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TECHNICAL BULLETIN

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Source Document: **19NYCRR 1220 - Residential Code of New York State (RCNYS)**
19NYCRR 1221 - Building Code of New York State (BCNYS)

Topic: **Flood Venting in Foundations and Enclosures Below Design Flood Elevation**

This document is to provide information regarding the requirements of the *Residential Code of New York State* (RCNYS) and the *Building Code of New York State* (BCNYS) for flood venting in foundations and enclosures below the design flood elevation in flood hazard areas.

The National Flood Insurance Program (NFIP) has an important objective to protect buildings constructed in floodplains from structural damage caused by flood waters. In support of this objective, the NFIP regulations include building design criteria that apply to new construction and substantial improvements to existing buildings in flood hazard areas. This is accomplished through the strict requirements of FEMA Technical Bulletin TB-1-93, entitled "Openings in Foundation Walls for Buildings Located in Special Flood Hazard Areas" and ASCE 24-98, entitled "Flood-resistant Design and Construction." These requirements are also incorporated into the International Residential Code and the International Building Code, and subsequently into both the RCNYS and the BCNYS. These requirements are provided later in this document with specific additional clarification.

All of the requirements for flood vents are designed to allow the floodwaters to automatically flow through the building walls that are below the design flood elevation so that the walls are not washed out from under the building. Thus the flood vents are provided to equalize the hydrostatic pressure of the floodwaters. Flood vents have to be bi-directional. One-directional flood vents do not allow the hydrostatic pressure to equalize and prohibit the flow of water either in or out of the enclosed area.

There is a significant difference between a flood vent and an air vent. Both the RCNYS and BCNYS by referencing ASCE 24 requirements use the term "net area." The net area is calculated by subtracting the area of any obstructions, such as louvers, from the gross opening size. Thus the gross opening size of an air vent with louvers will be larger than that of an unobstructed flood vent depending upon the area of the louvers. Additionally, the potential for blockage by debris when louvers or screens are installed has to be evaluated. Flood vents are required for crawl spaces which are below the design flood elevations, even if RCNYS section R323 or BCNYS section 1202.3 do not require the crawl space to be ventilated.

If air vents are used as flood vents they must be disabled in the open position in order to meet the requirement to provide for the automatic flow of floodwaters into and out of the enclosed area. Vents which close automatically based on temperature are not permitted because it would block the flow of floodwaters. In the winter there is an inclination to insulate and/or close vent openings, which is not

permitted because it would also block the flow of floodwaters. When human intervention is necessary to open the air vent it no longer functions as a flood vent. It is also critical that the bottom of the flood vent be no more than one foot above the outside grade.

Be aware that RCNYS section R323.3.6, "Construction documents" states:

The construction documents shall include documentation that is prepared and sealed by a registered design professional that the design and methods of construction to be used meet the applicable criteria of this section.

An additional requirement in this edition of RCNYS is Section R323.1.3.3, freeboard, which states:

A freeboard of two feet shall be added where the design flood elevation or other elevation requirements are specified.

The term freeboard is defined as:

A factor of safety expressed in feet above the design flood elevation.

The building has to be designed to have the first floor two feet above the design flood level.

BCNYS section 1612.5, "Flood hazard certificates," spells out the requirement that a certification, by a registered design professional, shall be provided to the code enforcement official that the design of engineered flood openings meets the minimum requirements of ASCE 24.

CODE REQUIREMENTS:

RCNYS section R323.2.2, "Enclosed area below design flood elevation," states:

Enclosed areas, including crawl spaces, that are below the design flood elevation shall:

- 1. Be used solely for parking of vehicles, building access or storage.***
- 2. Be provided with flood openings which shall meet the following criteria:***
 - 2.1. There shall be a minimum of 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 on exterior walls.***
 - 2.2. The total net area of all openings shall be at least 1 square inch for each square foot (275 mm for each square meter) of enclosed area.***
 - 2.3. The bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.***
 - 2.4. Openings shall be at least 3 inches (76 mm) in diameter.***
 - 2.5. Any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.***
 - 2.6. Openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this section.***

BCNYS 1612.4, "Design and construction," states:

The design and construction of buildings and structures located in flood hazard areas, including flood hazard areas subject to high velocity wave action, shall be designed and constructed in accordance with ASCE 24.

ASCE 24 provides two methods for flood venting, non-engineered openings and engineered openings.

The first method is as follows:

Section 2.6.1.1 "Non-Engineered Openings in Enclosures Below the Design Flood Elevation" states:

Non-engineered openings shall meet the following criteria:

1. there shall be a minimum of 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 on exterior walls.

2. the total net area of all openings shall be at least 1 square inch for each square foot (275 mm for each square meter) of enclosed area.
3. the bottom of each opening shall be 1 foot (305 mm) or less above the adjacent ground level.
4. openings shall be at least 3 inches (76 mm) in diameter.
5. any louvers, screens or other opening covers shall allow the automatic flow of floodwaters into and out of the enclosed area.
6. openings installed in doors and windows, that meet requirements 2.1 through 2.5, are acceptable; however, doors and windows without installed openings do not meet the requirements of this standard.

The second method is:

Section 2.6.1.2, “Engineered Openings in Enclosures Below the Design Flood Elevation,” with the following criteria:

1. Each individual opening, and any louvers, screens or other opening covers, shall be designed to allow the automatic entry and exit of floodwaters during design flood or lesser flood.
2. There shall be a minimum of two openings on different sides of each enclosed area; if a structure has more than one enclosed area below the DFE, each area shall have openings.
3. Openings shall be not less than 3 inches (76 mm) in diameter.
4. The bottom of each required opening shall be no more than 1 foot (305 mm) above the adjacent ground level.
5. The difference between the exterior and interior floodwater levels shall not exceed 1 ft during periods of maximum rate of rise and maximum rate of fall of the floodwaters, and at other times during the design, or lesser, flood events.
6. In the absence of reliable data on the rates of rise and fall, assume a minimum rate of rise and fall of 5.0 ft/h; where analysis indicates the rates of rise and fall are greater ...; where analysis indicates the rates of rise and fall are less than ...
7. The minimum total net area of the required openings in non-breakaway walls shall be calculated using the equation: ...
8. The minimum total net area of the required openings in breakaway walls shall be calculated using the equation: ...

The RCNYS incorporated the ASCE 24 non-engineered method in the body of the code text. The engineered design has the same requirements as items 1 through 5 of the non-engineered design. The NFIP describes an engineered opening as an opening certified by a registered design professional to pass flood water automatically in both directions, within the rate of rise and fall per the strict requirements of FEMA Technical Bulletin TB-1 and ASCE 24. The term “breakaway walls” is defined as any type of wall using materials and construction techniques approved by the authority having jurisdiction, which does not provide structural support to a structure, and which is designed and constructed to fail under specified circumstances without damage to the structure, or supporting foundation system. ASCE 24 Table 2-2, entitled Flood Opening Coefficient of Discharge, provides coefficients of discharge based on the shape of the flood opening. The table provides a coefficient of discharge of 0.20 (the lowest value) when the opening is partially obstructed. Additionally BCNYS section 1203.3.1, “Openings for under-floor ventilation;” section 1203.3.2 Exceptions, 5 states:

For buildings in flood hazard areas as established in section 1612.3, the opening requirements of ASCE 24 are authorized to be satisfied by ventilation openings that are designed and installed in accordance with ASCE 24.

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