

Dry Floodproofing

Dry floodproofing involves sealing the exterior of a building to prevent the entry of flood waters. This technique can only be used when the walls are strong enough to withstand the hydrostatic force of the water. Shields may be installed to seal off doors, windows, and other openings.

Applicability

A dry floodproofed building must withstand both the lateral pressure of floodwater and buoyancy forces. This technique is only applicable to structurally sound buildings in areas of shallow, low-velocity flooding.

Flood hazard: Dry floodproofing is infeasible when flood depths exceed 3 feet due to the risk of structural damage. Dry floodproofing should also be avoided in areas subject to high velocity flows, erosion, debris impact, or waves, which can damage the structure or puncture waterproof sealants. An additional consideration is the expected duration of flooding, because waterproofing compounds, sheeting, or sheathing may fail or deteriorate if exposed to floodwaters for extended periods. Most dry floodproofing systems require human intervention, which can only be implemented if there is adequate warning time.



Building characteristics: Dry floodproofing is appropriate primarily for slab-on-grade buildings with concrete or solid masonry walls. It should not be attempted if there is a basement. When dry floodproofing a wood-frame structure, only buildings constructed of block or faced with brick veneer should be considered. Weaker construction materials, such as wood-frame with siding, will often fail at much lower water depths. Even brick or concrete block walls should not be floodproofed above a height of three feet (without extensive engineering analysis) due to the danger of structural failure from excessive flood-related forces.

Regulations: Dry floodproofing is not allowed for new, substantially damaged, or substantially improved residential structures in the regulated floodplain. However, it can be used to bring a substantially damaged or substantially improved non-residential structure into compliance with floodplain development standards.

Emergency operation: If the design requires manual installation of flood shields or other activities, a physically capable person must be aware of the flood threat and able to implement all necessary interventions before flood waters arrive.

Costs

Dry floodproofing may be less costly than other methods of protecting flood-prone structures. Project costs depend largely on the building size, depth of protection, types of material used, and number of openings.

Techniques

Dry floodproofing is a sophisticated technique that requires an understanding of the hydrostatic forces that can damage walls and floors, as well as the protective measures used to withstand those forces. The project design should be certified by a licensed professional.¹ The building modifications include:

¹ FEMA's Floodproofing Certificate is available at <http://www.fema.gov/library/viewRecord.do?id=1600> and is required if a non-residential structure is dry floodproofed for compliance with floodplain development requirements or insurance rating purposes. Professional certification is recommended for all dry floodproofing projects due to the technical challenges of such projects.

- **Sealing building walls:** Since most wall materials will leak, it is generally necessary to apply waterproof sealants to the building walls, all structural joints (such as where walls meet foundations), and openings for utility lines. Cement- and asphalt-based coatings are often the most effective sealant. However, if applied to outside walls, these coatings can drastically change the appearance and may be susceptible to puncturing. Addition of a new masonry veneer over the coating can provide additional protection and aesthetic appeal. Clear coatings, such as epoxies and polyurethanes, can be applied to exterior walls without changing the appearance, but tend to be less effective than cement- and asphalt-based materials.
- **Permanently seal openings:** It may be possible to permanently seal the lower portions of some window or door openings. For example, all or part of a low window can be replaced with brick or glass block.
- **Flood shields for openings:** Windows or doors that extend below the flood protection level require temporary installation of watertight shields over the openings. The material used and installation methods depend on the width of the opening, flood depth, and other considerations. A plan must be developed and implemented to ensure that flood shields are properly installed prior to a flood.
- **Interior drainage:** A good interior drainage system must be provided to collect water that leaks through the sealant or sheeting and around the shields. This system typically requires a sump pump and an emergency power source, such as a portable generator, to enable operation during a power outage.
- **Other:** It may also be necessary to strengthen the walls, anchor the building, install backflow valves in sanitary and storm sewer lines, elevate utility systems, anchor fuel tanks, or implement other measures.

Advantages and Disadvantages of Dry Floodproofing

Advantages	Disadvantages
<ul style="list-style-type: none"> ● Dry floodproofing reduces risk to the structure and contents <u>if</u> the design flood level is not exceeded. ● May be less costly than other retrofitting measures. ● <u>For non-residential buildings</u>, dry floodproofing can satisfy the requirement for bringing substantially damaged or improved structures into compliance with floodplain development standards. ● May reduce flood insurance premiums for a non-residential building. ● Does not require additional land beyond the original footprint of the structure. ● Retains the structure in its present environment and may avoid significant changes in appearance. 	<ul style="list-style-type: none"> ● Dry floodproofing is generally not technically feasible for flood depths exceeding 3 feet or for a structure with a basement. ● This technique cannot be used to bring a substantially damaged or improved residential structure into compliance with floodplain development standards. ● Usually requires human intervention and adequate warning time for installation of protective measures. Practices requiring human intervention should not be used when there is a risk of flash flooding or if warning times are short. ● Requires on-going maintenance. ● Flood insurance premiums are not reduced for residential structures. ● Measures can fail or be exceeded by large floods, in which case the effect will be as if there was no protection. ● If design loads are exceeded, walls may collapse, floors may buckle, and the structure may even float, potentially resulting in more damage than if the building were allowed to flood. ● The structure should not be occupied during a flood. ● Shields and sealants may not be aesthetically pleasing. ● The damage to the exterior of the structure and other property may not be reduced. ● May be subject to leakage, which could cause damage to the structure and its contents. ● Dry floodproofing does nothing to minimize the potential damage from high-velocity flood flow, wave action, erosion, or debris impact.