

## Actions You Can Take to Protect a Flood-Prone House or Business with a Crawlspace

If your home or business has been flooded or is located in or near a flood hazard area, you typically have two choices:

1. Wait for the government to do something, like construct a reservoir or levee, or
2. Take actions on your own to reduce your risk of flood damage.

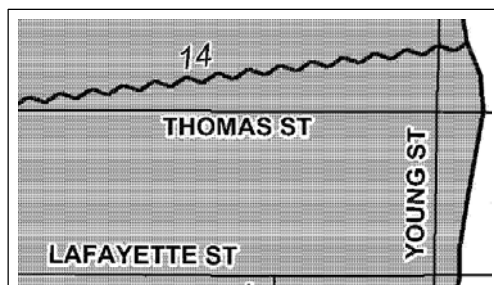
This brochure is for homeowners and business owners who want to reduce their exposure to flood damage (and potentially lower flood insurance premiums). Even if a government agency is planning to construct a reservoir or other flood control project, it may take years before it is constructed and operational. Meanwhile, you may flood again. This brochure provides a step-by-step decision-making process that can help you to reduce flood risk.

While it is advisable to consult with your local floodplain management administrator on regulatory and flood insurance requirements, this brochure is intended to provide basic flood risk reduction advice for structures located on a crawlspace.

### Step 1. Learn About Your Flood Hazard

You may have been flooded in the past, but the next flood could be worse. Talk to your community's floodplain management, planning, engineering or permit office and review any flood or drainage studies that have been done for your area. Answer these questions:

- a. **How deep have past floods been?** Don't assume the last flood is the worst that can happen. You also need to answer the following questions.
- b. **How deep could a future flood be?** While your community staff won't be able to make a prediction, they should have a Flood Insurance Rate Map and a Flood Insurance Study (FIS) that could tell you how deep different floods could be. You can also go to FEMA's [Flood Map Service Center](#), enter your address and obtain information on potential flooding.
- c. **Will the flood include fast-running water?** If you are located near a river, see if the FIS has a Floodway Data Table for your area. (A FIS is one of the products found in the [Flood Map Service Center](#)) or contact [1-877-336-2627](tel:1-877-336-2627). An average floodway velocity of over 5 feet per second is considered high and could pose a serious threat to life safety and could even cause failure of the crawlspace wall. It also means that some of the measures in this brochure should not be used.
- d. **Is your building located in a V Zone or coastal A Zone?** This means an added danger from possible wave action, another threat to life safety that also means some of the measures are not appropriate. Check with your local floodplain administrator about this.
- e. **Is there a flood warning system for your location?** If so, how do you get the warning? Will there be enough time to move things and turn off utilities before you evacuate?



A FEMA Flood Insurance Rate Map may show the approximate elevation of the base flood above sea level at your site next to a squiggly line. You will need to know the elevation of your ground to determine how deep the base flood could be at your property. Your community floodplain management

- f. **Is the area protected by a flood control structure such as a levee or flood gate?** What would happen if that structure failed or floodwaters went over the top?

## Step 2. Learn About the Rules

Ask your floodplain management or building department:

- a. What types of projects need a permit? You will likely need a permit to alter your building's walls or to regrade the yard. Requiring a permit does not mean you can't do the project. It means it has to be constructed to your community's building code and floodplain ordinance in order to make sure it meets certain standards and does not make a flood problem worse on your or your neighbor's property.
- b. Is your site located in a floodway, a V Zone, or coastal A Zone? If so, you will have limited or no ability to fill, grade or alter the flow of floodwaters. Check with your local floodplain administrator.
- c. What are the substantial improvement requirements? If you're making an improvement to your home that is more than 50% of the home's value, and the home is located in a Special Flood Hazard Area (SFHA), you may have to build to new building code requirements, such as elevating the building. There is more information on this topic in FEMA's [Substantial Improvement/Substantial Damage Desk Reference \(P-758\)](#).

## Step 3. Purchase Flood Insurance

No matter what floodproofing measure you chose, you should have flood insurance. With adequate coverage, an insurance policy will provide funds to cleanup, repair and rebuild your house or business after a flood.

Flood insurance is not covered by most homeowners' or commercial business policies. You can purchase flood insurance through the [National Flood Insurance Program](#) or a private insurance company. If your building is located outside of the SFHA, you may qualify for a low-cost Preferred Risk Policy.

## Step 4. Review Property Protection Alternatives

There are four common ways to reduce flood damage to a building with a crawlspace:

- a. **Relocate:** If you face deep and fast-running floods with little warning time, the safest thing to do is get out of harm's way. There are two relocation options for owners: (1) move the building to high ground or (2) sell and leave, which passes the flood risk on to future owners. Talk to your community development or emergency management offices about [grant programs](#) that can help. The process may take several years, but you'll get permanent relief from flood damage, danger to your family and the cost and stress of repairing and rebuilding after a flood (provided you move to a safer location).



- b. **Elevate:** If you don't have a high velocity flood hazard and you will receive a warning, the next safest alternative is to (3) elevate the building above the expected flood level. Buildings with crawlspaces in low velocity areas are the easiest to elevate. The steps are explained in a [brochure](#) from the International Association of Structural Movers and in FEMA's guide, [Above the Flood: Elevating Your Flood-Prone House \(P-347\)](#).



The end result is an open foundation or a higher crawlspace that allows floodwaters to flow under the first floor. Most [grant programs](#) that fund relocation can also help fund elevation projects. Raising the lowest floor above the base flood elevation can also lower flood insurance premiums by up to 80%.

- c. **Shallow flooding projects:** If the flood hazard is less than 1-2 feet deep and does not include high velocities, there are several relatively inexpensive (4) shallow flooding protective actions you can take to reduce flood damage (see Step 5).
- d. **Combination:** You might want to implement some shallow water flooding measures while you wait on funding for a buyout, relocation, or elevation project. You should always have a flood insurance policy as long as your building is exposed to floods.

### Step 5. Review Shallow Flooding Options

The measures presented here work for **shallow, low velocity, floodwaters** and can reduce damage from more frequent but less hazardous repetitive flooding or drainage problems.

- a. **Talk to your community officials:** Your community development or public works department is responsible for streets and drainage. If flooding is caused or aggravated by surface flows, there may be something your community can do to keep the water away from your property. There is a FEMA guide which provides additional discussion, [Reducing Damage from Localized Flooding \(P-511\)](#).
- b. **Improve your parcel drainage:** If flooding occurs during heavy rains, not from a river or ocean, it may be a local drainage problem from stormwater runoff. If so, one of these approaches may help:

- 1) Clear your floodwater drainage channel. Most lots were designed for the water to flow away from the building and along the property line to the street. Determine if something is blocking this flow, like a fence or an object like an accessory building, or landscaping. If so, see if it can be moved or altered to allow drainage.
- 2) Direct the water away from your structure with fill, a shallow berm, a wall (photo) or a channel.



Be careful not to direct flows onto another property. Local officials report that complaints about drainage is one of the most common causes of neighbor-to-neighbor disputes (and sometimes lawsuits).

Do not backfill against your crawlspace wall because that may block the openings (see the next section). Also, if your crawlspace floor ends up below the fill level on all sides, it could result in higher flood insurance premiums.

c. **Allow water into your crawlspace:** Trying to keep water out of your crawlspace is asking for trouble. The water pressure can crack or break the crawlspace walls (photo, right), especially if the crawlspace floor is located well below ground level. Have flood openings installed. These are either permanently open or automatically opened during floods (see arrow, next photo).



If you want a dependable method of protecting your walls:

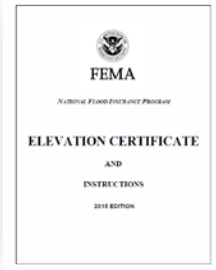
- 3) Have flood openings in at least two walls;
- 4) Make sure the vent's bottom is less than a foot above grade (the higher openings in the photo are good for air circulation around your floor joists, but won't let floodwater in before it builds up pressure on your walls); and
- 5) Measure the outside dimensions of your crawl space. You should have 1 square inch of net open area for every square foot of enclosed area.



If you meet these NFIP standards and have it recorded by a surveyor on a FEMA Elevation Certificate, you can get a break on your flood insurance premium.

Include a sump pump or other measure to drain your crawl space after the flood. Standing water attracts mosquitos and can cause mold.

Also consider dependable engineered openings (see arrow, above). For more guidance see FEMA's Technical Bulletin 1. [Openings in Foundation Walls and Walls of Enclosures](#)



d. **Empty your crawlspace.** You want to let the water into your crawlspace to protect your foundation walls, but make sure there's nothing in there for the water to damage. Note that only a few specified items in a crawlspace are covered by a flood insurance policy.

- 1) What will get wet when it floods? Do you store things in the crawlspace that could be put somewhere else?
- 2) How about the furnace and ductwork? As seen below, flooded ductwork is hard to clean and should be replaced. If this is not done, the sediment and mold in the ducts will be breathed in by everyone in the house when you run the furnace or air conditioner. This can cause serious and long-lasting illness.

**What can get wet?**

See FEMA's Technical Bulletin: [Flood Damage-Resistant Materials Requirements](#) for guidance on what can get wet and what should be moved away from a flood-prone area.

e. **Wet floodproof your garage:** This term means altering an area so floodwaters won't cause any damage. Move valuables up onto shelves or hooks above the expected water level. If the flood depth is only a foot or two, you can place larger things on blocks (see photo below).

f. After your crawlspace, you should tackle your garage. The walls and door should have openings, too, for the same reason you want to protect your foundation walls.

If you know a flood is coming and you have enough time, move the vehicle to high ground. Better yet, take the whole family to a safe area. Never stay in a house that will be surrounded by water.

Sometimes, wet floodproofing measures can be installed during remodeling or repairs. For example, if your garage walls are insulated and covered with drywall, you will need to tear wet drywall off and throw it away along with the insulation. Even if they look dry, they contain pollutants you don't want in your house. After the wall cavities are clean and dry, review LSU's Ag Center's [Wet Floodproofing](#) guide for ways to reduce damage to the walls and floor that can be incorporated when water resistant material is installed.



g. **Elevate your utilities:** Heating, air conditioning and electricity are vital utilities to make a building livable. If they are knocked out, it will delay repairing, rebuilding and reoccupying. One way to protect these utilities is to elevate them above the flood level, as in the example, below. Don't forget to elevate electrical outlets, too.



A flood in this house's crawl space resulted in over \$4,000 in damage to ductwork alone. The owner elevated the air conditioning compressor and relocated the furnace and ductwork into the attic. The result is an empty crawl space, no longer subject to floodwater damage.

There are commercial barriers and heavy-duty plastic bags that can wrap a furnace or water heater when a flood is coming. They are easy to pull up around the appliance and may be easier than elevating all the pipes and equipment.

See FEMA's [Protecting Building Utility Systems From Flood Damage \(P-348\)](#).

### **Step 6. Prepare an Emergency Plan as a Reminder for Steps to be Taken.**

Many communities have systems that can send out warnings via e-mail, text messages, and phone calls. Sign up for yours. Then write down the actions to take after you get an alert, like:

- a. Move valuables up, above the predicted flood level. This would include important papers, loose carpets, and even light furniture if you have a second story and enough warning time.
- b. Make sure the flood openings are clear of obstructions.
- c. Turn off the gas and electricity.
- d. Take what you can, like food that will go bad when there's no power for the refrigerator.
- e. Evacuate before the streets are flooded.

- f. When you evacuate, take your family [emergency kit](#) that would include prescriptions, insurance papers, and family contact information.

Be sure to mark and safely store any materials you'll need and practice these measures with your family at least once a year (e.g., on the first day of flood or hurricane season).

See also the Red Cross' website on preparing [before a flood](#).

### **Step 7. Weigh the Alternatives**

Relocate? Elevate? Shallow flooding project? Combination? Here are items to consider:

- a. **Will it work?** There are references for more information identified in the various sections above. Before you make a major investment, have an engineer review your situation and the building's structural condition to be sure that the approach is appropriate and effective. It can be a relatively small expense compared to the cost of repairing and rebuilding after a flood.
- b. **How much protection will you get?** If you are subject to deep flooding, shallow flooding projects probably won't do much when the big one comes. But if your problem is a shallow localized drainage problem, some of these inexpensive measures may do the job.
- c. **How much will it cost to build or install?** What can you do and what will require a contractor? If you're looking at a grant to help, how much will it cover and what share will you need to pay?
- d. **How long will it take to build or install?**
- e. Are there **long-term operation or maintenance costs**?
- f. How will it affect your **flood insurance premium**? If your building stays in a flood-prone area, you need to keep your insurance coverage. Elevating the building, installing flood openings, wet flood proofing the garage and elevating utilities can lower your premiums if recorded by a surveyor on a FEMA Elevation Certificate. Talk to your insurance agent to understand the dollar savings.

### **Step 8. Decide and Do It**

You may end up with a two-tier approach:

1. Low cost measures for the more frequent, low level flooding and
2. Flood insurance and emergency measures for you and your family for deeper flooding.

Don't give up: If you get flooded, see what worked and what didn't. Make adjustments or conclude that a shallow measure is not right for your house and look into elevation or moving. In all cases, have an emergency plan and keep that flood insurance policy in effect.

This guide was prepared by the Association of State Floodplain Managers'  
Nonstructural Flood Proofing Committee.

More information can be found on the Committee's webpage

[www.floods.org](http://www.floods.org)