openings with Engineered Vents
If engineered flood vents are used, such as Smartvents™, USA Flood Air Vents, FloodFlaps® or other FEMA approved opening covers, the specification sheet for the specific model used shall be attached to the Elevation Certificate for the structure. If site-specific

engineered vents are used, an As-Built certification from the engineer of record shall be attached to the Elevation Certificate for the structure.

APPROVED BY:



Suzanne Shields, P.E.
Director and Chief Engineer

5/19/21

Date

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