

Selecting Floodproofing Techniques – Assessing Flood Risk

A realistic floodproofing strategy must be based on an understanding of the current flood risks and reasonable objectives for reducing those risks. The flood risk for an existing building depends on both the local flood hazard (how often the water will get how deep) and the impact that those flood conditions will have on the structure, its contents, and the occupants.

Flood Hazards

Because we can't predict future floods, floodproofing decisions need to be based on available information about probability of particular flood conditions. The flood characteristics that should be evaluated include:

- Frequency with which floodwaters will reach various depths.
- Amount of warning time prior to flooding of the structure (or loss of access due to flooding of roads).
- Flow velocity, including the potential for erosion or scour.
- Duration of flooding.
- Debris load, such as trees or ice, which can cause impact damage.

The following sources can be used to assemble as much information as possible about the flood hazards at a particular location:

- Flood Insurance Rate Map and Flood Insurance Study: The flood hazard map (available at municipal offices, County Planning Departments, or online at <http://msc.fema.gov>) indicates if the property is in the so-called "100-year floodplain." This is the area calculated to have a 1% or greater probability of flooding in any given year. If the map provides an elevation for this 1% probability flood, additional information can be found in the accompanying Flood Insurance Study (FIS). Locating the site on a Flood Profile (in the back of the FIS) will enable determination of the calculated elevation for the 10-year, 50-year, 100-year, and 500-year flood at that location. If a flood elevation is not provided on the map (Approximate A Zone), simplified methods can be used to estimate an elevation for the 1% probability flood.¹ Note that flood hazards change over time (usually increasing as a result of development), so if the calculations for the maps are old or of the floodplain is an Approximate A Zone, the actual flood elevations may be higher. If the flood hazard maps indicate that the site is in the "floodway" portion of the floodplain, it is likely to be subject to high velocity flood flows.
- Other flood studies: A study of flood characteristics may have been conducted for a highway project or other purpose. If reliable flood height and frequency information are not currently available, it may be beneficial to conduct an engineering study, particularly if you plan to implement an expensive floodproofing project.
- Historic information: The characteristics of past flood events can provide valuable information about the potential for high flow velocities, short warning times, flood-borne debris, and long inundation periods. In flood-prone areas that are not indicated on flood hazard maps, historic flood heights may be the best information you have for anticipating future flood depths. However, weather patterns and land use changes are increasing the flood hazards in many areas. So if you are using the past as a key to the future, be sure to include an extra margin of safety. Consult with neighbors, municipal officials, County Soil and Water Conservation Districts, the local Fire Department, and County Emergency Management personnel about previous flood conditions and the potential for more severe floods in the future.
- Site characteristics: If the property is located near a small, high gradient stream, you should be prepared for flash flooding. In these areas, there may be little or no warning time, high water velocities, significant debris loads, and the potential for streambank erosion. A larger watershed generally allows greater warning time. A wide floodplain enables the water to spread out and slow down, particularly if flow is hindered by dense vegetation. Flooding from lakes or large rivers may take longer to recede.

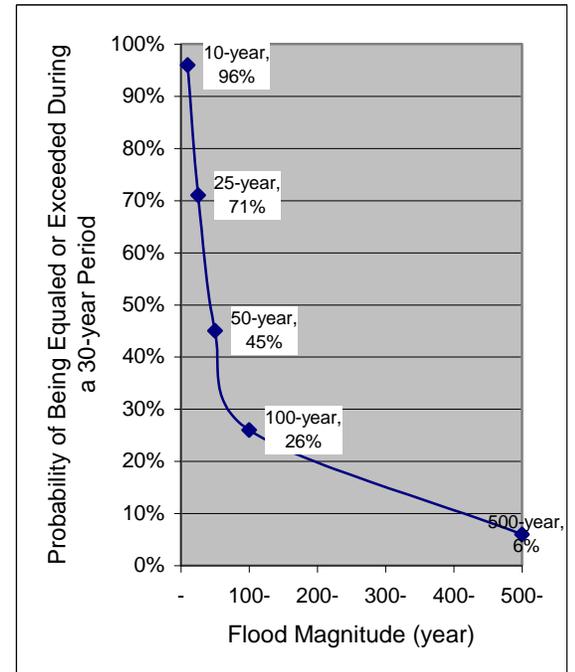
¹ *Managing Floodplain Development in Approximate Zone A Areas: A Guide for Obtaining and Developing Base (100-Year) Flood Elevations*, FEMA 265 (1995), available at <http://www.fema.gov/library/viewRecord.do?id=2215>.

Flood Impacts

The appropriate floodproofing technique and the desired level of protection depend on the impact that flooding will have on the building.

Elevation Certificate: It may be necessary to get a survey to determine how flood elevations (from the Flood Insurance Study) relate to the depth of water at your building. If a surveyor does this, request an Elevation Certificate,² which will document the elevation of the bottom floor, next highest floor, equipment servicing the building, lowest adjacent grade, and highest adjacent grade.

Flood Probability: The 100-year flood has a 1% probability of occurring during any given year and a 26% probability of occurring during a 30-year period (the length of a standard mortgage). The chart at the right can help with evaluating the benefit of protecting to a particular magnitude flood event. Regardless of the flood protection level you choose, keep in mind that a larger flood is always possible.



Floodproofing Objectives

It may be difficult to determine the flood level to which the building should be protected. Regulatory and flood insurance considerations generally favor protection to the 100-year flood elevation with additional freeboard (factor of safety provided by protecting to a higher level). However, if lower portions of a building sustain repeated damage from more frequent flood events, significant benefits can be achieved with a lower level of protection, even though the first floor remains susceptible to the 100-year flood. If you are elevating a building, the incremental cost of raising it a few feet higher may be worthwhile to provide additional protection and to reduce the cost of flood insurance.

The following considerations may be helpful in evaluating floodproofing options.

- Compliance with **current floodplain development standards** requires protection from the 1% probability flood event (Base Flood Elevation for the 100-year flood) with two feet of freeboard. See *Floodproofing Info #7: Regulatory Considerations for Floodproofing*.
- The **cost of flood insurance** is generally significantly lower if the elevation of the first floor and the lowest service equipment are above the elevation of the 1% probability flood. (Non-residential structures can be dry floodproofed to this level rather than elevated.)
- If an enclosed area below the finished living space is below grade on all sides or does not have adequate flood vents, it is considered the **lowest floor for insurance purposes**. Filling a basement or installing flood vents in a crawl space may thus enable significantly lower flood insurance costs.
- Do not rely on a floodproofing technique that requires **human intervention** if you are not certain that someone will be available and able to implement the needed actions.
- If someone using the building has difficulty with stairs, **building accessibility** may be a concern.
- Are **aesthetics** an important consideration?
- **How much risk can you tolerate?**
- **How much money can you invest in “buying down” your risk to a lower level?**

² FEMA Elevation Certificate and Instructions are available at <http://www.fema.gov/library/viewRecord.do?id=1383>.