

## For More Information Contact:



You can also contact your local emergency manager or the South Dakota Division of Emergency Management at (605) 773-3231.

*South Dakota*

Division of Emergency Management  
501 East Capitol Avenue  
Pierre, South Dakota 57501  
(605) 773-3231

5000 copies of this brochure were printed by  
the Division of Emergency Management at a  
cost of 20 cents per document.



# Floodproofing

**Ways to Protect  
Your Basement  
and Its Contents**

## Introduction

Over the last five years, hundreds of homes across South Dakota were damaged by high ground water and flooding rivers and lakes. In many instances, the damage, amounting to millions of dollars, could have been prevented or dramatically reduced with simple "floodproofing" techniques. This booklet identifies the best of these techniques, including easy-to-do tasks that homeowners can perform themselves as well as more complicated efforts that require the assistance of construction professionals.

## Contents

<b>Valves, Plugs and Standpipes</b> .....	<b>3</b>
Valves .....	3
Plugs .....	6
Standpipes .....	8
<b>Elevating and Enclosing</b> .....	<b>9</b>
Elevating .....	9
Enclosing .....	12
<b>Pumping Out a Flooded Basement</b> .....	<b>14</b>
<b>Glossary of Floodproofing Terms</b> .....	<b>15</b>

## Valves, Plugs and Standpipes

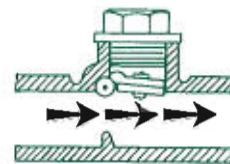
Valves, plugs and standpipes are the easiest and most cost-effective means of preventing water from entering your basement. Because floor drains and stools offer easy access for backed-up floodwater, installing the right valve or plug can be critical in avoiding basement flooding.

### Valves

Valves are used to close a pipe or sewer line. There are two basic types — the check valve and the gate valve.

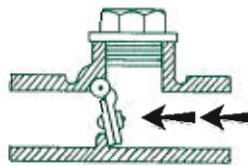
#### Check Valve

A check valve is a simple flapper covering one end of a pipe that allows water to flow in one direction only. Water flowing out of the house pushes the flap open; water moving in the opposite direction forces the flap over the pipe, preventing water from flowing back into the house. This method of operation gives the valve its other common name, "backflow" valve.



**Check Valve in Open Position**  
Water exiting through the pipe pushes the valve open.

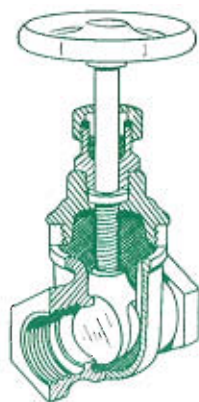
The advantage of the check valve is that it is automatic. The opening and closing of the valve is controlled entirely by the force of water. The check valve's disadvantage, however, is that the seal is not always tight, and in some instances the flap may be held open by debris.



**Check Valve in Closed Position**  
Water coming back into the pipe pushes the valve closed.

### Gate Valve

In contrast to the check valve, a gate valve works by the movement of a strong metal plate across the path of water. Unlike a check valve, a gate valve stops the flow of water in both directions. Gate valves offer the best seal and are capable of withstanding high levels of water pressure. However, gate valves are not automatic and must be opened and closed by hand.



**Gate Valve in Closed Position**

As the wheel is turned, the metal plate is raised, allowing water to flow.

### Combination Valves

Another option is the use of a combination valve. As its name implies, this valve includes the features of both the check valve and the gate valve. It will operate automatically when left unattended, but also allows a secure seal when closed by hand. Its disadvantage is its higher cost.

### Floodproofing with Valves

To floodproof your basement with valves, install valves on all pipes that leave the basement or are connected to equipment that is below the flood level. For instance, your sump pump is likely below the level of your basement and therefore, below the flood level. For this reason, it requires a valve.<sup>1</sup>

<sup>1</sup> Some sump pumps, however, are connected to underground drain lines. If your sump pump drain is connected in this manner, you will be unable to install a valve.

The following pipes or drains may all need valves installed:

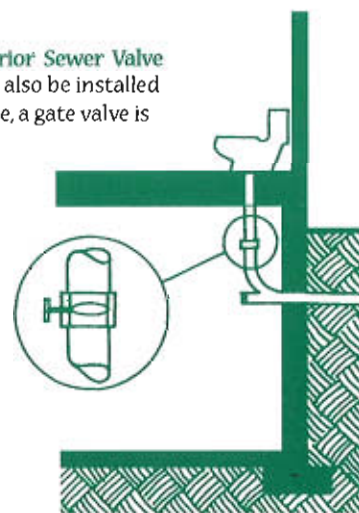
- ✓ sewer/septic tank connections
- ✓ washer and laundry sink drains
- ✓ oil heat lines
- ✓ rain downspouts
- ✓ sump pumps

Of these, the sewer or septic tank valve is the most important. Backed-up sewage, apart from being unpleasant, is a serious health hazard. To prevent a sewage backup during a flood, install a valve (either check or gate) on the exterior or interior line, or both.



**Exterior Sewer Valve**

An exterior sewer valve is placed in an accessible pit.



**Interior Sewer Valve**

Sewer valves can also be installed inside. In this case, a gate valve is placed in the basement to prevent floodwater from entering on the first floor.



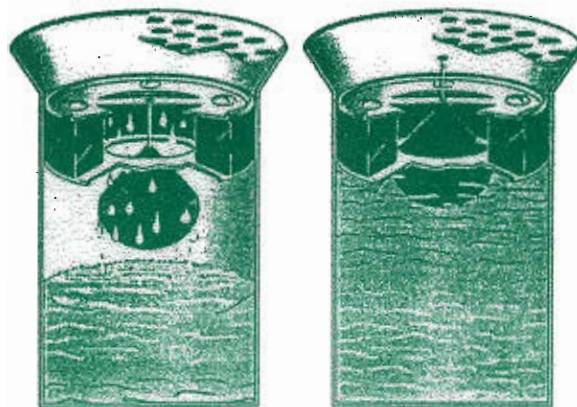
## Plugs

Plugs block the flow of water within a drain or pipe. Unlike a check valve that allows water to flow out but not back in, plugs prevent water from moving in either direction. They are most effective in preventing water from entering through drains such as the basement floor drain.

### Floodproofing with Plugs

Floodproofing with plugs is usually quick and easy. For example, to install a plug in your basement, locate the floor drain and determine its size. (Most household drains are four inches in diameter). Purchase a plug at your local hardware store and install it just beneath the grate. Because it seals tight against the walls of the pipe, you'll prevent any water from flowing back into your basement. Check to be certain that you have another method of disposing of any water that would normally leave your basement through the drain.

An alternative is a plug made with a float. Working somewhat like the check valve, the float allows water to drain out of the house, but prevents it from coming in. As the water in the pipe rises, the float is pushed up against the plug, effectively blocking the drain. Permanently installed float plugs are usually better than regular plugs because float plugs won't interfere with the regular operation of the drain.



**Floor-Drain Float Plug**

When the water level is down (at left), the float hangs free and allows water to drain. As the water rises, the float is pushed up into the plug, effectively blocking the drain from flooding.

Plugs, however, are not entirely foolproof. Because a float plug has to move up and down to work properly, even small amounts of debris can block the float's movement and thereby render the plug useless. Also, a floor-drain plug can't prevent flooding or sewer backup from occurring through another drain such as a laundry tub or basement toilet.

## Standpipes

Standpipes are long sections of pipe, usually three to four feet in length, that are inserted into a drain. As water in the ground outside the basement rises, the water in the standpipe rises as well. As long as the pipe extends above the level of groundwater outside, the water will remain in the standpipe, keeping the basement dry.

### Floodproofing with Standpipes

To floodproof with standpipes, you need to know the dimension of the drain in which you plan to place the standpipe. You should obtain a pipe that will fit snugly within the drain.

Make sure, however, that the standpipe is no longer than four feet in length. This height will keep your basement dry in most instances but will allow it to flood in severe conditions — an option normally preferable to exposing your basement to the external water pressures that can cause a collapse of the basement walls. By limiting the standpipe length, you will allow water to overflow into your basement and equalize the pressure against that of the groundwater outside.

## Elevating and Enclosing

**E**levating and enclosing are two floodproofing techniques useful in protecting basement appliances. Elevating techniques raise appliances above the flood level, while enclosing techniques surround the appliances with a protective barrier. Both are straightforward, but the difficulty in moving some appliances or constructing an enclosure may require the assistance of construction professionals. Before beginning any elevation or enclosure work, determine the degree of complexity involved. If you're in doubt about your ability to do the work, call a professional.

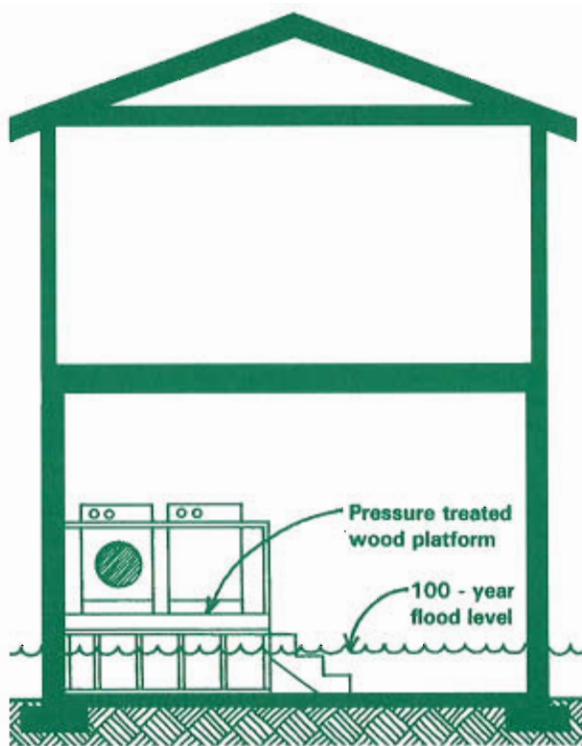
### Elevating

Elevating is the surest way to protect basement appliances, such as hot water heaters or furnaces, from flood damage. With this approach, appliances are moved above the potential flood level by placing them on risers or cement platforms in the basement, or by moving them to a higher level of your home. Elevating appliances minimizes or eliminates the possibility of their being damaged and ensures their continued functioning.

### Floodproofing Through Elevating

Before you elevate your basement appliances, first determine the 100-year-flood level for your area. The 100-year flood level is the flood that has a 1 percent chance of occurring in any given year. (Some South Dakota communities have had 100-year level floods three years in a row.) Your local emergency management office or floodplain administrator can provide you with this figure.

This figure will tell you whether you can elevate appliances adequately through the use of risers or platforms, or if you must move appliances to another level of your home. For instance, if the 100-year-flood level will only reach 24 inches in your basement, you might consider using risers or platforms. On the other hand, if the 100-year-level leaves you with six feet of floodwater in the basement, you may want to move your appliances to an upper level of the house.



#### Using a Riser or Platform

Most appliances can be placed on risers or platforms. However, if the potential flood level is fairly high, you may want to move appliances to another floor of the house.

If you choose to elevate with riser or platforms, follow these guidelines:

- ✓ If using wood for a riser or platform, use wood that has been pressure-treated and consequently resistant to the damaging effects of water.
- ✓ Anchor wood risers or platforms to the existing walls and floor to ensure that they remain stable in water.
- ✓ If using concrete or masonry, avoid very heavy platforms that can overload the basement floor.
- ✓ Construct the riser or platform so that the base is at least 12 inches above the 100-year-flood level.
- ✓ If elevating a hot water heater, make sure that the addition of the riser or platform meets local building codes. In many instances, these codes require a minimum amount of working clearance around a hot water heating system.

If after considering the 100-year-flood level you conclude that moving appliances to a higher level in your home is necessary, consider hiring professional help. Nearly all appliances can be moved to upper floors; however, re-piping and rewiring may be necessary. An expert can recommend options such as suspending a furnace from a ceiling or locating it on the roof. Also, because relocating some larger appliances may require some construction efforts, remember to obtain the proper building permits if necessary.





## Enclosing

Enclosing protects basement appliances by inserting a barrier between the appliance and the floodwater. This can be accomplished by covering appliances in large floodproofing bags, or through more durable methods, such as constructing a mini-floodwall.

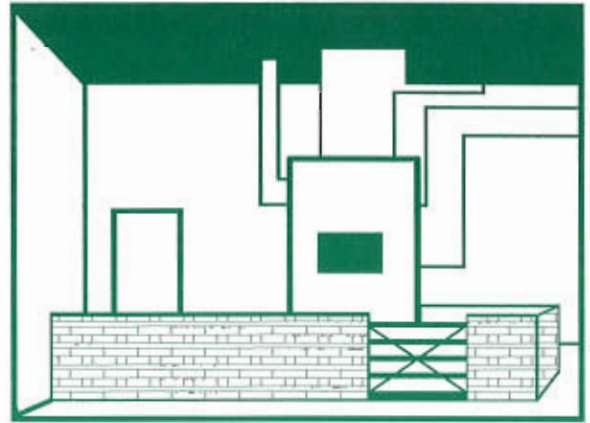
## Floodproofing Through Enclosing

### Floodproofing Bags

Using floodproofing bags is a quick and inexpensive method of enclosing appliances. Purchase the floodproofing bags from your hardware store or building supply outlet. (If you can't find the right bags, contact your local emergency management coordinator.) Place the appliance in the bag and roll the bag down to the appliance's base. In this position the bag will not interfere with the appliance's operation. When flooding is expected, disconnect the appliance from its power source, disconnect any other connections, and pull the bag up around the appliance. Check to be certain that the feet of the appliance have not punctured the bag.

### Floodwalls

Floodwalls are most useful in protecting basement appliances and utilities in the event of seepage or shallow flooding. Before installing a floodwall, however, be certain that the protection it provides will be adequate based on the 100-year-flood level. As a rule, floodwalls should be no more than three feet high.



**Building a Floodwall**

A floodwall should completely surround appliances in the basement. If the wall is too high to step over, install a watertight door sealed with watertight gaskets.

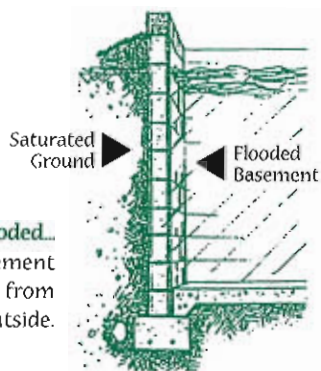
When constructing a floodwall, keep in mind the following points:

- ✓ Use reinforced, poured concrete or sufficient concrete masonry blocks to prevent failure under flood conditions.
- ✓ Anchor the floodwall to the existing walls and floor.
- ✓ Install a water-tight access door with water-tight gaskets on the sides and bottom of the door frame. If the flood threat is less than 12 inches, the flood wall could be low enough to step over.
- ✓ If the floodwall requires higher walls, you may need to install a removable shield or a set of low stairs.
- ✓ Install a sump pump to handle the buildup of seepage inside the floodwall area.

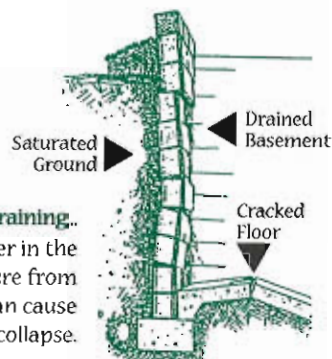
## Pumping Out a Flooded Basement

If your basement is flooded, don't be in too big a hurry to pump it out!

Water in the ground outside your house will still be pushing hard against the outside of your basement walls, and the water inside your basement is pushing right back. If you drain your basement faster than the water outside drains out of the ground, the outside pressure will be greater than inside pressure, causing walls and floor to crack and possibly collapse.



**When Flooded..**  
Water in the basement equalizes pressure from the water outside.



**After Draining..**  
Without water in the basement, pressure from groundwater can cause walls and floor to collapse.

## Glossary of Floodproofing Terms

### Elevating

The process of raising appliances or devices above the flood level. Appliances may be elevated through the use of risers and platforms, or by moving them to another level of the house.

### Enclosing

The process of protecting appliances by placing a barrier between them and floodwater. This can be accomplished by placing the appliances in large floodproofing bags or by locating appliances within a floodwall.

### Floodwall

A wall, built usually of cement construction, that acts as a barrier between floodwater and a dry area.

### Platform

A structure used in elevating appliances, also called a riser. It must be constructed of a material that is resistant to the effects of water, such as concrete or treated lumber.

### Plug

A device that is placed within a drain that blocks the flow of water in both directions.

### Standpipe

A long section of pipe that is placed into a drain and allows water to rise in the pipe rather than flow in through the drain.

### Valve

A device for controlling or regulating the flow of water. Check valves and gate valves are two types used in floodproofing.