

Wet Floodproofing

Wet floodproofing includes a variety of techniques that allow a structure to flood inside, but reduce the resulting damage to the building and its contents.

Wet floodproofing is generally the least expensive floodproofing technique, but it may also be the least effective. Although damages are reduced, significant cleanup and some repairs are usually required after a flood. Wet floodproofing is often used to reduce damage to existing flood-prone structures when other floodproofing techniques are not technically feasible or are too costly.

Building characteristics: Because wet floodproofing allows flood waters to enter the building, it is most practical for unfinished portions of a building, such as the basement, crawl space, or garage. It may be the desired technique for structures with basements that cannot be protected technically or cost-effectively by other techniques. The structure should have space above the flood protection level to relocate and/or temporarily store vulnerable items.

Flood hazard: Wet floodproofing is most suitable for areas with shallow flooding that only inundates unfinished space. In areas prone to flash flooding, temporary relocation of vulnerable items is not feasible. Wet floodproofing does nothing to alleviate the threat of damage from flowing water, erosion, debris impacts, or floodborne contaminants.

Regulations: In most circumstances wet floodproofing cannot be used to bring a substantially damaged or substantially improved structure into compliance with current floodplain development standards. However, if there is no basement (below grade on all sides) and finished living space is located above the flood protection level, compliance can be achieved by wet floodproofing a crawl space or other enclosed area below the lowest floor and using that area solely for parking, storage, or building access.

Costs

The major costs of this measure involve rearranging utility systems, installing flood vents, replacing materials that are not flood-resistant, acquiring labor and equipment to move items, and cleanup when floodwaters recede. Major disruptions to structure occupancy may occur during and after floods.

Techniques

Flood vents: The purpose of allowing water into the structure is to enable equalization of the interior and exterior hydrostatic pressures, which greatly reduces the likelihood of wall failures and structural damage. To accomplish this, the structure must have flood vents, or permanent openings, that allow water to flow in and out of the building without damaging the foundation. The size and number of openings must be sufficient to allow the water level inside the building to rise and fall at roughly the same rate as the water level outside. If the floodproofed area is above grade, the flood vent openings should meet or exceed the standards for floodplain development (see FEMA Technical Bulletin 1, referenced below). If the building has a basement, additional openings may be required so an engineer or architect should determine the number and size of flood vents.

Protect service equipment: Vulnerable items, such as utilities and appliances may be moved to a place in the building higher than the flood protection level. This could be existing space, such as an attic or a small addition that would serve as a utility room. Service equipment can be protected from shallow flooding with low floodwalls and shields or elevated on a platform. Ductwork and specially designed furnaces can be suspended from the ceiling. Electrical system components can be elevated. Keep in mind that most service equipment must remain accessible for maintenance. Automatic shut-off valves are installed on sewer and fuel lines.

Anchoring: Foundations, fuel tanks, equipment, and other components located below the flood protection level should be firmly anchored to resist flotation, collapse, and lateral movement.

Flood resistant materials: Building materials in flood-prone parts of the structure can be replaced with flood-damage resistant materials. Carpeting, paneling, and gypsum wallboard can be replaced with materials that will require cleaning rather than replacement after a flood (see FEMA Technical Bulletin 1, referenced below)

Protect building contents: To the extent possible, use of the floodproofed area should be limited and the contents permanently relocated to higher areas. If there is sufficient warning time, other items vulnerable to flood damage can be temporarily relocated to higher parts of the building prior to a flood.

Advantages and Disadvantages of Wet Floodproofing	
Advantages	Disadvantages
<ul style="list-style-type: none"> • No matter how small the effort, wet floodproofing can, in many instances, reduce flood damage to a building and its contents. • Installing flood vents to equalize hydrostatic pressure protects the building from structural damage that could result from flood loads on the walls and floors. • Costs for relocating or storing contents (except basement contents) after a flood warning is issued are normally covered by flood insurance. • Wet floodproofing measures are often less costly than other measures. • The appearance of the building is usually not adversely affected. • Does not require that additional land beyond the original footprint of the structure. 	<ul style="list-style-type: none"> • For most structures, this technique cannot be used to bring a substantially damaged or improved structure into compliance with floodplain development standards. • Flood warning and active intervention may be needed to prepare the building and its contents for flooding. • The structure will get wet inside and may be contaminated by sewage, chemicals, or other materials borne by flood waters. Extensive cleanup may still be necessary • The structure should not be occupied during a flood and may be uninhabitable for a time afterward. • It will be necessary to limit the uses of floodable areas of the structure so that it can be readily prepared for a flood. • There may be ongoing maintenance requirements. • To avoid foundation wall collapse, care must be taken when pumping out basements. • Wet floodproofing does nothing to minimize the potential damage from high velocity flow and wave action. • Generally no reduction in flood insurance premiums.

Additional Information

- *Wet Floodproofing Requirements for Structures Located in Special Flood Hazard Areas*, Technical Bulletin 7-93, FEMA FIA-TB-7 (1993), <http://www.fema.gov/library/viewRecord.do?id=1720>.
- *Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas*, Technical Bulletin 2, FEMA FIA-TB-2 (2008), <http://www.fema.gov/library/viewRecord.do?id=1580>.
- *Protecting Building Utilities from Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*, FEMA P-348 (1999), <http://www.fema.gov/library/viewRecord.do?id=1750>.
- *Openings in Foundation Walls and Walls of Enclosures*, Technical Bulletin 1, FEMA FIA-TB-1 (2008), <http://www.fema.gov/library/viewRecord.do?id=1579>.
- *Flood Resistant Design and Construction*, American Society of Civil Engineers (ASCE) 24-05, purchase at www.asce.org, highlights available at <http://www.fema.gov/library/viewRecord.do?id=3515>.