Appendix F

Actions for Flood Resilient Homes:
Actions and Programs Overview

There's no doubt about it. No matter where you live in the Twin Cities area, it's been tough to stay dry. In fact, the years between 2015 and 2019 were the wettest in Minnesota history. And, with our changing climate, we can expect more wet years, more powerful storms—and more flooding.

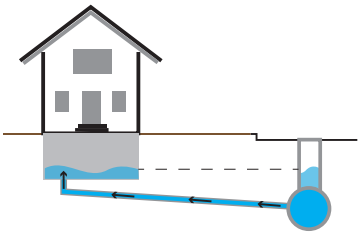
The City of Edina's strategy is to comprehensively reduce the risk of flooding throughout the community. This is accomplished through infrastructure, regulation, emergency services, and outreach and engagement. A series of factsheets were developed to describe actions people can take to reduce their own exposure and vulnerability to flooding. These factsheets, on topics ranging from sump pumps to sandbags, are now available on our website to help you determine what action is right for you.

Where does the flood water in my home come from?

Flood waters come from different sources. No matter the source, all can cause extensive damage to your home. Depending on the situation, different actions will work better than others to reduce damage to your property from the excess water. Gathering more information about how the water is entering your home, such as through a home drainage assessment, will help you choose the appropriate solution. Typical scenarios can include:

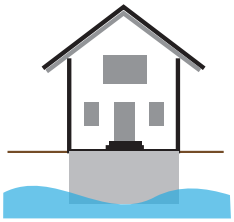
Surface water flooding

Severe storms or prolonged periods of wet weather can cause water levels in creeks, ponds, lakes, and rivers to rise and overflow their banks. If your home is near these water bodies or in a low-lying area, it can be at risk of flooding. Surface water can also cause what's known as "flash flooding." Because it occurs with little notice, flash flooding can catch people off guard. This normally occurs when existing drainage systems are overwhelmed by extremely heavy rain. Instead of soaking into the ground or draining through stormwater sewers, the water flows over the land surface, collecting in low-lying areas. Urban areas can be particularly vulnerable to flash flooding due to a greater amount of impervious surface.



Sanitary backflow

Sanitary backflow flooding can be caused by a blockage in the City's sewer system. This normally occurs when the sewer pipes are flooded with stormwater. When this happens, wastewater can flow backwards—into your home.



Groundwater seepage

Groundwater can also be a source of flooding. This tends to occur after long periods of heavy rain or snowmelt, when more water infiltrates the ground and causes the groundwater to rise above the home's foundation level.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Actions and Programs Overview

Image source: mprnews.org

Home retrofitting and flood prevention devices

The table below provides a quick overview of some common actions you can take to create more flood resilient buildings and landscapes. The factsheets that follow provide in-depth information on how, when, and where to use these actions and additional resources for residents.

Actions can reduce exposure or vulnerability

✓ Reduces exposure	✓ Reduces vulnerability
The extent to which property, homes, buildings, infrastructure, and other assets come into contact with flood water	The extent to which an exposed asset is able to resist flood-related damage

Action	City permit required	DNR permit required	Watershed permit required	Groundwater flooding	Surface water flooding	Sanitary backflow	Relative Cost	Before flood	During flood	After flood	Reduces exposure	Reduces vulnerability
Sump pump	x			x	x		Low	x				x
Sanitary backflow prevention	x					x	Medium	x				x
Dry floodproofing	x			x	x		Med-High	x				x
Sandbags					x		Low	x			x	
Wet floodproofing	x			x	x		High	x	x			x
Basement and low-level area pumping				x	x	x	Low			x		
Rain gardens and landscape changes	x[1]		x[2]		x		Medium	x			x	
Shoreline restoration		x[3]	x		x		High	x				x
Backyard element siting	x[4]		x		x		Low	x				x

[1] *Rain gardens may require a City permit if grading over 10 cubic yards.*
[2] *Rain gardens may require a permit from the watershed district. To learn more about your watershed visit: http://www.ninemilecreek.org or http://www.minnehahacreek.org.*
[3] *DNR permit may be required; visit https://www.dnr.state.mn.us/rys/index.html for more info.*
[4] *Setbacks and structure count may apply; contact the City Planning Department for more info.*

☐ Building action ■ Yard action

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes: Programs and Evaluation

Described below are a few ways to take action in the fight against flooding. Consider flood insurance and a home drainage assessment to protect your home; consider adopting a drain to protect the environment and your community.

NATIONAL FLOOD INSURANCE PROGRAM

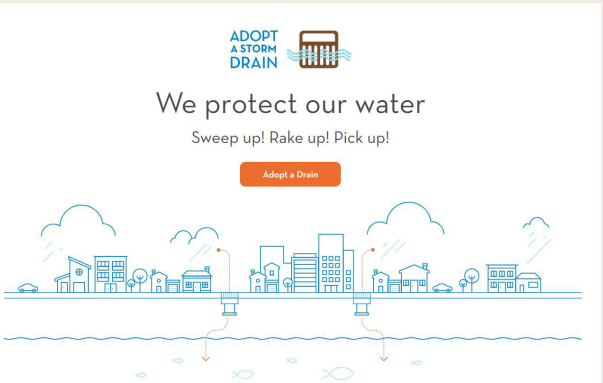
FloodSmart.gov

The Official site of the NFIP

Flood insurance

The City of Edina participates in the National Flood Insurance Program which enables anyone residing in Edina to purchase a National Flood Insurance Program flood insurance policy.

Your homeowner's or renter's insurance agent may also be able to help you purchase flood insurance. A list of participating providers can be found here: https://www.floodsmart.gov/find.



Adopt-A-Drain

By committing to keep drains clear of trash, leaves, grass, snow, and ice you can help prevent flooding—not to mention keeping Minnesota's lakes, streams, and rivers free of pollutants. For greater impact, consider working with a friend or your neighbors to adopt multiple drains.

More information on the Adopt-A-Drain program can be found by visiting: https://www.adopt-a-drain.org/.

Home drainage self-evaluation

Improper drainage can cause water damage during even minor rain or snowmelt events. Whether you're an owner or a renter, the Home Drainage Basics factsheet can help you assess problem areas where you live.

Take action!

The following factsheets describe actions that can protect your home from damage related to flooding. Not all actions will benefit your home; a proper home drainage assessment can help you understand which measures will be best for your situation. Many measures will require assistance from professional contractors and may require City permits. Please refer to each factsheet for additional information.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Flood Insurance

According to the Federal Emergency Management Agency (FEMA), flooding is the most common natural disaster in the United States and the consequences can be costly. Even 1 inch of water can cause $25,000 damage to your home.

While homeowner's insurance policies do not typically cover flood damage, the good news is that you can purchase separate protection. Because the City of Edina participates in the National Flood Insurance Program (NFIP), all of its residents are eligible to purchase flood insurance.

Who needs flood insurance?

Under federal law, if your home is within, or touches, a high-risk flood area and you have a mortgage on the property, you will be required to purchase flood insurance. Homes considered to be at high risk are those located within the 100-year floodplain—areas where there is a 1% annual risk of water rising above the base flood elevation.

If you live near an area of past flooding, you should consider purchasing flood insurance. Even if you don't live in or near a high-risk area, flood insurance can be a wise investment. In fact, more than 20 percent of flood insurance claims come from properties outside of high-risk flood zones. And, compared to the cost of paying back a disaster loan, flood insurance is a bargain. The Minnesota Commerce Department calculates that the average payment on a $50,000 disaster loan is $240 per month ($2,880 per year) for 30 years, while a $100,000 flood insurance premium is about $33 per month ($400 per year).

Flood insurance is not limited to homeowners; it is also available to renters and owners of non-residential buildings.

✓ Before flood action | ✗ During flood action | ✗ After flood action

How do I find out about my risk of flooding?

To learn about your specific risk of flooding, go to the City of Edina's interactive flood risk map, or visit FEMA's Flood Map Service Area.

How do I buy insurance?

You can start by contacting the agent who provides your auto, homeowner's, or renter's insurance. They may be able to help you purchase flood insurance. If your insurance agent does not sell flood insurance, you can contact the NFIP Help Center at 800-427-4661.

COST: $150-$12,000[1]

Costs are variable based on whether the location of the structure being insured is above or below the base flood elevation, whether the policy holder is a homeowner or renter, and many other factors. Due to the numerous variables, the best way to learn what your costs would be is to contact multiple providers and utilize the resources at the bottom of this page.

What does flood insurance cover?

You can purchase separate coverage for your home and its contents; both are recommended for the best protection. Make sure your policy contains a comprehensive list of items covered.

Almost all walled and roofed buildings above ground can be covered. Coverage available for basements typically includes foundation elements (including posts or other support systems), utility connections, and necessary mechanical equipment (e.g., furnace, hot water heater, clothes washer and dryer, food freezer, air conditioner, electrical junction). Items typically found in finished basements—paneling, carpeting, furniture—are not covered.

You must normally wait 30 days after you've paid your premium before your policy will be effective.

Other considerations

Losses from sewer backup are not covered by flood insurance unless the backup occurs as a result of surface water flooding. You may want to consider purchasing a rider on your homeowner's policy to protect you from sewer backups not related to flooding.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]According to the Minnesota Department of Commerce, the average cost for a flood insurance policy is $500 per year. In low-to-moderate risk areas insurance can cost just over $100 per year. A renter's policy can range from $150–$900 according to the Policygenius website: https://www.policygenius.com/renters-insurance/what-renters-need-to-know-about-flood-insurance/

Other resources: FEMA National Flood Insurance Program: www.floodsmart.gov

Minnesota Department of Commerce Flood Insurance Basics: https://mn.gov/commerce/consumers/your-home/protect/other/floods/basics.jsp

Minnesota Department of Natural Resources Flood Insurance FAQs: https://files.dnr.state.mn.us/publications/waters/floodplain_management_fact_sheet_8.pdf

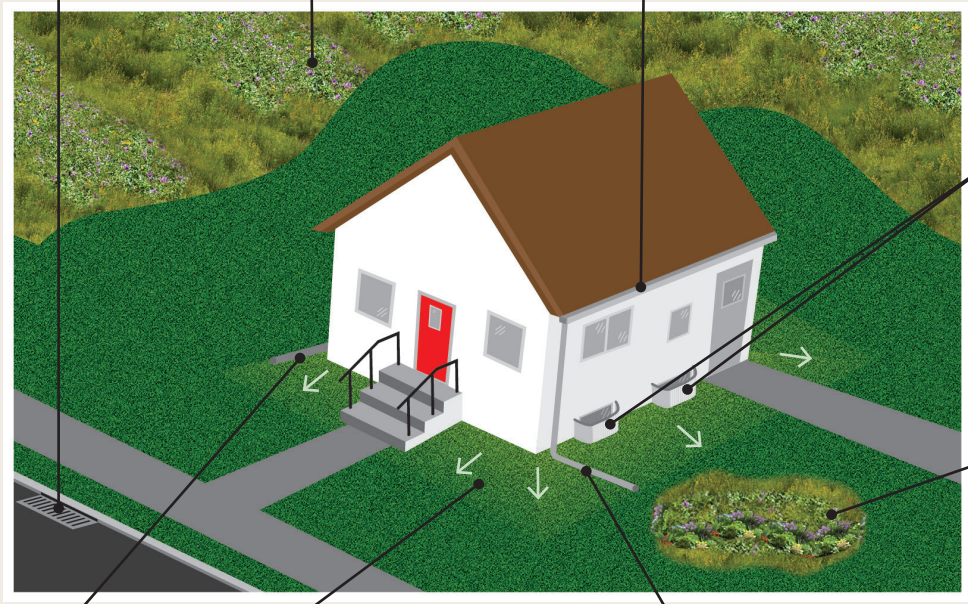
Actions for Flood Resilient Homes:
Home Drainage Basics

The graphic below shows common home drainage issues and solutions. Basic measures such as repositioning downspouts, grading away from your foundation, and seasonal home maintenance routines can help keep your home dry during heavy rainfall events.

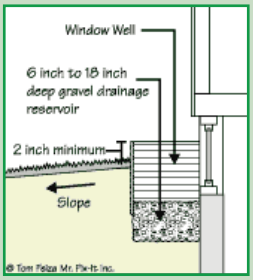
Clearing storm sewer drains helps them perform effectively. Drains frequently become clogged with stormwater debris or blocked by snow and ice. This can cause water to accumulate and overflow onto roads and lawns.

Turf to native conversion helps infiltrate stormwater and prevents flooding. The conversion can also be a money and water saver; native plants often require less water than turf lawns.

Gutter installation is the key to directing water from your roof away from your home's foundation. Too much water falling too close to your home can cause soil erosion, foundation problems, and water in the basement. To be effective, gutters must be cleaned in spring and fall.



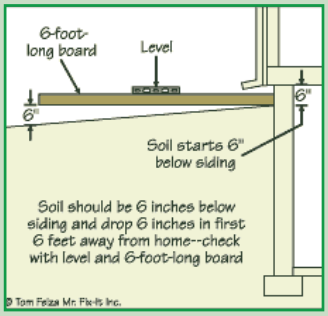
Installing shields can prevent flooding through low-level windows. To protect window wells, create a gravel reservoir that allows water to slowly dissipate into the ground and install a cover.



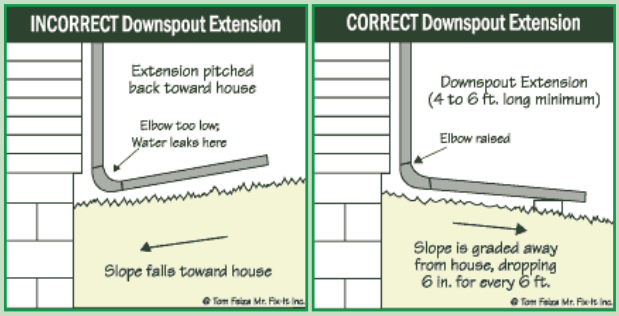
Rain gardens, soil amendments, rock trenches, and sub-surface systems can all assist with stormwater infiltration on your property. See Rain Garden Factsheet for details.

Sump pump discharge pipe locations should follow the guidance provided on the Sump Pump Factsheet. Follow similar guidance for downspouts to ensure water drains away from the home.

Grading away from your home provides water with a path away from your home's foundation.



Proper downspout alignment helps to drain water away from the home. Make sure the downspout extension is at least 4–6 feet long and properly positioned to avoid water backup.



NOTE: When stockpiling snow during the winter, plan ahead for the spring melt. Make sure water can effectively drain away from your property rather than pooling.

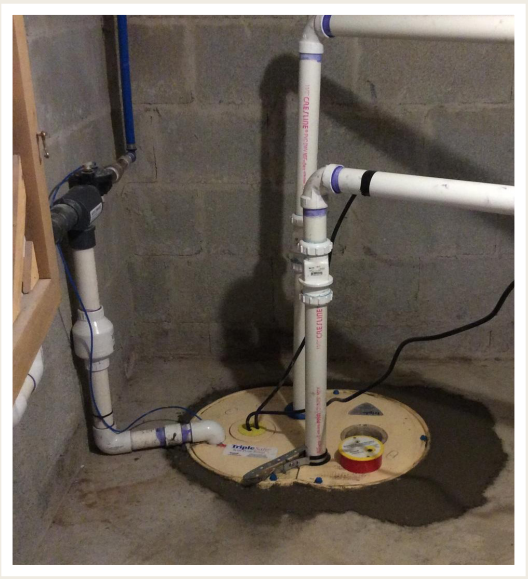
Inset images courtesy of: http://www.ashireporter.org/HomeInspection/Articles/Keeping-Basements-Dry/1048

For more information on flood resilience, contact the Engineering Department at 952-826-0371.
http://www.ashireporter.org/HomeInspection/Articles/Keeping-Basements-Dry/1048

Actions for Flood Resilient Homes:
Sump Pumps

What is a sump pump?

A sump pump is a small pump installed in the lowest part of your basement. Its purpose is to collect subsurface water from the ground near your home's foundation and pump it out to your yard to keep your basement dry.



Who needs a sump pump?

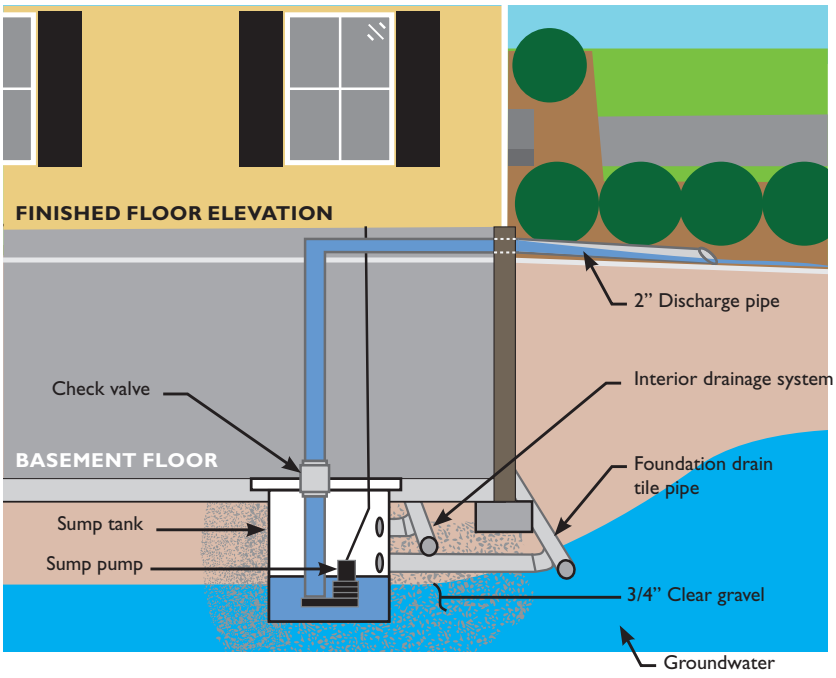
According to the American Society of Home Inspectors, 60% of homes in the United States have wet basements. If yours is one of them—or if one of the conditions below applies—you should consider installing a sump pump.

- Your basement has flooded
- You live in a low-lying area (see the interactive flood risk map)
- You have a finished basement where you store valuables (including appliances such as a washer/dryer)
- You live in an area that receives significant amounts of rain or experiences rapid snowmelt

✓ **Before flood action** | ✗ During flood action | ✗ After flood action

How does a sump pump work?

The sump pump usually stands in a "sump pit," which is a hole about 2 feet deep and 18 inches wide. Water from the soil around your home's foundation flows into the sump pit through drains. Once that water reaches a certain level in the pit a pressure sensor or float activator (similar to the one in your toilet) turns the pump on. The activated pump moves the water out of the pit through a pipe that should empty onto the ground at least 20 feet away from your home. In the City of Edina a utility connection permit is required to drain sump water to the storm sewer.



COST: $400 (median MN)[1]

✗ **Reduces exposure**

✓ **Reduces vulnerability**

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]According to improvenet.com (2020) for cost of replacement sump pump installation. May be substantially higher for new pumps, depending on type of pump/flooring and location.

Actions for Flood Resilient Homes:
Sump Pumps

Other considerations

- Drain tile around your home is an essential part of your sump pump system. The purpose of the tile is to collect water around the basement foundation and channel it to the sump pit.
- Gutters can significantly affect the water that gets into your basement. Make sure your gutters are well maintained and large enough to handle heavy rains. Downspouts should be directed away from the home. Similarly, make sure that the land next to your home is properly graded—directing water away from the foundation.
- Sump pumps should be checked regularly, particularly in early spring and when heavy rains are forecast. To test your pump, pour a bucket of water into the pit to make sure it starts automatically and that the water pumps out quickly.
- Pump maintenance should include removing the pump from the pit and cleaning the grate on the bottom. You should also make sure that if you are using a discharge pipe, the air gap is clear. The air gap is located outside your home, where the sump pump's internal discharge line exits the basement and connects to the external discharge line. Its purpose is to provide an outlet for flows in the event there is a problem with the discharge line or the stormwater system. If the air gap is obstructed, water can backflow, flooding the basement and causing the pump to burn out.
- A standard 15-amp, 110-volt, three-pronged grounded electrical outlet can handle a sump pump. The outlet should be an isolated line, with no other connections between the breaker and the outlet. Because the pump is located near water you may want to plug it into a working ground fault circuit interrupter (GFCI). However, keep in mind that lightning has been known to trigger GFCIs and could shut off power to your pump during a heavy rainstorm. Make certain to check on the pump during the storm so you can reset the GFCI if necessary.
- Consider replacing your sump pump every 10 years.

Connecting your sump pump to City of Edina storm sewers:

- The pipe exiting the house should have an air gap and drain to an area that slopes away from your home's foundation. Direct the drainage away from your home toward green areas that infiltrate water or toward public drainage paths.
- Sump drain lines can connect your sump pump directly to the storm sewer. This is best done by a licensed professional and requires a permit from the City of Edina.

Air gap types (left to Right): Atrium, candy cane, pipe in pipe.
Images source: City of Ann Arbor https://www.a2gov.org/departments/engineering/Documents/AirGapInfoSheet_2018.pdf

Make sure your sump pump is ready for whatever water comes its way …

Sump pumps often come with water-level or flood alarms to alert you if the pump fails. Some can even call your cell phone or notify your alarm company. To minimize the risk of flooding, test your sump pump periodically to make sure it is in good operating condition. Your user's manual should specify when and how to test your pump. You can also consider investing in a backup pump to operate if the primary pump fails or becomes overwhelmed with water from a large storm. Similarly, because sump pumps operate on electricity, they are vulnerable to power outages. Pumps with backup battery power are available, or a generator can be used.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Sump pump standards can be found at: https://www.edinamn.gov/DocumentCenter/View/397/Sump-Pump-Discharge-Connection-Policy-PDF.
Information on utility connection permits can be found at: https://epermits2.logis.org/home.aspx?city=ed.
Sump drain detail: https://www.edinamn.gov/DocumentCenter/View/848/310---Sump-Drain-PDF
Sump drain connection detail: https://www.edinamn.gov/DocumentCenter/View/849/311---Sump-Drain-Service-Connection-PDF
Installing sump pump requires a permit: https://www.edinamn.gov/209/Building-Permits-Resources.

Actions for Flood Resilient Homes:
Sanitary Backflow Prevention Devices

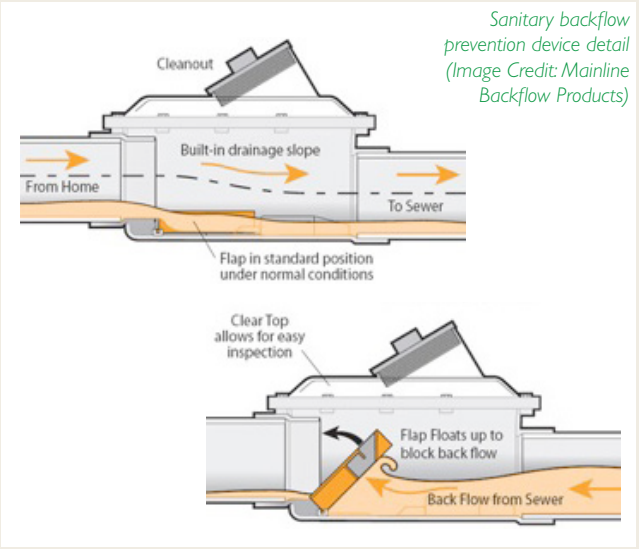
What is a sanitary backflow prevention device/ backflow valve?

A sanitary backflow prevention device is a valve attached to your plumbing system. It is designed to prevent overflow waste water from the City's sewer system from backing up into your home.

Who needs a sanitary backflow prevention device?

Because sanitary backflow prevention devices can prevent the significant damage caused by sewer backup, the City of Edina recommends them for all homes. If you have a newer home a valve may have been installed during construction. Backflow valves are usually located in the floor; if you have a sump pump the valve is likely to be close by.

Note that many insurance companies offer discounts to homeowners who install sanitary backflow prevention devices. The City recommends that backflow prevention devices be installed by a licensed plumber. A permit is required for this installation.



Sanitary backflow prevention device detail (Image Credit: Mainline Backflow Products)

✓ **Before flood action** | ✗ During flood action | ✗ After flood action

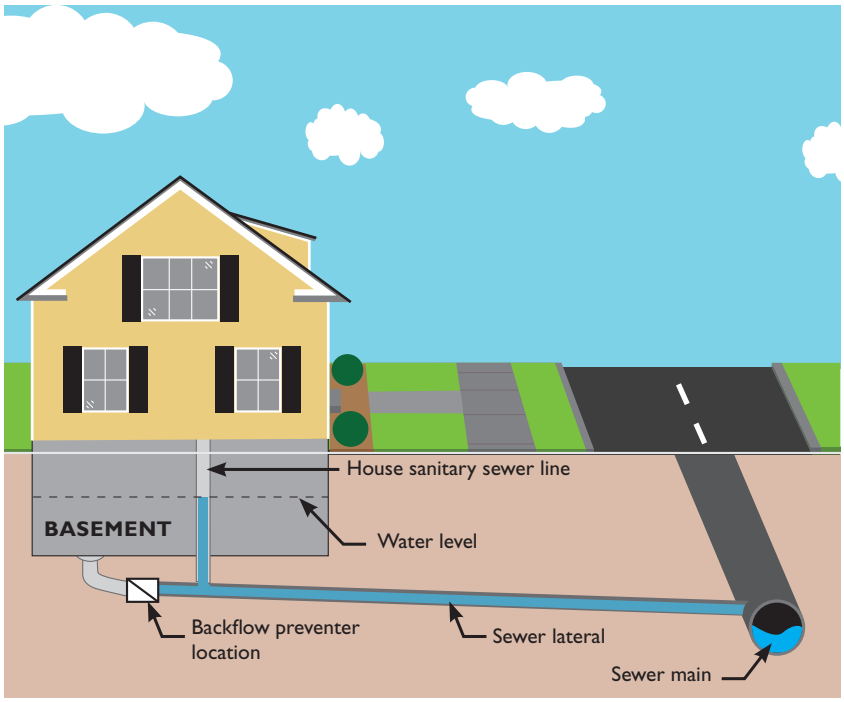
How do sanitary backflow prevention devices work?

A backflow valve has a flap with small floaters on both sides that allow the flap to open and close. Under normal conditions, the flap is open—allowing water from your home to flow into the main sewer system. However, if a large storm or snowmelt overwhelms the sewer system, causing water or sewage to backflow toward the house, the floaters will close the flap, effectively shutting your home off from the street sewer system (see detail above). Once the street sewer system has a chance to drain and return to normal functioning, the flap opens again to discharge waste water. Due to the potential for clogging, annual inspection of the device is needed.

COST: $135-$1,000[1]

✗ **Reduces exposure**

✓ **Reduces vulnerability**



Sanitary backflow prevention devices overview

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]*According to HomeAdvisor (2020). Costs to install a backflow preventer (including device) depend on the size and type of system.* Note that many insurance companies offer discounts to homeowners who install sanitary backflow prevention devices.

Actions for Flood Resilient Homes:
Sanitary Backflow Prevention Devices

Other considerations

- You should have your backflow prevention device cleaned and checked annually, preferably by the licensed plumber who installed it.
- To avoid backflow in your home plumbing system, keep your plumbing free of materials such as diapers, sanitary napkins, and cigarette butts.
- Backwater from a public sewer system is hazardous to your health. If sewer water enters your home, you should hire a licensed and trained professional cleaning service.

Sanitary backflow preventer installation

(Top) Image of sewer backup in bathroom, courtesy of https://blueskyplumbingfl.com/wp-content/uploads/2016/10/sewer-backup-in-bathroom.jpg

(Right) Sanitary backflow prevention device install; image courtesy of https://www.flickr.com/photos/69302634@N02/16327005228/in/photostream/

Make sure you're ready for sewer backups …

Backflow prevention devices can function automatically or be operated manually. To protect your home, the valve must be closed during overload periods—which will vary with the size of the storm, but typically last from 2 to 6 hours. Be aware that during the time the valve is closed you will not be able to use your plumbing.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Dry Floodproofing

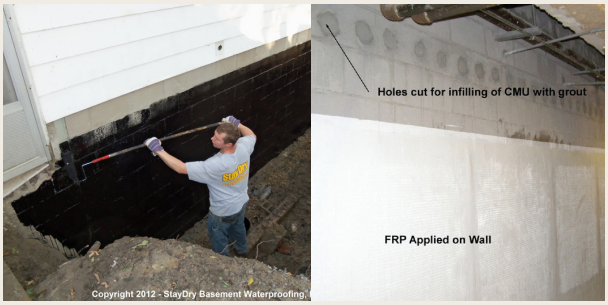
What is dry floodproofing?

Dry floodproofing describes a range of strategies to seal the exterior of a building from flood waters.

Who should use dry floodproofing?

Dry floodproofing is only viable for buildings that are structurally sound in areas with low-velocity, relatively shallow flooding (below 3 feet). It is most appropriate for slab-on-grade buildings with concrete or solid masonry walls. Due to risk of structural failure from excessive flood forces, dry floodproofing is not advised for homes with basements or homes comprising weaker construction materials (e.g., wood frame with siding).

Note that dry floodproofing residential structures will not reduce flood insurance premiums.



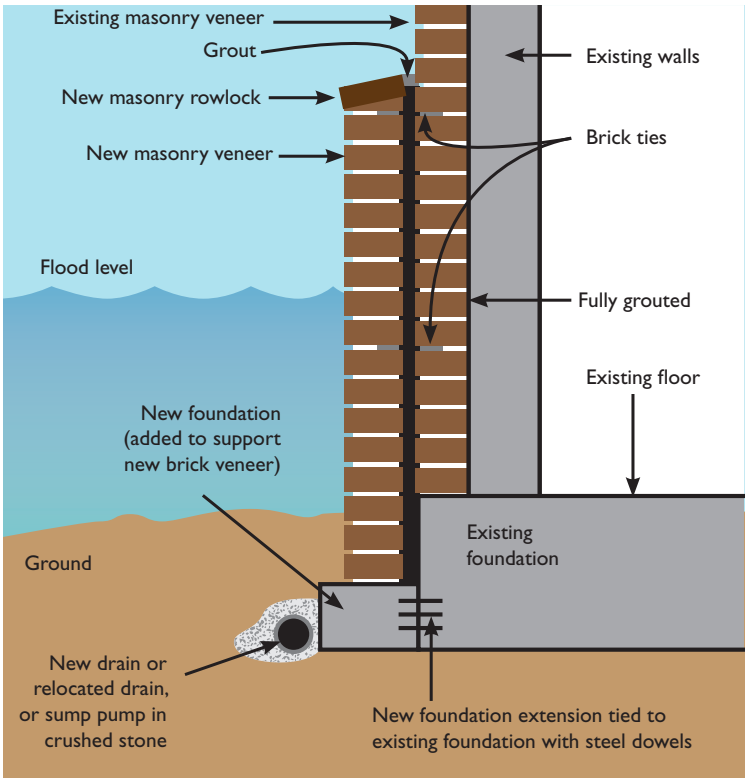
(Left) *Example of exterior application of asphalt membrane (courtesy of https://staydrywaterproofing.com/)* (Right) *An interior application of a fiber-reinforced polymer wrap, image provided by FEMA P-312, Homeowner's Guide to Retrofitting 3rd Edition (2014)*

✓ **Before flood action** | ✗ During flood action | ✗ After flood action

What are dry floodproofing methods?

- **Temporary installation of waterproof membranes:** Heavy plastic sheeting or a waterproof membrane along a wall's exterior can be effective in preventing water from entering the home.
- **Use of sealants:** Waterproof sealants can be applied to building walls, structural joints, and openings for utility lines. Cement and asphalt-based coatings are effective, but can drastically change the appearance of the home and may be susceptible to puncturing. Clear coatings (e.g. epoxies or polyurethanes) can be applied to exterior walls without changing appearance but tend to be less effective.

(continued on next page)



(Above) *"A way to seal an existing brick-faced wall is to add an additional layer of brick with a seal in between. Please note that weep holes (drainage) and wick drains are moved up to prevent moisture from getting inside the walls." Images and descriptions provided by FEMA P-312, Homeowner's Guide to Retrofitting 3rd Edition (2014)*

COST: VARIES[1]
✗ **Reduces exposure**
✓ **Reduces vulnerability**

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]The cost of dry floodproofing varies depending on the building size, depth of required protection, types of material used, and number of openings. Examples of general cost estimates can be found in FEMA publications: *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding* and *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures.*

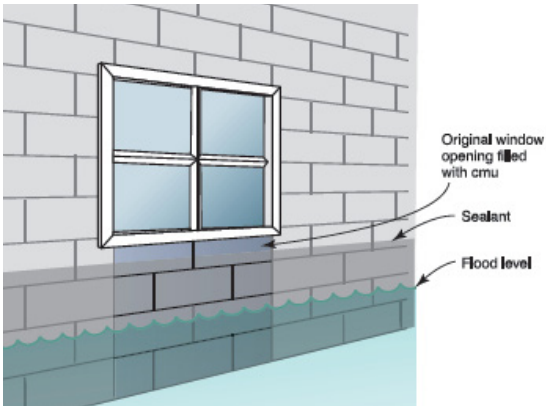
Actions for Flood Resilient Homes:
Dry Floodproofing

Other considerations

- The Federal Emergency Management Agency recommends that dry floodproofing should be designed by licensed professionals. Failure to anticipate hydrostatic forces (force due to the pressure of a fluid at rest) may result in extensive damage.
- Placement of flood shields or waterproof membranes is not feasible during flash floods or when warning times are short.
- Ongoing maintenance is required.
- Flood shields and sealants may not be aesthetically pleasing.
- Dry floodproofing does not mitigate the potential impact of high-velocity flood flow, wave action, erosion, or debris.

What are dry floodproofing methods? *(continued)*

- **Addressing closures**: Openings in the walls need to be either temporarily or permanently sealed shut. For example, low window openings at ground level can either have a pre-sized closure fitted over their surface or a low wall constructed around the opening. Similarly, all or part of a low window could be replaced with brick or glass block.
- **Using flood shields:** Temporary watertight shields can be placed over windows or doors in anticipation of flooding. Most residential shields can be stored in the home and installed when needed by bolting them into place or securing them in permanently installed brackets or tracks.
- **Addressing interior drainage**: A good interior drainage system to collect leaking water (e.g., a sump pump with an emergency power source) is an important component of a dry floodproofing system. Sanitary backflow prevention is also recommended.



(Above) *Metal shields installed with bolts or permanently installed tracks; image courtesy of www.psfloodbarriers.com/wp-content/uploads/sites/4/2016/09/Flood-Plank-21.jpg*

(Left) *Low window raised and original opening filled with brick; image provided by FEMA P-312, Homeowner's Guide to Retrofitting 3rd Edition (2014)*

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes: Sandbags

Under severe flood conditions, it may be necessary to build a sandbag dike to protect your home from water damage. Sandbags that are properly filled and placed can successfully divert water—moving it around buildings rather than allowing it to flow through them. The information below outlines the materials and steps necessary to build a sandbag dike.

City-provided sandbags

Public Works delivers sand bags to residents when requested and will leave sand bag pallets at the end of the property driveway. Requests are typically fulfilled within 24 hours. Residents must place the sand bags themselves—Public Works staff does not place sandbags.

When sandbags are no longer needed, residents may keep the sandbags or place them back on the pallet and call Public Works for pickup.

How to make a request

- During regular business hours, requests can be made by calling in to the Public Works utility line (952-826-0375).
- On weekends, requests can be made by calling in to the non-emergency police (952-826-1600) to get routed to the on-call person.
- Leave name, address, and the quantity of sandbags desired. If you're unsure, describe the size of the area and Public Works can help determine how many are needed.

✓ **Before flood action** | ✗ During flood action | ✗ After flood action

Sandbag materials

Sandbags themselves are generally made of treated burlap or woven polypropylene and measure approximately 24 inches by 14 inches. A sandy soil is best for filling sandbags, but other available materials (silt, clay, gravels, or a mixture) may be used. Sandbags can be found online and in hardware stores. The City does not endorse any specific company but some local sources of sand or gravel include:

- Bjorklund & Companies, 763-444-9301
- Hedberg Supply, Landscape & Masonry, 763-545-4400
- Marshall Concrete Products, 612-789-4303
- Plaisted Companies, 763-441-1100

Filling a sandbag

Filling and deploying sandbags is usually a three-person job: one person to hold the bag open, one person to shovel sand, and a third person to position the bag. The use of gloves is advised, as well as safety goggles.

Bags should be filled about one-half to two-thirds full and will weigh approximately 35–40 pounds. Untied bags are recommended for most applications.

Placing sandbags

Remove any debris from the area before placing sandbags. To avoid placing stress on walls, you should leave at least 8 feet between the dike and the building you want to protect.

Place the first layer of bags lengthwise, parallel to the direction of the water flow. The bags should be "lapped" so that the filled portion of one bag lies on the unfilled portion of the next. The untied end should be facing downstream. Similar to brick laying, offset adjacent rows or layers by one-half bag length to eliminate continuous joints. To form a tight seal, walk on the bags as they are placed and continue walking on them as succeeding layers are added. Because bags may remain untied, make certain to fold under all loose ends.

image: https://www.disaster.qld.gov.au/dmp/sandbagging/Pages/default.aspx

COST: VARIES[1]

✓ **Reduces exposure**

✗ **Reduces vulnerability**

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1] Costs vary depending on the size of the area to be protected.

Actions for Flood Resilient Homes: Sandbags

Other considerations

- Sandbags can become contaminated with bacteria and other pathogens from polluted flood waters. The sand from these bags should never be used in children's sandboxes.
- Full sandbags may be stored for short periods of time and reused for same-season flood fighting. However, prolonged storage can lead to mold. According to the Minnesota Pollution Control Agency, the safest place to dispose of full sandbags is a sanitary landfill. Sandbags may also be disposed in a demolition landfill. Be aware, however, that not all landfills will accept sandbags, so call first.
- Even when properly installed, water can leak and rain may fall inside the barrier. Be prepared with a pump to remove water from inside the barrier..

How high and how wide should my dike be?

The U.S. Army Corps of Engineers recommends that your dike should have a base three times wider than its height, although a ratio of 2:1 is also commonly recommended. A triangular pyramid shape should be used for a dike that is higher than 1 foot. For heights less than a foot, support the wall of sandbags every 5 feet with clusters of bags; this will stabilize the structure.

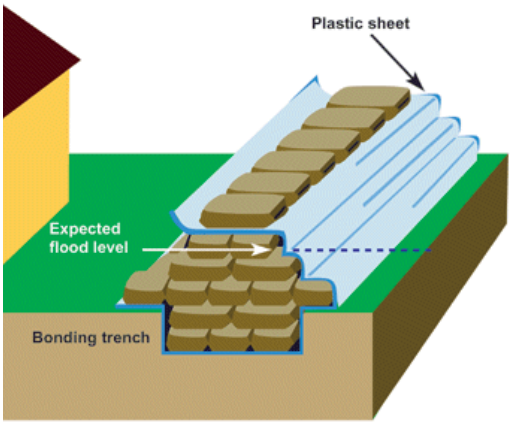


image: http://goldenlake.co/

How many bags will I need?

The North Dakota State Extension Service offers the following estimates for the number of sandbags needed per 100 linear feet of dike.

Dike Height	3:1 base to height	2:1 base to height
2 foot	2,100 bags	1,700 bags
3 foot	4,500 bags	3,000 bags
4 foot	7,800 bags	5,500 bags
5 foot	12,000 bags	9,000 bags

Sealing the dike

To improve water tightness, your finished dike should be sealed with a sheet of plastic at least 6 mils thick. First, spread a loose layer of soil or sand about 1 inch deep and 1 foot wide along the bottom of the dike on the water side. Then, lay the plastic sheeting so the upper edge extends over the top of the dike and the bottom extends 1 foot beyond the bottom of the dike (over the layer of soil and sand). Be careful not to stretch the plastic too tight; this could lead to puncturing. Finally, put a row of sandbags on the bottom and top edges of the plastic to form a watertight seal and hold it in place. Be careful to avoid puncturing the plastic by walking on it.

Sandbag alternatives

Alternatives to sandbags include "sandless" sandbags and Hydrabarriers, which can be purchased online or at some hardware stores. The sandless bags are made of an absorbent polymer that swells on contact with water—basically self-inflating the bags to form a water barrier. The Hydrabarrier is a tube (available in different sizes) that you fill with water to form a barrier. The advantage of these systems is that they are lighter weight, reusable, and do not pose a disposal problem. The disadvantage is that these systems can be expensive to purchase.

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

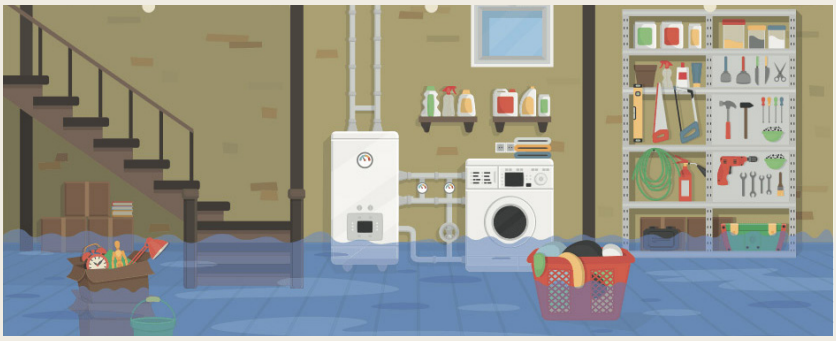
Actions for Flood Resilient Homes:
Wet Floodproofing

What is wet floodproofing?

Wet floodproofing refers to a range of strategies used to prevent or provide resistance to flood damage—while allowing water into the uninhabited portion of a building (e.g., unfinished basement, crawlspace, garage). Allowing floodwater to enter the enclosed areas of a home equalizes pressure, which can prevent structural damage. Successful wetproofing involves (1) ensuring that floodwaters inside the home rise and fall at the same rate as floodwaters outside the home, (2) reducing damage through the use of flood-resistant materials, (3) protecting service equipment inside and outside of the home, and (4) relocating any high-value items stored below the designed flood elevation (DFE).

Who should use wet floodproofing?

If you are at risk of flooding and cannot elevate your home or build reliable flood barriers, wet floodproofing of non-living spaces is an option. It is most suitable for shallow flooding that inundates uninhabited space. It is not practical for most slab-on-grade structures that have the living space at or near ground level. Also, it is not a reasonable approach if the duration of a flood is expected to be more than one day.



https://www.restoration1greaterminneapolis.com/how-to-deal-with-a-flooded-basement

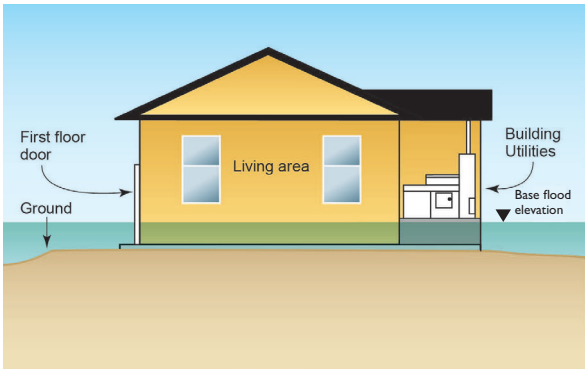
✓ **Before flood action** | ✗ During flood action | ✗ After flood action

What are wet floodproofing methods?

An advantage of wet floodproofing is that it is flexible; it can be done in stages—many of them relatively inexpensively. A good time to employ wet floodproofing strategies is when you remodel your home. The following are some wet floodproofing methods:

- **Elevate appliances and utilities or install barriers:** Items that should be elevated or protected with a barrier include your furnace and air-conditioning unit, outside air-conditioner compressor, washer and dryer, water heater, freezer, and electrical outlets and switches. You can also relocate these to a place in your home that is higher than the DFE (e.g., an attic), or build a small addition that would serve as a utility room and as storage for valuable furnishings during a flood.
- **Use flood-resistant materials:** The Federal Emergency Management Agency (FEMA) publishes flood-resistant classifications for flooring, wall, and ceiling materials, as well as the adhesives used to install them (Technical Bulletin 2-08). Carpeting, paneling, and gypsum wallboard can all be replaced with materials that would require cleaning rather than replacement. *A table on the following page* lists materials that are acceptable in wet floodproofing home projects.

(continued on next page)



Wet floodproofing techniques for a house. Image from FEMA P-259 (Figure -10)

COST: VARIES[1]
✗ **Reduces exposure**
✓ **Reduces vulnerability**

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]Costs of wet floodproofing vary with the methods adopted. Major costs are associated with rearrangement of utility systems, installation of flood vents, and replacement of materials that are not resistant to floods. **Note that wet floodproofing will not reduce flood insurance premium rates on residential structures.**

Actions for Flood Resilient Homes:
Wet Floodproofing

Other considerations

- Ongoing maintenance is required to minimize flood risks.
- Pumping water from a basement too soon after a flood may lead to structural damage.
- Work on electrical systems, gas systems, or air-conditioning compressors requires a licensed contractor, and permits may be required.
- Sewage backflow prevention is important; a backflow valve should be installed.
- Because wet floodproofing allows your home to flood, extensive cleanup may be necessary to remove potential chemical and biological contamination and prevent mold growth and decay.

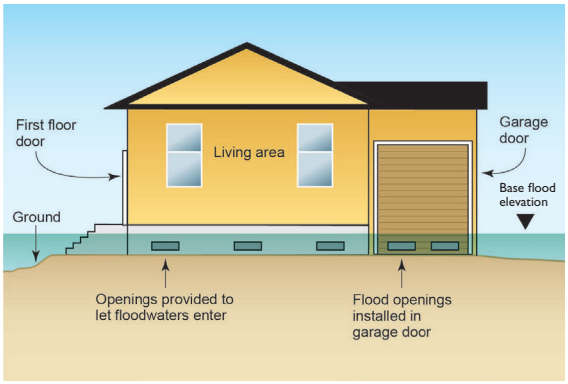
What are wet floodproofing methods? (continued)

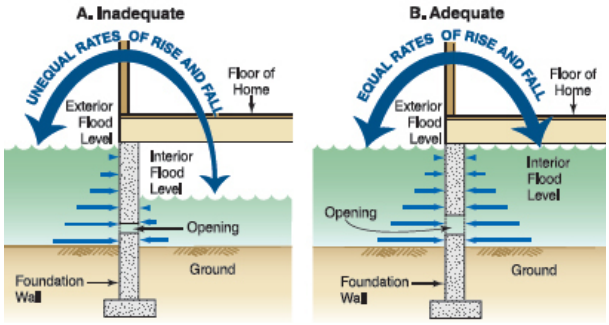
Materials that are acceptable in wet floodproofing home projects:

Material Type	Acceptable	Unacceptable
Structural Flooring Materials	• Concrete • Naturally decay-resistant lumber • Pressure-treated plywood	• Oriented strand board (OSB)
Finish Flooring Materials	• Clay tile • Ceramic or porcelain tile • Terrazzo tile • Vinyl tile or sheets	• Engineered wood or laminate flooring • Carpeting • Wood flooring
Structural Wall and Ceiling Materials	• Brick face, concrete, or concrete block • Cement board/fiber-cement board • Pressure-treated plywood • Solid, standard structural lumber (2x4) • Non-paper-faced gypsum board	• Fiberglass insulation • Paper-faced gypsum board • OSB
Finish Wall and Ceiling Materials	• Glass blocks • Metal cabinets or doors • Latex paint	• Wood cabinets and doors • Non-latex paint • Particleboard cabinets and doors • Wallpaper

FEMA P-312, Homeowner's Guide to Retrofitting 3rd Edition (2014)

- **Install flood vents:** Flood vents (permanent openings) allow water into the structure, equalizing interior and exterior pressures to avoid structural damage.





(Above) *"Wall openings must allow floodwaters not only to enter the home, but also to rise and fall at the same rate as floodwaters outside the home." Images provided by FEMA P-312, Homeowner's Guide to Retrofitting 3rd Edition (2014).*

(Left) *Base flood elevation and location of flood vents. Images provided by FEMA Technical Bulletin 2, 2008, Openings in Foundation Walls and Walls of Enclosures.*

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Pumping Guidance

If dry floodproofing methods fail during a large storm or you've chosen wet floodproofing, you may end up with a significant amount of water in your basement. Though your impulse may be to remove the water as soon as possible, it's important to remember that moving too quickly may cause structural damage to your home. Even though flood waters may have receded, there is still water in the ground that may be exerting force against your basement walls. If that force is greater than the force of water inside your basement, the foundation, basement walls, or floors may rupture or crack.

✗ Before flood action	✗ During flood action	✓ After flood action

Pumping procedure—when and how much to pump

If you need to pump water out of your basement or house, the Federal Emergency Management Agency (FEMA) recommends taking the following steps to avoid serious damage to your home.

1. Begin pumping only when floodwaters are no longer covering the ground outside.
2. Pump out 1 foot of water, mark the water level, and wait overnight.
3. Check the water level the next day. If the level rose to the previous mark, it is still too early to drain the basement.
4. Wait 24 hours, pump the water down 1 foot, and mark the water level. Check the level the next day.
5. When the water level stops returning to your mark, pump out 2 to 3 feet and wait overnight. Repeat this process daily until all of the water is out of the basement.

Safety first!

Remember that water conducts electricity. Before walking into a flooded basement make certain the power is turned off and wear heavy rubber boots and rubber gloves that do not leak.

COST: VARIES[1]

✗ Reduces exposure

✗ Reduces vulnerability

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1]Costs rely on a number of factors—including the amount of water and whether you choose to do the pumping yourself. You can contract with a water-removal service, but you may have to wait several days for assistance.

Actions for Flood Resilient Homes: Pumping Guidance

Other considerations

- A second pump should be considered to provide increased capacity and act as a backup.
- Strainers should be used to protect pumps from large debris.
- Use clean, fresh fuel in your pump or generator and make sure you have enough available to act in a flood.
- Be careful around floodwater that may have been contaminated by sewage. Tetanus shots are recommended when cleaning flooded areas.

Pumping procedure—equipment

A submersible pump is needed to remove water from a flooded basement. You can rent this type of equipment from a construction rental store or a hardware store; this will be less expensive than purchasing professional pumping equipment. The pump is encased in a waterproof shell with a sealed electrical cord; it connects to a regular garden hose or a sump hose. The power source for the pump will depend on whether you have electricity.

If you don't have electricity you will need to connect to a generator. Be careful! Do not use gasoline-powered pumps or generators indoors; these can produce deadly carbon monoxide exhaust fumes. Note: opening doors and windows does not provide sufficient ventilation. Another option is a pump that runs on a 12-volt marine or car battery or a petrol/diesel driven pump.

If you do have power, you can use a heavy-duty extension cord to run the pump on standard electricity—provided you have a place to plug it in. If your fuse box isolates your basement and you are absolutely sure you can disable the power in the basement, you can use electricity on the ground floor or higher. No matter what energy source you use, you will need to be careful to keep the connection between the extension cord and the pump cord away from water. You can do this by looping the cords around a ceiling joist or another heavy object.

image courtesy of https://www.forconstructionpros.com/equipment/worksite/pumps/article/11477112/pick-the-right-submersible-pump-for-dewatering-applications

Pumping procedure—pumping out the water

To pump water, a garden or sump hose should be attached to the fitting on the top of the pump. The end of the hose is then pointed away from the house to drain away to the street or storm sewer If the water is low enough, you can place the pump in the lowest part of the basement, making sure to wear rubber boots. In the event of very high water, you can lower the pump into the basement using rope. Once the pump is in place, start the generator, plug the extension cord in, and turn the pump on. If you're using electricity, plug the extension cord into an upstairs wall socket.

If your water is less than an inch deep, a wet-dry vacuum can be used. These work well, but can be very labor intensive; the tank on a wet-dry vacuum generally holds only 4 to 5 gallons of water and will need to be emptied frequently. One inch of water in a 1,500–2,000 square foot home would be 1,000–1,200 gallons and would require approximately 250 empties!

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Rain Gardens

What is a rain garden?

A rain garden is a tool used to decrease runoff and filter pollutants from stormwater. These gardens, built in shallow depressions, are filled with long-rooted grasses and plants that soak up rainwater from impervious surfaces—before the polluted flow enters lakes, rivers, and wetlands. Because they decrease runoff, rain gardens are also useful in flood prevention. Once established, they require little watering and minimal maintenance.

In addition to decreasing runoff and filtering pollutants, rain gardens also create habitat for birds and butterflies, recharge groundwater, reduce mosquito breeding, and enhance property value.

image courtesy of Minnehahacreek.org

Who should use a rain garden?

Rain gardens are particularly beneficial for those who have a large amount of nearby impervious surface (rooftops, walkways, driveways), have downspouts running into the lawn, or areas downhill from a downspout. They may also be helpful if you have soil erosion. (With deep-rooted plants, rain gardens hold soil in place and prevent erosion).

✓ Before flood action	✗ During flood action	✗ After flood action

How do I plant a rain garden?

There are many online resources that provide guidance on the construction and maintenance of rain gardens, including:

Rain Garden FAQs, Rain Garden Alliance
Rain Gardens Provide a Healthy Corrective to Runoff Flooding, WisContext
How and Why to Build a Rain Garden, U of M Extension
How Much Does a Rain Garden Cost?, Cost Helper
USDA Rain Garden Fact Sheet, USDA
Nine Mile Creek Watershed District Grants
How to Create an Effective Rain Garden, Habitat Network
Rain Gardens in Minnesota, Natural Resources Conservation Service

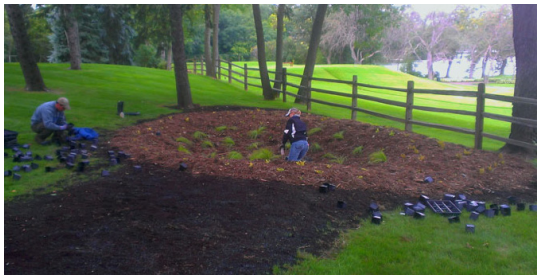


image courtesy Natural Shore: http://www.naturalshore.com/rain-garden-project-album/

Other considerations

- Rain gardens require partial to full sun. They should be built at least 10 feet away from your home to prevent water damage to foundations and basements.
- Rain gardens are typically 100 to 300 square feet, depending on the slope of the surrounding landscape and the size of the area draining to it; a garden will typically handle runoff from an impervious area three times its size. More than one garden may be needed to handle runoff from large surfaces (e.g., large rooftops).
- To prevent plants from drowning and mosquitoes from breeding, a rain garden requires soil that is porous enough to soak up water within 48 hours of a rainstorm. You can test your soil by digging a wide 10-inch-deep hole, filling it with water, and observing whether the water disappears within 48 hours.
- Before you dig, contact Gopher State One Call (811) or visit http://www.gopherstateonecall.org/to locate electrical, gas, or telephone lines.

COST: VARIES[1]

✓ Reduces exposure **✗ Reduces vulnerability**

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

[1] *According to the Rain Garden Alliance, a do-it-yourself rain garden will cost about $3–$5 a square foot. If you use a landscaper to plan and install the garden, the cost will be $10–$15 a square foot or more. Plants are the most costly consideration in a rain garden. Parts of the City of Edina are within the Nine Mile Creek Watershed District, which offers cost-share grants for rain gardens. The minimum grant is $500 and requires a 25% match. To see if your home is located within the district and to learn more about the grant program, go to https://www.ninemilecreek.org/.*

Actions for Flood Resilient Homes:
Shoreline Restoration

What is shoreline restoration?

Shoreline restoration involves the use of native vegetation to provide a buffer between your yard and the water's edge. This buffer (10–50 feet) replaces turf grass.

Although shoreline restoration does not reduce your exposure to flooding, it can reduce your vulnerability. Unlike turf grass, native trees, shrubs, forbs, and grasses have long roots that better withstand the effects of flooding. Under lengthy, high-water conditions, this may prevent the need to replace flooded turf.

✓ **Before flood action** | ✗ During flood action | ✗ After flood action

In addition to reducing flood vulnerability, shoreland restoration has a number of ecological benefits:

- Deep-rooted native plants are more resistant to wave and ice erosion and reduce the likelihood of slope failure.
- Native plantings improve water quality by slowing and filtering runoff before it enters the lake.
- A mixture of native vegetation provides diverse habitat for fish and wildlife.
- A buffer prevents wave action from stirring up sediment that can cause the lake to become murky.
- A buffer area provides privacy and aesthetic views while discouraging nuisance geese.

COST: VARIES[1]

✗ **Reduces exposure** ✓ **Reduces vulnerability**

How do I restore my lakeshore?

"Restore Your Shores," offered by the Minnesota Department of Natural Resources (DNR) (https://www.dnr.state.mn.us/rys/index.html) provides online guidance for implementing shoreland restoration projects, including steps and techniques, a plant guide, and references and resources. Comprehensive guidance, pertinent to Minnesota landscapes, is also available in the book, "Lakescaping for Wildlife and Water Quality," published by the Minnesota DNR. Or, consult a local landscaper who specializes in shoreline restoration.

Other considerations

- Some shoreline restoration projects will require a local or Minnesota Department of Natural Resources permit.

Helpful websites:
https://www.dnr.state.mn.us/lakescaping/index.html
https://www.dnr.state.mn.us/publications/waters/shoreline_alteration.html

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Parts of the City of Edina are within the Nine Mile Creek Watershed District, which offers cost-share grants for rain gardens. The minimum grant is $500 and requires a 25% match. To see if your home is located within the district and to learn more about the grant program, go to https://www.ninemilecreek.org/.

Actions for Flood Resilient Homes:
Floodproofing Accessory Structures and Yards

The damage that can be caused by flood water doesn't stop at your front door. The way you care for your yard and how you site and construct accessory structures can reduce both flood exposure and vulnerability.

✓ Before flood action	✗ During flood action	✗ After flood action

Floodproofing accessory structures

Your yard is an extension of your living space, which needs to be protected. The first step in floodproofing is to site the accessory structures on your property—your patio, fire table/pit, garden shed, gazebo—on high ground. You can also reduce your vulnerability by building these structures with flood-resistant materials. See the City's factsheet on Wet Floodproofing for a list of flood-resistant materials.

You should also secure yard items to prevent them from being damaged or swept away. Anchor them or attach them to more stable structures.

Floodproofing yards

There are many options you can consider to reduce flooding in your yard.

- **Make sure your yard is properly graded:** Patios, driveways, walkways, flowerbeds—if possible, they should all be graded so that the water flows away from the house.
- **Install a rain garden**: Rain gardens protect your yard from flooding by allowing runoff water to pool and slowly percolate into the ground. See the City's factsheet for more information on rain gardens.
- **Install dry wells:** Dry wells are underground structures that help rainwater dissipate into the ground. They can be used for wet spots or small, flood-prone areas on your property.
- **Create or take advantage of natural swales:** Swales are depressions in the landscape that redirect water flow, normally to a dry well or a garden bed with good drainage. You can slow the flow by lining the lowest point with rocks or adding deep-rooted plants on the slope.
- **Use heavier mulch:** Light-weight mulch can spread under flooding conditions, clogging drains. If using mulch near your home's exterior, make sure the mulch is at least 6 inches from your siding to prevent moisture wicking and rotting.
- **Replace impervious surfaces:** Impervious (non-porous) surfaces increase runoff. Replace them with pervious materials or landscaping.
- **Drain your driveway:** Driveways are a big contributor to stormwater runoff. You can mitigate the impact of that stormwater by adding drainage on the sides of the pavement—or by replacing the pavement with a pervious surface.
- **Plant a tree:** Trees create a leafy canopy that intercepts rainfall and reduces runoff. According to the Chesapeake Bay Foundation, a typical street tree can intercept from 500 to 760 gallons of water per year, depending on the species.

Other considerations

Parts of the City of Edina are within the Nine Mile Creek Watershed District, which offers cost-share grants for rain gardens. The minimum grant is $500 and requires a 25% match. To see if your home is located within the district and to learn more about the grant program, go to: https://www.ninemilecreek.org/.

Helpful websites

https://www.epa.gov/green-infrastructure/manage-flood-risk
https://www.homeadvisor.com/r/flood-proof-landscaping/
https://www.owntheyard.com/how-to-fix-backyard-flooding/
https://aibd.org/6-backyard-flooding-solutions-landscaping-storm-proof-yard/

For more information on flood resilience, contact the Engineering Department at 952-826-0371.

Actions for Flood Resilient Homes:
Reducing Risk as a Renter or Condo Owner

Even if you don't own a home, your property may be at risk during a flood. Below are some simple steps you can take to reduce that risk.

Get the facts

First, find out if the building where you live is in a high-risk flood area. You can check by going to the Federal Emergency Management Agency (FEMA) website https://msc.fema.gov/portal/search and entering your address. It's also helpful to know what steps your landlord/association has taken to decrease the building's exposure and vulnerability. Here are some questions you might ask:

- Does the building structure have flood insurance? This may be important because it could influence your landlord's ability to recover following a flood—and your ability to continue living in the property.
- Has the landlord/association taken flood resilience measures (wet floodproofing, dry floodproofing)?
- Is there a sump pump in the building? Is there a sewer backflow prevention device? This is particularly important if you store personal items in the basement of the building.
- In the event flood waters are predicted, is there available above-ground storage?
- In the event of an impending flood will the landlord/association be responsible for sandbagging? If not, will you be allowed to sandbag? (See City factsheet on sandbagging for more information.)

Consider buying flood insurance

It's important to know that your regular renter's insurance policy does not cover flooding. But, flood insurance is available for renters and condo owners through the National Flood Insurance Program (NFIP). The policy covers your personal property and contents during a flood. It does not include "loss-of-use" coverage or any additional expenses caused by a flood.

Flood insurance premiums are based on a number of factors including flood risk, year of building construction, building occupancy, the number of floors, the location of your contents, and the deductible and amount of coverage you choose. Even if you live in a low-to-moderate risk area, it's worth considering flood insurance. According to the NFIP, nearly 26 percent of all flood claims occur in these areas. Also, you may be eligible for a "preferred risk policy," which carries the lowest premiums. The cost for renters' flood insurance generally ranges from $150 to $900 per year.

Though flood insurance is provided by the NFIP and prices are set by the NFIP, it is sold by private insurance companies. Contact your insurance agent to find out whether they can provide coverage. If not, call the NFIP at 800-427-4661 to request an agent referral.

If you decide to buy insurance, don't wait for the next storm. There's typically a 30-day waiting period between when the policy is purchased and when coverage applies.

Consider the low spaces—including underground garages

If you have personal items in the basement or garage, put them in covered, plastic containers and store them on shelving—off the floor. Similarly, don't leave valuables in your car if flood waters are predicted.

Helpful websites

https://www.fema.gov/national-flood-insurance-program/How-Buy-Flood-Insurance

https://www.policygenius.com/renters-insurance/what-renters-need-to-know-about-flood-insurance/

For more information on flood resilience, contact the Engineering Department at 952-826-0371.