



Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas

An Online Continuing Education Course for Engineers

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Credit: 2 Hours / 2 PDH / 2 CPD

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INTRODUCTION

This course describes planning, design, and construction requirements for wet floodproofing certain types of structures and their uses under the National Flood Insurance Program (NFIP). The basic characteristic that distinguishes wet floodproofing from dry floodproofing is the internal flooding of a structure as opposed to providing essentially watertight protection. Specifically, wet floodproofing can be defined as:

Permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure.

Flooding of a structure's interior is intended to counteract hydrostatic pressure on the walls, surfaces, and supports of the structure by equalizing interior and exterior water levels during a flood. Inundation also reduces the danger of buoyancy from hydrostatic uplift forces. Such measures may require alteration of a structure's design and construction, use of flood-resistant materials, adjustment of building operation and maintenance procedures, relocation and treatment of equipment and contents, and emergency preparedness for actions that require human intervention.

In accordance with the NFIP, Wet Floodproofing is allowed in only limited situations.

Application of wet floodproofing as a flood protection technique under the NFIP is limited to specific situations in A Zones (including A, AE, AI-30, AH, AO, AR zones). For certain uses and types of structures described in this course, communities may allow wet floodproofing only through the issuance of a variance from certain floodplain management requirements. The situations and conditions in which a community may allow wet floodproofing are described in detail in the next section of this course entitled Applicability.

For structures in V zones (includes V, VE, VI-30 zones), more stringent design and construction requirements have been established for the portion of a structure below the Base Flood Elevation (SFS). For information on V-zone design and construction requirements, refer to the NFIP regulations under 44 CFR Section 60.3.

APPLICABILITY

New Construction and Substantial Improvements of Residential and Non-Residential Structures

An important objective of the NFIP is to protect structures constructed in floodplains from flood-induced damage. In support of this objective, the NFIP regulations include building design and construction criteria that apply to new construction and substantial improvements (including structures which have incurred substantial damage) of existing structures in Special Flood Hazard Areas (SFHA). According to these criteria, residential structures in A zones must be constructed with their lowest floors elevated to or above the BFE. Non-residential structures constructed in A zones must either have their lowest floors elevated to or above the BFE or be dry floodproofed (made watertight) to or above the BFE. Measures to accomplish dry floodproofing of non-residential structures must not only provide watertight protection but also must be designed to withstand hydrostatic, hydrodynamic, and impact forces produced by flooding. The intent is to provide complete protection at least up to the floodproofing design level which must, at a minimum, be at the BFE.

Note: To receive a flood insurance rate based on 100 year flood protection, the structure must be dry floodproofed to an elevation at least 1 foot above the BFE (i.e. 1 foot of freeboard)

In accordance with the NFIP, there are limited enclosed areas within newly constructed and substantially improved residential and non-residential structures where the community may allow wet floodproofing without a variance as a flood protection technique. These are limited to:

Enclosed areas below the BFE that are used solely for parking, building access, or limited storage. New construction and the substantial improvement of residential and non-residential structures whose lowest floors have been constructed at or above the BFE may be constructed with enclosed areas below the BFE. These areas must; (1) be used solely for parking, building access, or limited storage, (2) be designed to allow for the automatic entry and exit of flood waters through the use of openings, and (3) be constructed of flood resistant materials.

Attached garages. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for the automatic entry of flood waters. Openings are required in the exterior walls of the garage or in the garage doors. In addition to allowing the automatic entry of flood waters, the areas of the garage below the BFE must be constructed with flood resistant materials. Garages attached to non-residential structures must meet the aforementioned requirements or be dry floodproofed.

Certain categories of structures where FEMA has advised communities that variances to allow wet floodproofing may be issued

Communities must determine whether a variance from local floodplain management regulations may be issued to allow wet floodproofing for the categories of structures described in this section. To make such a determination, the community must, at a minimum, apply the NFIP variance criteria set forth in the 44 CFR Section 60.6. Included in these criteria is the requirement that the variance be the minimum necessary to afford relief, considering the flooding conditions at the site. This means that when a community issues a variance from elevation or dry floodproofing requirements, the structure must still be protected to the maximum extent possible using an appropriate alternative flood protection technique, such as wet floodproofing. To properly administer the granting of a variance for wet floodproofing, communities should have variance review procedures in place. These variance procedures must be within the bounds of State enabling law and meet the minimum requirements of the NFIP.

Variances to allow wet floodproofing may be issued for the following categories of structures. These structures must comply with floodway encroachment provisions of the NFIP Regulations in accordance with section 60.6(a)(1).

Structures Functionally Dependent On Close Proximity to Water: Certain structures that must be located near water are functionally dependent uses, as defined in section 59.1, and are permitted to be wet floodproofed after the issuance of a variance from NFIP elevation and dry floodproofing requirements. These structures may include certain types of docking, seafood processing, and port facilities associated with marine activities. Specific criteria for issuing a variance for functionally dependent uses are established in section 60.6(a)(7). These include the requirement that the structure or other development be protected by methods that minimize flood damage and create no additional threat to public safety.

Historic Buildings: Under section 60.6, variances may be issued for the repair and rehabilitation of historic structures, as defined in Section 59.1, upon the determination that the proposed repair or rehabilitation will not preclude the structure's continued designation of a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure.

Accessory structures, used solely for parking (two-car detached garages or smaller) or limited storage (small, low-cost sheds): If a community wishes to allow a non-elevated/non-dry floodproofed accessory structures, the community must establish the meaning of low-cost and small accessory structures. Communities may allow wet floodproofing of these structures provided that

they represent a minimal investment and are designed to have a low damage potential with respect to the structure and contents.

The following requirements, at a minimum, must be attached to the variance for an accessory structure:

- 1) it must be anchored to resist flotation, collapse, and lateral movement;
- 2) the portions of these structures located below the BFE must be constructed of flood-resistant materials;
- 3) it must be designed to allow for the automatic entry of flood waters;
- 4) mechanical and utility equipment must be elevated or floodproofed to or above the BFE;
- 5) it must comply with the floodway encroachment provisions of the NFIP Regulations; and
- 6) its use must be limited to parking and/or limited storage.

Some communities have included provisions in their floodplain management ordinance for permitting the construction of these low-cost, small detached accessory structures. Communities wishing to regulate the placement of such structures in this manner should contact their FEMA Regional Office for guidance and assistance.

Certain Agricultural Structures: FEMA recognizes that wet floodproofing may be appropriate for certain types of agricultural structures located in wide, expansive floodplains. A variance may be issued only if the structure is used solely for agricultural purposes in which the use is exclusively in connection with the production, harvesting, storage, drying, or raising of agricultural commodities, including the raising of livestock. Only in circumstances when it can be demonstrated that agricultural structures can be designed in such a manner that results in minimal damage to the structure and its contents and will create no additional threats to public safety, may a variance be issued. Because the wet floodproofing of a new agricultural structure with the lowest floor below the BFE is not in conformance with NFIP requirements, any variance issued must address both the nonconforming flood protection technique and the restriction of use to the above-described agricultural purposes. Types of agricultural structures that may be wet floodproofed following the issuance of a variance are:

- Farm Storage Structures used exclusively for the storage of farm machinery and equipment (e.g., pole and pre-fabricated metal frame structures with open or closed sides).
- Grain bins
- Corn cribs
- General purpose barns for the temporary feeding of livestock, provided they remain open on at least one side.

In addition, structures presented as agricultural

sory Structure category also be limited to

Existing (Pre-FIRM) Damaged

Improved or Substantially

For existing structures substantially damaged, the code apply. Owners should reduce potential damage that are generally for flood protection

or that have not been regulations do not particular structure to constructed of materials ertight, or unsuitable

Although it may be possible to improve structures by sealing the perimeter walls, in some cases, it is often unadvisable to do so because of high water pressure. Dry floodproofing will fail due to some unforeseen factor in these usually non-engineered, older structures. In these cases, wet floodproofing and flood protection through either relocation or elevation of structures may offer the only technically viable flood-damage reduction alternatives. In some situations, wet floodproofing may be the only realistic economic alternative for existing structures that are not substantially improved or damaged.

