



Flood Protection Handbook



**Engineering Division
Department of Public Works
City of Arvada, Colorado**



**Urban Drainage and
Flood Control District
Denver, Colorado**

HOW TO USE THIS HANDBOOK

➔ If you have just heard a flood watch or flood warning, go to page 21.

➔ If you have just been flooded, go to page 25.

➔ If things are quiet and dry, start on page 1.

On the cover

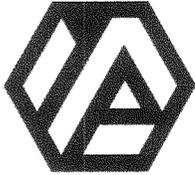
Flooding of Leyden Creek at Quaker Street, August 3, 2006.

Photo credits

Photos courtesy of Arvada Department of Public Works and KATV.

Disclaimer

The information provided in this handbook is based on careful research and input from experienced professionals. The reader must assume responsibility for adapting this information to fit his or her conditions. This handbook is not intended to replace the advice and guidance of an experienced professional who is able to examine a building and assess the needs of the particular situation. The reader is advised to seek professional assistance if he or she is not experienced and competent in handling technical matters such as building construction or electrical components.



CITY OF ARVADA

CITY COUNCIL

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January, 2010

Dear Arvada Resident:

Flooding may affect our community in many ways, with impacts ranging from streets being blocked to property and buildings being inundated. This handbook contains information designed to help you protect yourself, your family, and your property from a flood event. It also contains an outline for a post-flood recovery plan to help residents restore their lives after a flood disaster.

Minimizing flood damage is a community-wide responsibility. While the City attempts to minimize damages by building and maintaining flood control structures, the risks associated with flood events can never be completely removed. Residents and businesses can and should take steps to lessen the effect that flooding may have on their properties and families.

This handbook includes a wide range of materials to assist in personal flood management. Many of the actions suggested in this document are low cost and easy to implement. It is important that you take action now to protect yourself and your home or business and not wait until a flood is imminent.

If you have questions or would like to know more about the City's flood control efforts, please contact the Department of Public Works' Engineering Division at 720-898-7640 or Ask Arvada at www.arvada.org.

Sincerely,

Robert Frie
Mayor

Acknowledgements

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Many residents of Arvada think that if they haven't been flooded yet, they never will be. But it's just not so. Arvada has really been lucky so far. The City has not had a major flood in recent history. This chapter reviews the types of flood hazards faced by Arvada's residents and how you could be affected by a flood worse than any you may have already experienced.

The Causes of Flooding in Arvada

Arvada's floods are caused by heavy rains, usually during summer storms. Sometimes, snowmelt adds to the amount of water running off during a storm. Creeks, ditches, and storm sewers can only carry so much water. Even in natural settings, creeks overflow every year or two when rains overload the channel. This can be aggravated if debris blocks the waterway.

Urban development has changed the natural setting of the Arvada area. Pavements and rooftops mean that less rainwater can soak into the ground. Gutters and storm sewers speed the runoff to the channels. Our pattern of streets and buildings has interrupted some of the natural drainageways and reduced the size of some channels. As a result, more water runs off and it runs off faster. In some areas, floodwaters can't go where they used to go and in many places, the drainage system gets overloaded more often.

This combination of storms and an overloaded drainage system results in three sources of flooding in Arvada:

- (1) overbank flooding,
- (2) irrigation canals, and
- (3) streets.

Each source causes a different type of flood problem with somewhat different hazards.

(1) Overbank flooding. The most hazardous kind of flooding in Arvada happens when the creeks flow over their banks. This can occur on Little Dry Creek in the north part of the City and on Leyden, Ralston, and Van Bibber Creeks in the south during heavy storms or if an upstream dam fails. Floodwaters are usually fast-moving and can be several feet deep. The combination of velocity and depth makes overbank flooding the most destructive and the hardest to protect against.

Overbank flooding occurs in Arvada fairly often. Fairly severe floods happened in 1965, 1973, and 1991. On July 22, 1991, Van Bibber and Ralston creeks flooded several blocks on each side of their banks. Businesses in Arvada Plaza were flooded and the Valley Mobile Manor trailer park had to be evacuated. The 1991 flood was estimated to be about a 5-year flood. A flood of that size has one chance in five of occurring again every year. More serious floods can and do occur. The 1976 Big Thompson flood, for example, exceeded the 100-year level, killed over 130 people, and caused millions of dollars in property damage. The 1997 Spring Creek Flood in Ft. Collins exceeded the 500-yr flood, causing four deaths and several hundreds of million dollars in damages.

Most flood construction projects and regulations try to protect people and property from the 100-year flood (one chance out of 100 or a 1% chance of occurring every year). The areas affected by the 100-year flood have been mapped for the National Flood Insurance Program and the Urban Drainage and Flood Control District. These maps are available for review at the Arvada

Public Library and City Hall. A map of the 100-year floodplain in Arvada can be found at www.arvadarecords.org/maps/current_maps/Flood_Plain.pdf. You should not use it to determine whether buildings are in or out of the floodplain, but it does give a general idea of what areas could be affected by overbank flooding. Check to see if your property is close to the mapped floodplain. If so, take a look at the larger map in the library, or contact the City's **Engineering Division (720-898-7640)** to get more information on the expected flood depths and velocities in your area.

Although overbank flooding is the most hazardous of the three sources of flooding, its danger is reduced somewhat by a flood warning system. The Urban Drainage and Flood Control District and the National Weather Service monitor rain and stream gages and report to the Arvada Police Department and the Jefferson County Emergency Operations Center. With the help of this system, flood watches and warnings can be issued, but they cannot provide more than a few minutes advance notice of a flash flood. This amount of time should be enough to get people to safety and, in many cases, take some emergency steps to protect property, if you know where to go and what to do. (See the section about making a Flood Response Plan on page 8).

(2) Irrigation canals. Arvada has three irrigation canals (or ditches) going through it, the Farmers Highline, Church, and Croke canals. They carry water collected in the mountains to users downstream. They travel **along** hillsides, following the contours. As a result, they cut across the natural drainage pattern, which carries water **down** hillsides.

The floodplain map accessible from the above web link also shows that the canals cross the creeks. Overbank flooding, heavy local rains, or burrowing animals can break the canal banks, causing them to flood nearby properties. Several years ago, the bank of the Highline Canal was weakened by muskrats near 75th and Carr. Luckily, the water flowed into the Croke Canal and there was little damage. However, the experience shows that there is little or no warning for this type of flooding.

(3) Street flooding. Stormwater runs across yards and into the streets on its way to the City's storm sewers, canals, and creeks. The streets are part of the human-built drainage system and they carry water away from buildings. In some areas the land is very flat or has depressions. In other areas streets, buildings, or other construction projects have blocked the old routes that the runoff used to follow. As a result, water may collect or "pond" in low or flat areas.

Except at underpasses, street flooding and yard ponding usually do not get deeper than a foot or two. There can be high-velocity flows on streets going downhill. There is no special warning system for this problem.

Street flooding and yard ponding is often viewed more as a nuisance than a major hazard. It obstructs traffic and may mean that some streets have to be closed for a while. However, ponding next to a house can cause the same water damage as other types of flooding.

Impact of Flooding

If you haven't been through a flood, it is hard to envision the kinds of damage and how severe it can be. Flooding affects people and their property in four ways:

- Flooding damages the building and yard.
- Flooding damages the contents of the building.

- Flooding presents a safety hazard.
- Flooding causes health problems, both physical and emotional.

Damage to the building and yard. Standing water can seep through building walls, soak wood, dissolve wallboard, and contaminate insulation. Water and electricity don't mix—electrical components may short, creating a fire or safety hazard. If dried the wrong way, wet wood will warp and plywood will split, requiring replacement of stairs and flooring.

As the water gets deeper, it puts more and more pressure on the walls and floor. Basement walls and floors face the greatest pressures because they are subject to the deepest water. A flood that is over three feet deep will crack or break a standard house wall. Even very shallow flooding on the surface will put over seven feet of water pressure on a basement wall or floor, causing cracks, leaks, or even buckling.

Moving water causes more problems than standing water. It may carry debris that batters building walls. It scours the ground, removing grass and plants and eroding channel banks. Anything that floats, like toys, firewood, propane tanks, and landscaping timbers, will be carried away.

Damage to contents. Wet wooden furniture may get so badly warped that it can't be used. Other furnishings, like upholstery, carpeting, mattresses, and books, are usually not worth the cost of drying them out and restoring them. Electrical appliances and gasoline engines won't work safely until they are professionally dried and cleaned.

Safety hazards. As noted above, floodwaters and electricity are a bad combination. Floods may damage gas lines, floors, and stairs and create secondary hazards.

Tests at Colorado State University have shown that as depth or velocity increase, a person is less able to stand up in a flood. They showed that a person six feet tall will be knocked over in four feet of water that is moving at a velocity of only one foot per second, or in one foot of water that is moving at four feet per second.

Being in an automobile is not much safer. Cars can float in one or two feet of water. More people are killed trying to drive on flooded streets or bridges than in any other single flood situation.

Health hazards. Floodwaters are not clean. They carry mud, silt, road oil, and whatever else was on the ground. Sometimes they even carry sewage. Food, cosmetics, medicines, stuffed animals, baby toys, and any other items that would come in close contact with people must be thrown out. Clothes and dishes need to be washed thoroughly. Even clean water causes a problem if it sits around too long. Mold, mildew, and bacteria grow in damp, flooded areas. If the water system lost pressure, a boil order may be issued to protect people and animals from contaminated water. Water wells may also become contaminated.

Floods also take a toll on people's mental health. Stress comes from not knowing how badly your family, home, and contents were hit. This is aggravated by fatigue during cleanup and anxiety over lost income, health risks, and damage to irreplaceable items. Children and the elderly are especially susceptible to stress from the disruption of their daily routines. How to deal with these problems is discussed on page 25.

Chapter 2

Government Flood Programs

There are many programs underway to prevent or reduce flood damage. Most are implemented by the City, the County, and the Urban Drainage and Flood Control District. This chapter reviews these programs so you can see that you're not tackling your flood problem by yourself.

Public Information Programs

This handbook is only one of several ways to get flood protection advice. There is flood information at the Arvada Public Library. People purchasing flood-prone property are required by law to be advised of the flood hazard. Each year the Urban Drainage and Flood Control District sends notices to all of the City's floodplain residents reminding them of the hazard and suggesting ways they can protect themselves.

Flood Warnings

The City participates in a flood warning program in cooperation with the Urban Drainage and Flood Control District, Jefferson County, and the National Weather Service. Automated rain and stream-level gages have been installed along Ralston, Van Bibber, and Leyden creeks. They give officials the ability to continuously monitor storm and flood conditions. Trained staff has access to this gaging network and to other weather-related information. Early flood predictions and warnings are provided directly to the Arvada Police Department. The police then pass this information on to other key City agencies and the Arvada Fire Protection District, so they can prepare for a possible flood emergency. When flood danger is imminent, a flood warning is issued to the public.

Emergency Operations

When the warning system indicates that a flood is expected, the Emergency Operations Center (EOC) is activated. Arvada uses the Incident Command System to respond to emergencies. Each City department has one or more representatives in the EOC, ready to react quickly to meet the needs that are reported. Periodic drills and experiences with real emergencies help keep City crews ready to respond to floods.

**Arvada Channel
Drainage improvement project
Along W. 51st Avenue**



Flood Control Projects

In 2002, a Stormwater Fee was placed on all properties within the city limits. This fee generates \$1.5 million annually for use on flood control projects. The Department of Public Works spends the funds on bridge and culvert improvements, installing larger storm drains, and protecting stream and canal banks.

Stream Maintenance

Each spring the Streets Division inspects all the City's creeks and canals. Accumulated debris and low tree limbs are removed to keep the channels clear so water can flow more readily along the drainage channel. The Division also repairs and cleans stream banks and pipes to maintain the channels' flood carrying capacity. If you see debris or other problems in the channels, you should call the **Streets Division (720-898-7720)**.

The Urban Drainage and Flood Control District also funds annual maintenance programs to preserve floodplains. This program includes routine maintenance, such as mowing and debris cleaning, tree

thinning and channel stabilization, and replacement of culverts, retaining walls, and other structures that have deteriorated over time.

Ralston Cove Park is in the floodplain.



Floodplain Parks

One of the best ways to prevent flood damage is to keep the floodplain open. If there are no buildings, there will be little damage. West Woods Golf Course, Oak, Davis Lane, Danny Kendricks, Leyden Creek, Ralston Valley, North Jeffco, Woodrun, and Lake Arbor parks are all examples of floodplain areas that have been acquired by the City of Arvada and kept open. Stormwater is detained in these areas during flood events; most of the time the sites provide recreational opportunities.

Building Regulations

The City Council has adopted regulations to help ensure that new construction will not make our flooding problem worse. Only certain low-damage developments are allowed in the floodway—that portion of the floodplain including and closest to the channel—that is needed to carry floodwaters. These areas are limited to agricultural, recreation, and similar open space uses. In all other places in Arvada, new buildings and substantial improvements to existing buildings in the floodplain must be built above the 100-year flood level.

All construction projects in the 100-year floodplain need a City Floodplain Development Permit. This includes grading, new buildings, garages, sheds, walls, or fences, as well as improvements to existing properties. If you see construction near a creek or canal without a City permit sign, call the **Building Inspection Division (720-898-7620)**. Improperly constructed development of any kind can obstruct water flows, causing damage to property nearby or at other places in the floodplain.

There are additional regulations for areas outside the floodplain. All new developments must provide storm drainage plans. The plans are designed so that the development's stormwater runoff during the 100-year storm does not overload the drainage system downstream.

Flood Insurance

Arvada's building regulations allow the federal government to make flood insurance available in the City. Arvada is one of the approximately fifty Colorado communities that participate in the National Flood Insurance Program's Community Rating System. Because the City and the other agencies are doing so much to reduce flood problems, Arvada residents receive a reduction in their flood insurance rates. Flood insurance is described on page 9.

Other Programs

There are numerous other programs administered by state, federal, and private agencies. These include technical assistance for reducing flood damages, planning assistance, and construction programs (U.S. Army Corps of Engineers), disaster response and assistance (Colorado Office of Emergency Management, the Federal Emergency Management Agency (FEMA), and the American Red Cross), floodplain development regulations and flood insurance (Colorado Water Conservation Board and FEMA), and dam safety (Office of the State Engineer and the Colorado Office of Emergency Management). When these agencies do work in Arvada, it is coordinated by City offices. A large collection of information about floods and emergency preparedness is maintained at the Natural Hazards Center at the University of Colorado in Boulder.

The time to protect yourself from flooding is before the flood. This chapter covers three ways to do that: flood preparedness, flood response planning, and insurance. A fourth way—and one of the best and more dependable—is floodproofing, which is covered in Chapter 4.

Flood Preparedness

There are many things that can be done to get ready for the next flood. Doing them in the logical order presented below and using this as a checklist will help you prepare properly.

KNOW YOUR FLOOD HAZARD

Identify the stream or other flooding source nearest your home

Find out how deep floodwaters can get in your neighborhood

Learn where fast-moving water or water filled with debris is likely to occur

Determine the best ways for you and your family to get a flood warning

Understand that floods can occur with little or no warning

Find out what streets are likely to be flooded or barricaded in and around your neighborhood

1. Determine how bad flooding could be on your property (see the guidelines in the box).

2. Know the official warning and evacuation procedures (see page 21).

3. Purchase your own water alarm if your flooding comes from sewer backup or basement seepage. This can give you precious extra lead time. A water alarm is similar to a smoke alarm; it beeps when water touches it. Water alarms cost \$15 to \$20 and are available at hardware stores.

4. Talk to your insurance agent about your coverage. Check out flood and sewer backup insurance (see pages 9-10).

5. Prepare a list of emergency telephone numbers, including the number for your insurance agent. Make copies and keep the copies in a separate, safe place where you can easily access them.

6. Assemble the supplies you will need for cleanup and recovery and put them in a safe place. A list of such supplies is in the box on page 26.

7. Make a record of all your personal property. Go through your house room by room and make a household inventory. Take photographs or videotapes inside and outdoors. Inventory forms are available free from most insurance companies.

8. Put photocopies of inventory records, insurance policies, deeds, automobile titles, wills, telephone numbers, bank and credit card account numbers, and other valuable papers at a location away from your house, such as a safe deposit box.
9. Write a flood response plan and keep copies in a separate, safe place where it can be easily accessed. Keep this handbook handy, too.
10. Check out the appropriate floodproofing options for your house (see page 11).

Flood Response Plan

Preparing a flood response plan will help you think through all the details that demand attention after a flood watch or warning is issued. Walk through your house with this handbook, and make notes of how to adjust these instructions to your own situation. Writing it down will help you remember everything, which is especially important when everyone is in a hurry and anxious because a flood is coming.

The flood response plan needs to be based on your own property's flood risk and how much lead time you will have after a flood watch or warning. In the Arvada region, we are prone to quickly developing and life-threatening flash floods. If flooding is imminent, you should get out of the area immediately. Your plan should be a checklist of steps to take before floodwaters reach your house.

If you have only a few minutes, the following things might be on your plan:

- Monitor local radio or TV stations or websites for flood information and evacuation instructions. Radio Station 850 KOA (on the AM dial) is the primary Emergency Alert System (EAS) activation station, which should alert listeners to impending emergencies.
- Install flood shields and any other floodproofing measures you have already prepared (see page 11).
- Identify two places where family members can meet if you are split up—one place in the neighborhood and another place that is sure to be high and dry and out of the flood area.
- Turn off the electricity, gas, oil, and water (see pages 23–24). If you are only subject to basement flooding, mark your fuse box or breaker box to show the electrical circuits that serve the basement so you can turn off that portion and still have power in the rest of your house.
- If you leave, take your pets, medicine, and other things you will need if you can't get back for a day or two.
- If you leave, lock your house and follow your evacuation route to a place of shelter. Leave a note on the door (high and dry) indicating where you went and how to reach you.

If you have 10–15 minutes warning time, include items like these:

- Read the safety precautions at the end of this handbook.
- Test your sump pump.
- Move the most valuable or damage-prone contents in your house to above the flood level or to another safe place. These include small carpets, lower drawers to dressers and cabinets, and

cleaning fluids or hazardous chemicals. They can simply be put on the upper story of your house, or even up on cabinets or tables, if floodwaters will not be that deep.

Insurance

Flood insurance is highly recommended. An advantage of insurance is that your property is covered as long as the policy is in force, even when you're not home to implement your flood response plan. **Most standard homeowner's insurance policies do not cover a property for flood damage.** However, there are three ways you can get the house and contents insured.

National Flood Insurance. The City of Arvada participates in the National Flood Insurance Program (NFIP). Local insurance agents can sell a separate insurance policy under rules and rates set by the Federal Insurance Administration. Any agent can sell a policy and all agents must charge the same rates. If your agent does not know about flood insurance, ask him or her to call the **NFIP Direct Service (Agent and Customer Service for policies: 800-638-6620)**. Locally, you can call the **NFIP Bureau & Statistical Agent (303-299-7873)**. Your rates will not change just because you file a damage claim; they are set on a national basis.

Coverage - Any walled and roofed structure can be covered by a flood insurance policy. Detached garages and accessory buildings are covered under the policy for the lot's main building. Separate coverage can be obtained for the building's structure and for its contents (except for money, valuable papers, and the like). Renters may purchase contents coverage. The structure generally includes everything that stays with a house when it is sold, including the furnace, cabinets, built-in appliances, and wall-to-wall carpeting. There is no coverage for things outside the house, like the driveway and landscaping.

Basements - The NFIP considers any floor below grade as a basement. For example, the lower level of a split level house is considered a basement. A National Flood Insurance policy does **not** cover damage to contents in a basement. Structural coverage only covers the structural parts of basement walls and floor (not finishings like wallpaper or paneling) and selected items such as the furnace, water heater, washer, and sump pump. The NFIP does **not** insure buildings for subsurface flooding, including seepage and sewer backup.

Mandatory purchase - If you are located in a "Special Flood Hazard Area" identified on a Flood Insurance Rate Map (FIRM), you must buy flood insurance coverage as a condition of having a federally-backed mortgage, home improvement loan, or disaster assistance. Arvada's "Special Flood Hazard Area" can be found on the City's website (see page 2 of this handbook for the link). In some cases, a private insurance policy will satisfy this requirement, but usually the lender or granting agency will ask to see an NFIP policy.

Waiting period - **There is a thirty-day waiting period before NFIP flood coverage takes effect.** Don't wait for the next flood to buy insurance protection. Contact your insurance agent for more information on rates and coverage.

Cost - The cost of a flood insurance policy depends on the amount of coverage you desire, the location and elevation of the insured structure with respect to expected flood elevations, and the date the building was constructed. For example, a building located outside the mapped floodplain has less flood risk than a similar building located within the floodplain. Therefore, the cost of insurance for that building is less. Buildings constructed in Arvada after the City joined the NFIP (making flood insurance available) are required to have the lowest floor elevated above the 100-year flood level. Thus, those buildings are less likely to be flooded and

so the cost of insurance may be lower than for older buildings in the same area. Structures within the floodplain built before Arvada joined the NFIP may be at greater risk for flood damages, but are “grandfathered”, qualifying the owner for subsidized NFIP rates.

Your flood insurance cost can be reduced even further by choosing higher deductible amounts, just like you standard homeowner’s insurance policy. Each structure is different however, so only your insurance agent can calculate exactly what your policy will cost. For a building to be fully insured the coverage must be 80% of the building’s replacement cost. If you have a basement in a mapped floodplain, you must have the 80% coverage in order for the limited basement coverage to take effect.

Basement backup insurance. Some insurance companies have sump pump failure or sewer backup coverage that can be added to a homeowner's insurance policy. Each company has different amounts of coverage, exclusions, deductibles, and arrangements. Most are riders that cost extra. Most exclude damage from surface flooding that would be covered by an NFIP policy.

Each company has its own deductibles and exclusions and premium costs will vary.

Private flood insurance. A few private insurance companies sell their own flood insurance policies, although the coverage and rates are different from the NFIP's. Some manufactured housing (mobile home) insurance covers flood losses. Unlike the NFIP, private insurance will vary from company to company so check several for their coverage and rates. Make sure that your coverage won't be cancelled if you submit a claim for damage.

This chapter covers floodproofing, i.e., changes that you can make to your building or lot to prevent or reduce damage by floodwaters. This handbook can only introduce the topic. Before you invest much money in floodproofing, talk to an engineer, architect, or experienced contractor. The measures are explained in more detail in several books and a video that are available in the Arvada Public Library (see the box).

**HELPFUL PUBLICATIONS
IN THE ARVADA PUBLIC LIBRARY**

Floodproof Retrofitting – Homeowner Self Protective Behavior, Shirley Bradway Laska, 1991

Floodproofing Non-residential Structures, FEMA-102, May 1986.

Selecting Appropriate Mitigation Measures for Floodprone Structures, FEMA 2007

Repairing Your Flooded Home, American Red Cross, 1992

Above the Flood: Elevating your Floodprone House, FEMA, 2000

Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings, FEMA 1995

Protecting Your Home from Flood Damage: Mitigation Ideas for Reducing Flood Loss, FEMA 2003

Homeowner's Guide to Retrofitting: Six Ways to Protect your House from Flooding, FEMA 1998

Different floodproofing techniques are appropriate for different types of buildings and different flood hazards. See the box on page 11 for what you need to know about your flood hazard. Use the following as a guideline:

If you have a basement, read about basement cracks (page 12), sump flooding (page 12), sewer backup (page 13), and wet floodproofing (page 17).

If your house is on a slab foundation and the 100-year flood will be less than three feet deep on your first floor, read about dry floodproofing (page 17).

If your house is on a crawlspace and the 100-year flood will be less than three feet deep on your first floor, read about wet floodproofing (page 17), and elevation (page 19).

If the 100-year flood will be over three feet deep on your first floor or will include high velocities and/or debris, read about relocation (page 20).

Basement Cracks

Groundwater can seep into your basement around pipes or if there are cracks in the walls or floor. This may be difficult to determine if the walls have been covered with paneling or other finishing. The best way to deal with a groundwater problem is to waterproof the walls and relieve the water pressure through a footing drain system and sump (see next section).

Cracks can be repaired and the walls can be waterproofed from inside or outside. Waterproofing on the outside is more effective because groundwater pressure forces the sealer into the foundation. The best technique is to dig a ditch around the basement wall so that you can apply a commercial sealant to the exterior walls. This can be done by the handyperson (many home maintenance manuals have instructions for this) or a commercial waterproofing company.

Precautions. Waterproofing alone is only recommended for groundwater problems. Surface water will put much more pressure on the building's walls and can even break them.

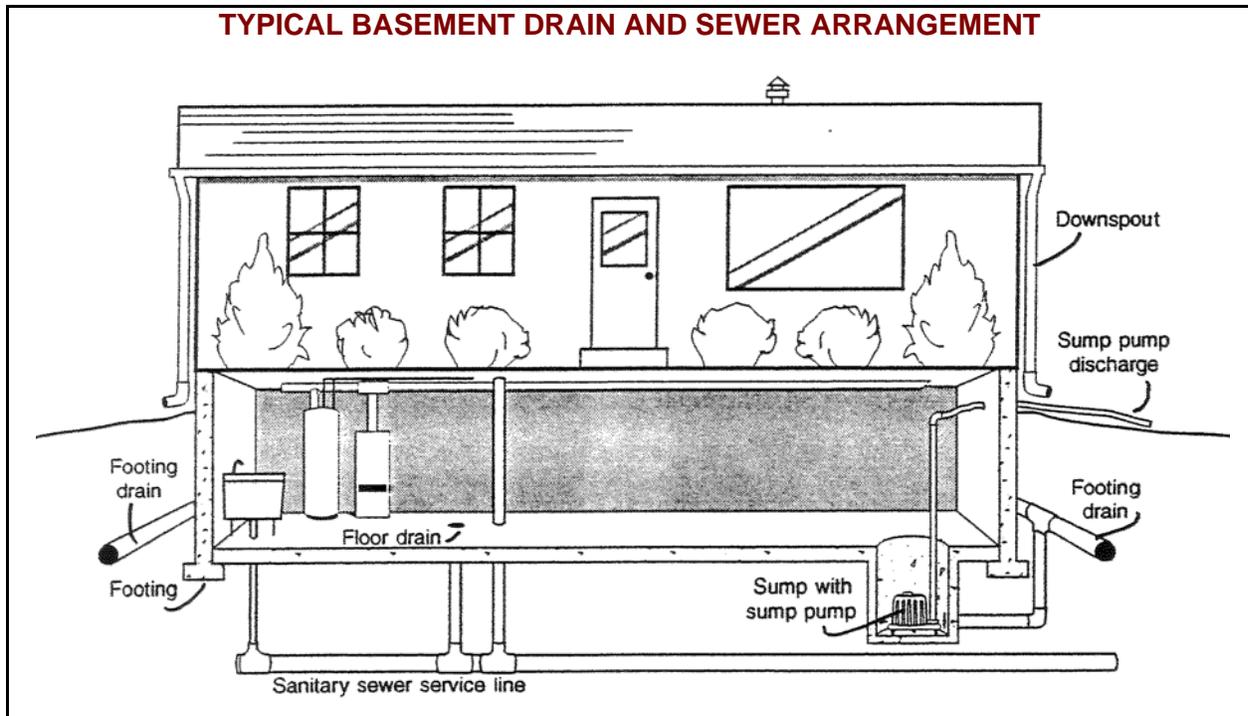
Because the work is hidden and sloppy work may not show up for several years, there have been many instances of disreputable contractors doing basement waterproofing. Therefore, ask the waterproofing supplier or company to provide references of buildings in your area that have used their material or technique.

Sump Flooding

Basement flooding caused by saturated ground can be corrected by installing a footing drain around the foundation (see illustration). The drain collects groundwater and directs it to a sump. When the sump fills, water is pumped out, usually onto the ground away from the building. Depending on local conditions, the drain and pumping system may have to handle large volumes of water.

If the pump is blocked with debris, gets overloaded, or there is a loss of power, the system designed to keep groundwater out of your basement can act as a conduit to bring water in. You can prevent sump flooding by doing one or more of these floodproofing projects:

- Clean the pump intake to remove blockages,
- Install a larger sump pump,
- Add a second or third pump,
- Connect the pump to a backup source of electricity, such as a battery system or generator,
- Disconnect the downspouts from the footing drain, or
- Redirect the downspouts and sump pump discharge farther away from the house.



Precautions. When the basement is full of water, it is hard to tell how it got in. It's a good idea to check for cracks in the walls and install sewer backup protection, too. If your backup source of electricity is a generator, be sure it is set up outside or vented to the outside to direct deadly carbon monoxide exhaust fumes outdoors.

Sewer Backup

The illustration above shows the sewer arrangements for a typical house with a basement. The sanitary sewer line drains toilet waste, laundry tubs, and the basement floor drain to the sanitary sewer main in the street. Clean stormwater and groundwater is handled by downspouts, footing drains, and sump pumps.

Basement flooding may be caused by these two sewer systems being interconnected. During a heavy rain, excessive amounts of stormwater may enter the sanitary sewer system, causing backups into one house and overloading the main lines, contributing to backups in other houses. This is one reason why the City prohibits connecting downspouts, footing drains, and/or sump pumps to the sanitary sewer service.

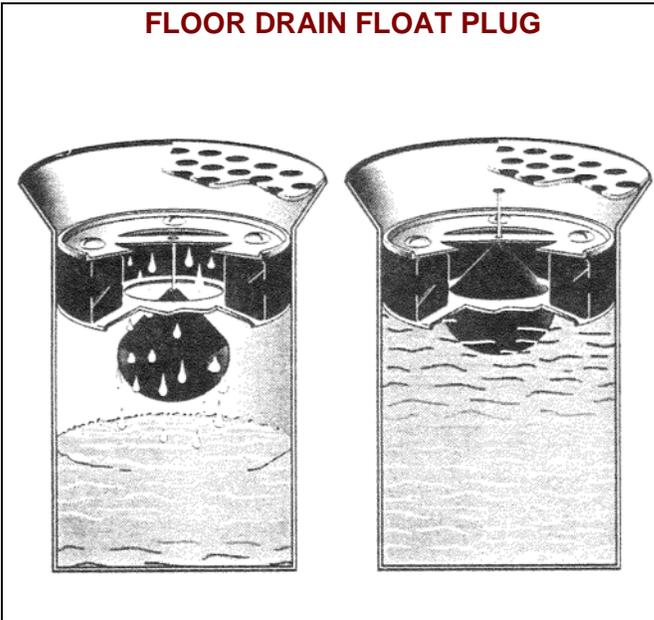
Sanitary sewer backups can also be caused by events not related to storms or flooding. Individual service lines can be plugged by grease, waste, tree roots, breaks in the pipe, or saturated ground. The City's main lines can also be plugged by the same causes as well as vandalism or illegal placement of items in manholes. These problems can be fixed by the owner or the City, depending on where the stoppage occurs. Proper maintenance can prevent most of these problems.

This section focuses on protection measures that deal with sanitary sewer backup that occurs when the sewer main is overloaded and backs up through the sanitary service line into the house. There are four ways to stop sewer backup: a floor drain plug, a floor drain standpipe, an overhead sewer, and a backup valve. Each of these measures will work for buildings with basements or below-grade floors.

Floor drain plug. The simplest way to stop sewer backup is to plug the opening where it first occurs. This is at the floor drain, the sanitary sewer system's lowest opening in the house. Commercial plugs are available that can be placed in the floor drain below the grate. Bolts on metal end pieces are tightened, causing a rubber gasket to expand and seal the plug in the pipe.

A plug stops water from flowing in either direction. Therefore, if the laundry tub overflows or other spillage occurs, it will stay in the basement unless the plug is removed. Because of this, it may be best to leave the plug out under normal circumstances and put it in place only during heavy rains.

FLOOR DRAIN FLOAT PLUG

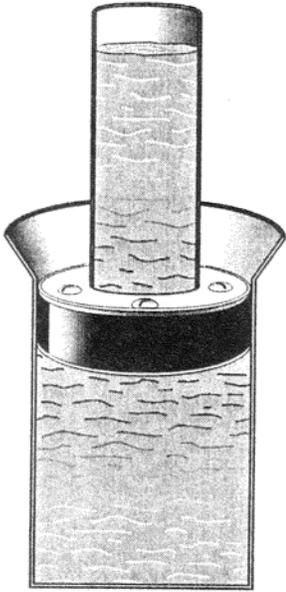


One variation is a plug with a float. It allows water to drain out of the basement (see illustration, left). When the sewer backs up, the float rises and plugs the drain (see illustration, right). A float plug permanently installed will not interfere with the floor drain's normal operation.

Precautions - A plug left in the floor drain may contribute to a wet basement if spillage cannot drain out. Float plugs are known to have been jammed open by a small amount of debris. A floor drain plug does not stop backup from coming out of the next lower opening, like a laundry tub or basement toilet. Sealing the base of the toilet to the floor will protect you until the water backs up higher than the top of the bowl. A plug does not tell you if there is a problem in your sewer service line. If the plug is not tight enough, pressure can eject it. In older houses, the sewer lines under the basement floor may be clay tile. A buildup of pressure can break them. In newer houses, they are cast iron and unlikely to break.

Standpipe. A standpipe is an inexpensive alternative to a floor drain plug. A "donut" with metal end pieces and a rubber gasket in the middle is placed in the floor drain. A length of pipe is placed in the "donut hole." Bolts are tightened and the metal end pieces squeeze the gasket to make a tight seal on both the floor drain and the pipe.

STANDPIPE



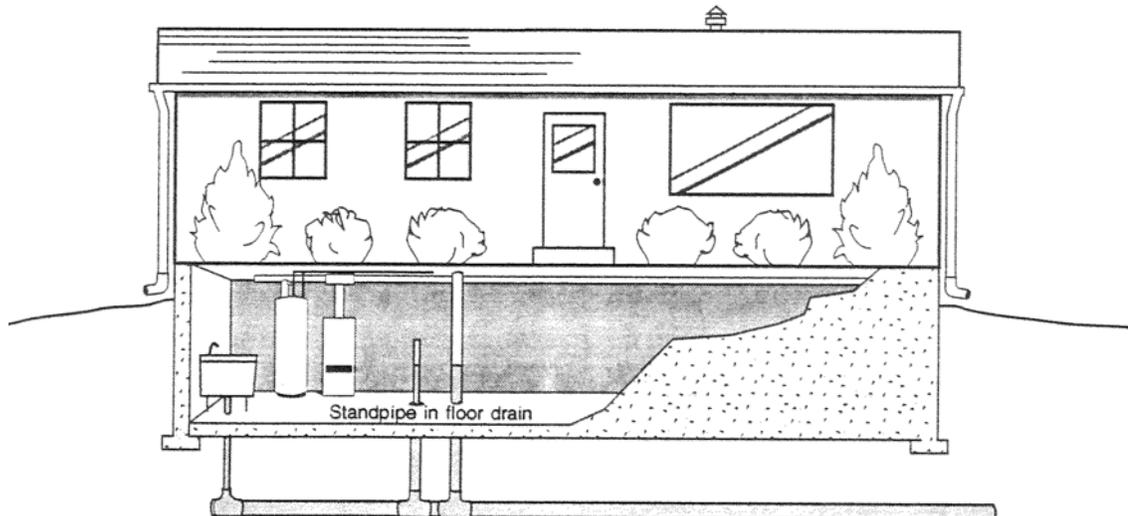
When the sewer backs up, the water stays in the pipe. Water pressure cannot build up to blow a standpipe (if properly installed) out of the floor drain. The system works unless the backup is so deep that it goes over the top of the pipe.

One advantage of the standpipe over the floor drain plug is that the overflow acts as a safety valve. A flooded basement equalizes water pressure on the walls and floor, minimizing the chance of a cracked floor from broken pipes underneath.

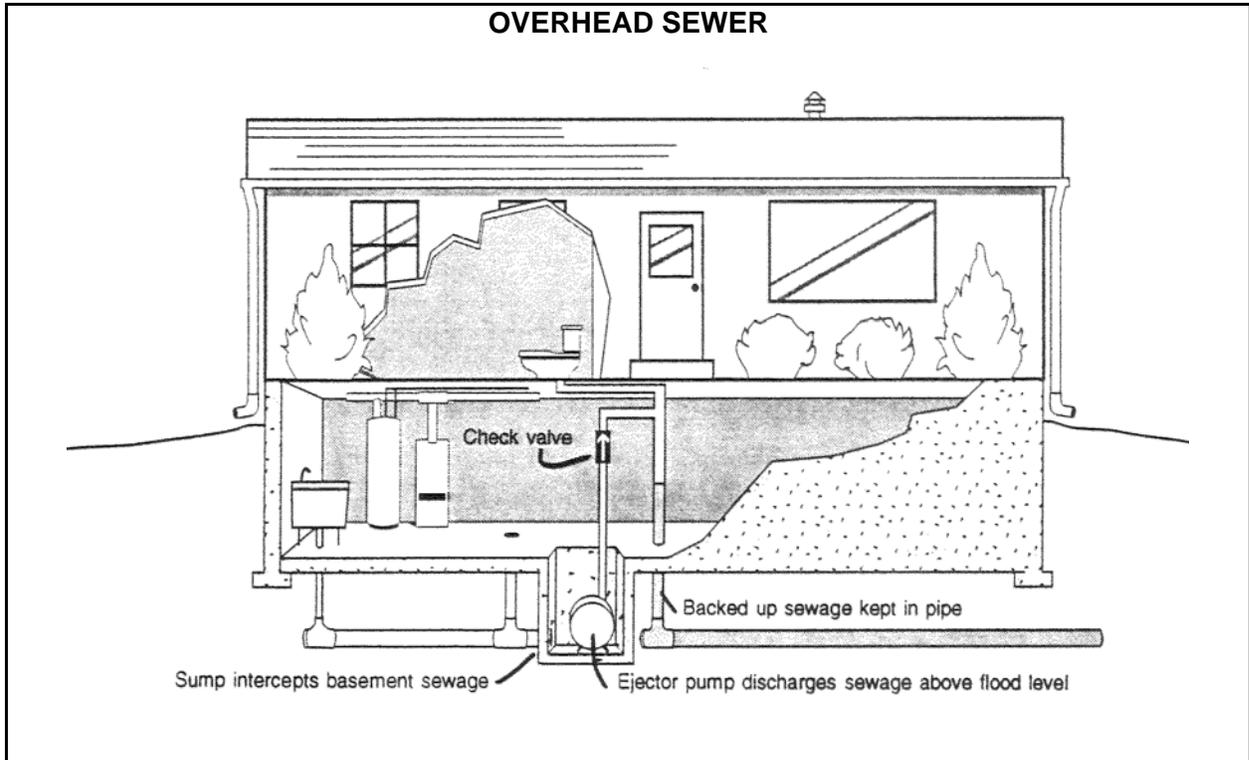
Precautions - A standpipe left in the floor drain may contribute to a wet basement if spillage cannot drain out. A standpipe only protects up to its height, normally three feet. Deeper flooding will flow over the top. A standpipe does not stop backup from coming out of the next lower opening, such as a laundry tub or toilet in the basement. Sealing the base of the toilet to the floor will protect you until the water backs up higher than the top of the bowl.

Because water pressure depends on the height of water in the pipes, a standpipe does not reduce the pressure in the pipes. Because the pressure in the pipes is the same with a standpipe or a plug, standpipes and plugs are only recommended for buildings with cast iron sewer lines underneath the floor.

STANDPIPE LOCATION



Overhead sewer. An overhead sewer acts like a standpipe but without the problems. A sump is installed under the basement floor to intercept sewage flowing from basement fixtures and the basement floor drain. An ejector pump in the sump pumps sewage up above the flood level. From there it can drain by gravity into the sewer service line. Plumbing fixtures on the first floor are not affected. They continue to drain by gravity to the sewer service line.



It is unlikely that the sewers will back up above ground level. If water does go higher, a check valve in the pipe from the ejector pump keeps it in the pipes. Backed up sewage is enclosed in the sewer pipes so there is no worry about overflowing laundry tubs or basement toilets.

Another advantage is that you don't have to be home during the storm because an overhead sewer is a permanent alteration to the plumbing. The only concern is that during a power outage, the ejector pump won't work. But this only limits the use of the facilities in the basement that need the pump. The upstairs plumbing still works and the sewer is still prevented from backing up.

Precautions - The ejector pump requires maintenance and electricity to work properly. The basement is disrupted during construction. The contractor may have to run the overhead pipes through one or more basement rooms, although often they can be camouflaged. **This work requires a licensed plumber and a permit from the City's Building Inspection Division (720-898-7620).**

In older houses, the sewer lines under the basement floor may be clay tile, and a buildup of pressure can break them. Sometimes this can be accounted for by running the overhead line through the basement wall. (In newer houses, the sewer line under the floor is cast iron, and probably won't break.)

Dry Floodproofing

This term covers several techniques for sealing up a building to ensure that floodwaters cannot get inside it. All areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, with removable shields, or with sandbags. A sewer backup protection measure is installed (see page 19). Many dry floodproofed buildings do not look any different from those that have not been modified.

Dry floodproofing is only appropriate for buildings with concrete slab floors (without basements) with no cracks, and subject to less than three feet of water.

Precautions. A building should not be dry floodproofed if floodwaters may be more than three feet deep or move faster than five feet per second. It is very tempting for the owner of a dry floodproofed building to try to keep the flood out if floodwaters get deeper than two or three feet. This can result in collapsed walls, buckled floors, and danger to the occupants.

Dry floodproofing is only appropriate for buildings with slab on grade foundations. It is difficult to waterproof a crawl space to protect it from underseepage. Basements should not be dry floodproofed to protect them from surface flooding because of the water pressure on the walls and floors. Basement walls can be waterproofed to protect them from groundwater as long as a footing drain is installed to keep the water pressure from building up.

Many commercial waterproofing compounds are made to protect wood from rain, but they will not withstand the pressures of standing water. Some deteriorate over time, so check with the supplier to be sure the waterproofing compound is appropriate for sealing your basement walls from water. Closing openings depends on having enough warning and having someone at the building who knows what to do.

A dry floodproofing project may require a City building permit. Check with the **Building Inspection Division (720-898-7620)** to be sure that your project does not violate any code requirements.

Wet Floodproofing

If floodwaters in your yard are touching the house, they are probably also seeping down between the soil and the exterior of the basement walls. Even if the outside water is only a few feet deep, it is putting pressure on the basement walls and floor equal to that of a standing body of water seven or more feet deep—750 pounds of pressure per square foot. (Dry soil exerts less than 100 pounds per square foot.)

Most walls and floors are not built to withstand that kind of pressure. As a result, waterproofed basement walls and floors can be cracked, buckled, or broken by the pressure of floodwater. Instead of just a wet basement, you may end up with a wet basement and broken walls.

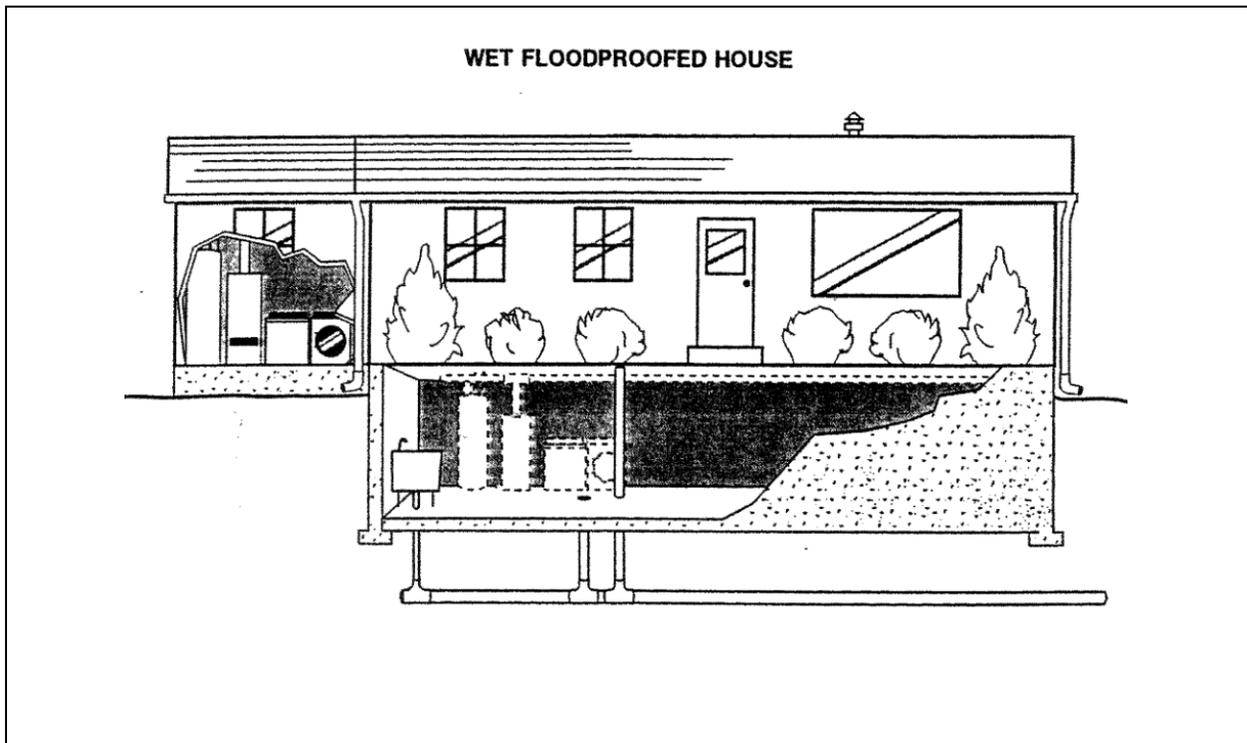
One way to deal with this is to let the water in and remove everything that could be damaged by a flood. This is called wet floodproofing. There are several ways to modify a building so that floodwaters are allowed inside, but minimal damage is done to the building and its contents. These techniques range from moving a few valuable items to rebuilding the floodable area.

In the latter case, structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher level. In the illustration below, these items are relocated to a small room added onto the house. Another approach is to raise these items on blocks or platforms where the flooding is not deep.

Wet floodproofing is not feasible for one-story houses because the flooded areas are the living areas. However, many people wet floodproof their basements, garages, and accessory buildings simply by relocating all hard-to-move valuables, such as heavy furniture and electrical outlets. Light or moveable items, like lawn furniture and bicycles, can be moved if there is enough warning.

Another approach is to wet floodproof a crawlspace. If your crawlspace has a furnace in it or is used for storage, these items could be moved to the first or second floor. Vents should be placed on the foundation walls to ensure that floodwaters can get into the crawlspace to equalize water pressure.

Wet floodproofing has one advantage over the other approaches: no matter how little you do, you will reduce your damages. Thousands of dollars in damage can be prevented by simply moving furniture and electrical appliances out of the flood-prone area.



Precautions. Moving contents is dependent on adequate warning and the presence of someone who knows what to do. Flooding an area where there is electricity, paint, gasoline, pesticides, or other hazardous materials creates a safety hazard. There will still be a need for cleanup, with its accompanying health problems. **Moving water lines or furnaces requires a building permit from the City's Building Inspection Division (720-898-7620).**

Elevation

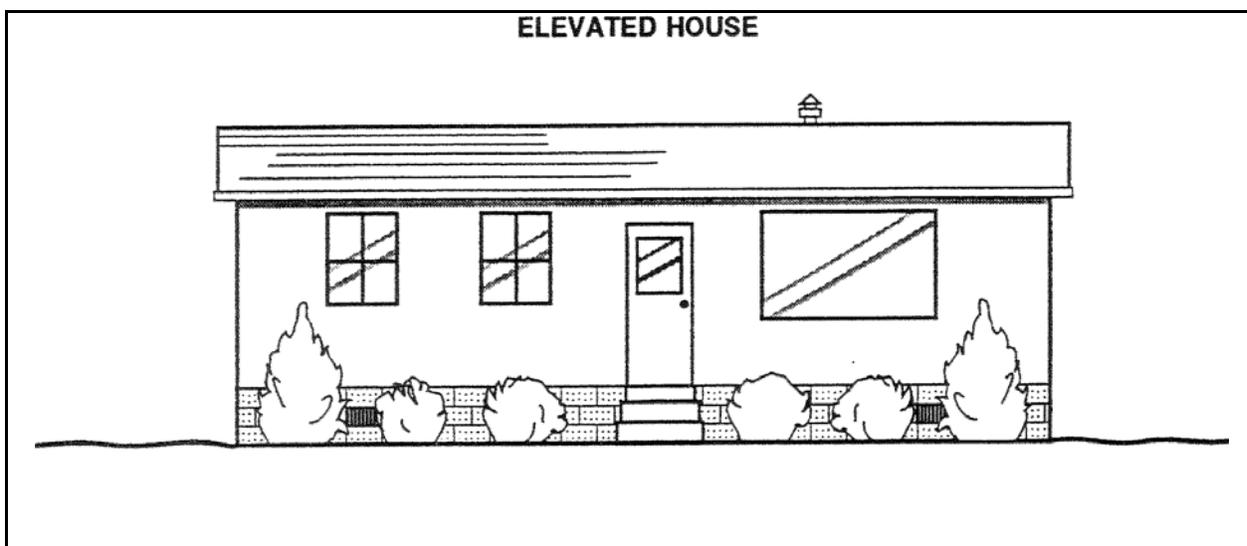
Short of removing it from the floodplain, the best way to protect a house from surface flooding is to raise it above the flood level. The area below the flood level is either filled in or left with openings to allow floodwaters to flow under the building, causing little or no damage. Elevation is required by law whenever a new house is constructed in a floodplain.

Many qualified house-moving contractors know the techniques for elevating a building. It is jacked up and set on cribbing while a new foundation is built underneath. The foundation walls are raised to the flood protection level and the house is lowered onto the new foundation. Utility lines are extended and reconnected, steps built, and, in some cases, the perimeter is backfilled or landscaped to mask the change. If the lower area is not filled in, it must have openings to allow water to flow under the building. This keeps the water pressure from endangering the supporting walls.

Where floodwaters are not very deep, the appearance of the elevated house is similar to that of a house on a two- or three-foot crawlspace (see illustration on the next page). If the house is raised two feet, the front door would be three steps higher than before. If the house is raised eight feet, the lower area can be wet floodproofed for a garage or for storage of items not subject to flood damage.

Lighter, wood frame buildings on crawl spaces or basements are the easiest to elevate because jacks can readily be placed under them. Masonry buildings on crawlspaces can be elevated but the cost is higher because of the weight and the care needed to keep the brick or stone from cracking or falling off. Buildings on slabs can be elevated slab and all, but not many contractors know how to do this.

Precautions. Zoning and building height restrictions may exist in your area. If you raise your building eight feet, you may be tempted to put materials subject to flood damage, such as furniture, in the "new" lower area. **Structural modifications such as elevating a building require a building permit from the City's Building Inspection Division (720-898-7620).**



Relocation

The surest and safest way to protect a building from flooding is to move it to high ground. If your house is subject to deep flooding or high velocities, you should seriously consider relocating out of the floodplain. There are several federal programs that are interested in acquiring buildings that have been substantially damaged by a flood. The City may have funds for other properties, particularly if they are adjacent to parks or other public land.

Smaller, wood frame buildings on crawlspaces are easiest to relocate. Larger buildings, those on slabs, or those built of masonry may be too expensive to move, and are usually demolished after they are purchased by the City or other entity. The land is then kept open for public or open space use. If you are interested in pursuing this approach, contact the City's **Engineering Division (720-898-7640)**.

Storms and floods can occur very quickly in our area. You should be on the alert when you see storms brewing. When in doubt, monitor news reports via radio, television or web sites for weather information.

FLASH FLOOD SAFETY

Flash floods can happen without warning. Have a plan.

Know your flood hazard: If you are at home, at work, or in your car, know whether you could be affected by a flash flood (see the box on page 7).

If it is raining and you are near a mountain stream, monitor local news reports (radio, television, or websites). If you hear a "flash flood watch" for your area, play it safe and move to high ground. If you hear a "flash flood warning," climb to higher ground immediately. Leave your car, camping gear, and other belongings. You may have only minutes to escape.

Never try to drive or run downhill to outrace a flash flood. Avoid flooded areas and fast-flowing water. Do not try to cross flooded streams on foot or in your car. Road beds can wash away and two feet of water will carry away most automobiles. Be especially cautious at night when it is harder to recognize flood dangers.

If your vehicle stalls, leave it immediately and seek high ground. Rapidly rising water may engulf the vehicle and its occupants and sweep them away. Remember, it is better to be wet than dead!

Flash floods can occur at any time along the Front Range and often with little notice. If you see flooding, please report it to the City so we can have a better picture of what is happening. Call **720-898-7720** during business hours (7:30 a.m. to 4:00 p.m.). After hours, call **720-898-7820**.

Flood Warnings

The National Weather Service issues three types of flood notices:

-Flash flood watch: flash flooding is possible within the area described by the notice.

-Flash flood warning: flash flooding is imminent or occurring in the area described by the notice.

-Urban and small stream flood advisory: flooding of small streams, streets, and low-lying areas, such as railroad underpasses and urban storm drains, is occurring.

The City of Arvada, Jefferson County, and the Urban Drainage and Flood Control District work with the National Weather Service to share rain and stream flow data and monitor conditions as they develop. If flooding is likely to occur, these agencies will issue warnings through the following ways:

-NOAA Weather Radio: This is a radio station operated by the Weather Service on frequency 162.55 Mhz. You can buy a special battery-operated weather radio at a local electronics store for \$20-\$35.

-Local radio and TV stations: Radio station KOA, AM 850, is Denver's Emergency Alert System station. Most radio and television stations will keep you posted on the flood status. News and weather websites: local news outlets will post updates on their websites. Check the time and date of the posting to make sure the information is up to date.

Telephone Emergency Notification: Recorded messages may be received by phone. (This system cannot reach cell phones unless they are pre-registered with the City. To add a cell phone number to the Aurora and Jefferson County telephone emergency notification system, enter www.your911.net in the subject line of your internet browser and follow the registration instructions.)

Emergency vehicles: The City, County, or fire protection district may send police or fire vehicles out to the threatened areas. The vehicles have sirens and mobile public address systems that

will announce the warning. They may tell you to evacuate. If so, follow their instructions and the steps below. If there is no specific direction given, monitor local news reports (radio, television, or websites) to find out what to do.

The flood status will be updated on the radio and television stations and websites as information is received. Once the agencies are sure that the danger has passed, they will issue an "all clear" message. **Remember: You may not get a flash flood warning before flooding actually begins. Play it safe in stormy weather, and read the next section.**

What You Should Do

Once you hear a flood watch or warning, you should take the following steps:

1. If the radio, television, reverse 911, or emergency vehicle announced what to do, follow those instructions.
2. If a **flash flood warning** was issued and you are in a mountainous area:
 - Climb to high ground as fast as possible.
 - Do not try to take belongings with you—your life is more important.
 - Do not try to run or drive downhill to outrace a flash flood.
3. Implement your flood response plan, if you have one (see page 8).
4. If a **flood watch** was issued, you can still make a flood response plan (see page 8).
5. If a **flood warning** was issued **and** you are in the mapped floodplain (see page 2 for link to map) or suspect you have a flood problem:
 - Turn off the electricity and gas (see pages 23–24).
 - Read Flood Safety Outdoors in the back of this handbook.
 - Lock your doors and evacuate.
 - If you don't have a place on high ground where you can stay, monitor news and weather stations (radio, television, or websites) for information on public shelters.
6. If you are **not** in the mapped floodplain, it is unlikely that you will be flooded deeply. If the streets are flooding, you are better off staying in your house.
 - Read Flood Safety Indoors in the back of this handbook.
7. If you are **not** in the mapped floodplain, but you know that your basement floods:
 - Turn off the basement electricity by removing the fuses or turning off the circuit breakers.
 - Turn off the gas.
 - Move any valuables upstairs.
 - Stay out of the basement if the water outdoors is touching the house (the water pressure

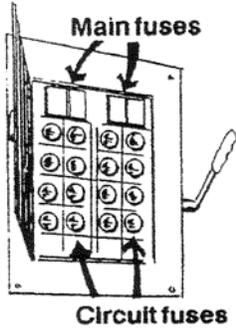
could collapse the walls).

Turning Off the Utilities

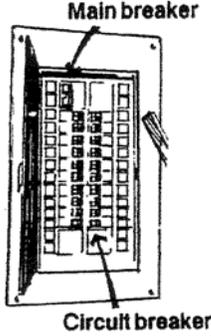
If your house or basement could get flooded, turn off your utilities to prevent greater damage. This section provides directions on how you can do this safely. If you are unsure of how to do these things, ask a friend or neighbor to help you, or don't do them at all. **If your house is in danger of a flash flood, it's more important that you get to safety quickly.**

Electricity. The most important utility to turn off is electricity. You have a fuse box or a breaker box in the house. The breaker box is more common in newer buildings or if you have had some electrical work done in the last 20 years. The illustration below shows how to turn off the power.

TURNING OFF THE ELECTRICITY



The diagram shows a fuse box with its door open. At the top, two large fuses are labeled "Main fuses". Below them are several smaller fuses labeled "Circuit fuses". A handle on the right side of the door is shown in the "OFF" position.



The diagram shows a breaker box with its door open. At the top, two breakers are labeled "Main breaker". Below them are several other breakers labeled "Circuit breaker". A handle on the right side of the door is shown in the "OFF" position.

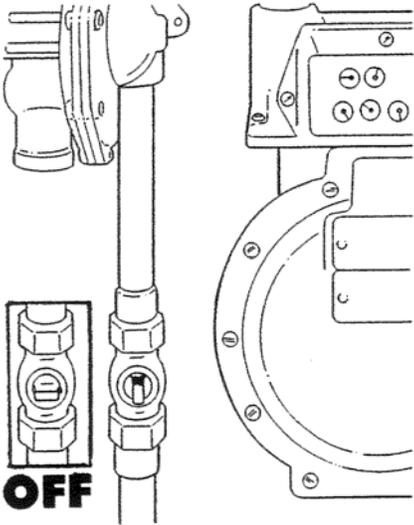
Fuse Box

1. Make sure that you are not standing in water and that the box is dry.
2. If your box has a handle on the side, pull the handle to "OFF."
3. Open the box door.
4. One or two large fuses will be marked "Main." Pull them out by their handles. Put the fuses in a safe and dry place.

Breaker Box

1. Make sure that you are not standing in water and that the box is dry.
2. Open the box door.
3. One or two breakers at the top will be marked "Main." Switch them to "OFF."

TURNING OFF THE GAS



Gas. Floodwaters may knock out pilot lights and silt may get into burners. To prevent a fire and potentially explosive safety hazard, you should turn off the gas before you leave.

There is a valve next to the gas meter. If the valve handle is parallel to the pipe, the gas is on. **To shut the gas off**, turn the handle 90 degrees (a quarter turn) so the handle is perpendicular to the pipe. You may need a pair of pliers or a wrench to turn the valve.

Most gas meter valves have a hole in the handle that lines up with a hole in the valve body when the gas is shut off. This hole is used by the gas company to lock or seal the valve closed when the building is vacant. When the holes are lined up, you know that the gas supply has been shut off. **IMPORTANT: After the flood**, contact your utility company to check the furnace, turn on the gas, and re-ignite the furnace pilot light.

Fuel oil tanks. If you have a fuel oil or propane tank, turn off the fuel valve at the tank. After the flood, contact your utility company to check the furnace, turn on the gas, and re-ignite the furnace pilot light.

Water. Since your water faucets are usually turned off, you shouldn't have to worry about turning all the water to the house off. However, if your washing machine is in the basement, or if the floodwaters around your house could be several feet deep, the floodwaters could get into the water lines through the appliances. If you have the time, turn off the water to the house. There is usually a valve near the water meter or where the service line enters the house. Turn it all the way clockwise.

This chapter covers the first three steps you should take if your property has been flooded. If you've been flooded, you should get a copy of *Repairing Your Flooded Home*, published jointly by the American Red Cross and the Federal Emergency Management Agency. Copies of the book are available free from the Red Cross at 7220 W. Jefferson Avenue, Suite 120, Lakewood, CO. Ask for publication ARC4477.

Step 1. Take Care of Yourself First

You and your family have been through a disaster. Your life has been disrupted and you must allow time for things to return to normal. You should recognize that the flood can take its toll on you as well as your property. You need to look after yourself and your family while you focus on cleanup and recovery.

HEALTH HINTS

Wash your hands thoroughly. This is especially important before eating, cooking, or smoking.

Confirm that the water is clean and safe. Don't drink it or wash dishes until you're sure.

Disinfect dishes and all items that floodwaters touched.

Watch out for fatigue. When your body is tired, you are more prone to accidents, back strain, and depression.

Report health hazards. Call the Jefferson County Health Department (303-232-6301) if there are animal carcasses, rats, dangerous chemicals, or other hazards on your property.

Your hidden enemy is stress. Watch for signs of trouble like short tempers, getting upset over little things, having difficulty sleeping, bad dreams, aches, pains, stomach problems, apathy, and depression. These are ways your body tells you that times are difficult. Reactions to stress are common and usually temporary. Here are some things you and your family can do to relieve your tensions.

Keep the family together. Togetherness provides mutual support.

Discuss your problems. Talk to family and friends. Share your anxieties. Let others talk to you to help release tension. Crying is a natural response to a disaster. It's also a great way to release pent-up emotions.

Rest often and eat well. You are more likely to suffer from stress and health problems when you are weak.

Set a manageable schedule. Make a list and do the

jobs one at a time.

Watch for signs of stress. Don't be surprised if you experience tension or see signs of stress in family members. Often other people will notice problems more readily than you do. Listen to them.

Seek help. If you cannot shake feelings of despair or other telltale signs of stress, get professional help. Contact the **Red Cross (303-722-7474)** or your local mental health clinic.

Floodproof as you rebuild. Nobody likes being subject to the whims of nature. Getting ready for the next flood can give you a sense of control over the future.

**THINGS TO TAKE WHEN
IT'S SAFE TO RETURN**

- °Flashlight
- °First aid kit
- °Battery-operated radio
- °Waterproof boots or waders
- °Hard hat, boots with hard soles
- °Camera or video camera to record damage
- °Tools: crowbar, hammer, saw, pliers, etc.
- °Drinking water
- °Trash bags
- °A wooden stick for turning things over and scaring away small animals
- °Cleaning supplies:
- °Shovels
- °Buckets, hose
- °Trash bags
- °Mops, brooms, brushes
- °Rubber gloves
- °Rags
- °Cleaners and disinfectants
- °Lubricating oil

Care for your children. Watch your children closely. You can expect to see them display fear or symptoms of stress. Be understanding. Remember, they are going through a rough time too.

Stay healthy. When you work in an area that has been flooded, you will be exposed to dangerous chemicals and germs that you are not used to and can make you very sick.

Step 2. Give Your Home First Aid

Read the safety precautions on the back cover of this handbook. Each year about 150 people die because of floods. Many of those fatalities are due to electrocution or other accidents that occur after the floodwaters have gone down. Your first job is to make sure everything is safe. Follow these steps:

1. IF YOUR HOUSE HAS BEEN POSTED, DO NOT ENTER IT. Call the Arvada Building Inspection Division at 720-898-7620 for information.

2. Monitor news reports to find out if and when you can go back home. The City may issue special instructions or make building inspectors available to help you check out your house.

3. Check with your insurance agent to see if some of your cleanup and repair work is covered. If so, you may want to hire professional help for the rest of these steps.

4. Walk around the outside of your house and check for loose power lines and gas leaks. You can detect leaking gas by the putrid, rotten egg smell of chemicals that have been added to it to make a leak noticeable. If you

find downed lines or leaks, call XCEL Energy, 1-800-895-1999 for electrical or 1-800-895-2999 for gas leaks.

5. Check the foundation for cracks or other damage. Examine porch roofs and overhangs to be sure they still have all their supports. Look for gaps between the steps and the house. If you see obvious damage, have a building inspector check the house before you go in. For help, call the **Building Inspection Division (720-898-7620)**.

6. Turn off the electricity at your house, even if local power is off; the power grid may reactivate before you are ready. If you have to go through water to get to your fuse box or breaker box, if the boxes are wet, or if you're not comfortable with electrical matters, call an electrician. Otherwise, you can follow the instructions in the box on page 23.

7. Turn off the gas. See the instructions on page 24.

8. **Go inside carefully.** It may be easier to enter your house through a window if the door won't open easily. Look carefully at the ceiling before you go in to be sure it is not ready to fall. Do not smoke or use candles, gas lanterns, or other open flames until the house has been well ventilated. There may be explosive gas.
9. **Rescue the most valuable items.** Find and protect the "irreplaceables," like money, jewelry, insurance papers, photographs, and family heirlooms. Wash the mud off before they have a chance to dry. Put them in a safe place like the upper story (if it's dry), a plastic bag, or take them to a friend's home.

Photographs, books, and other articles that are easily damaged when wet can be frozen and cleaned later when you have more time. To do this, first wash the mud off, then put the wet articles in plastic bags and take them to a friend who has electricity. If you put them in a frost-free freezer, they will be protected from mildew and further damage until you have time to thaw them out and clean them.

10. **Keep the damage from getting worse.** Open the windows and doors (if weather permits) to reduce the moisture and get rid of any gas. Cover holes in the roof, walls, or windows with boards, tarps, or plastic sheeting to keep out the wind and rain.
11. **If you suspect structural damage because of sagging floors or roof sections.,** call the City of Arvada Building Division at 720-898-7620 Use 4 x 4's or other heavy lumber to brace weak areas. If you're uncertain how to shore up floor or ceiling joists, call a contractor.
12. **Remove tree limbs or other trash** that may have landed on or floated into the house.
13. **Check for broken or leaking water pipes.** If you find any, cut off the water supply by turning off the valve at your water meter. If the water pipes are not leaking, you can use your tap water for hosing things down and cleaning. But **do not drink or cook with tap water** until the City declares it safe. If in doubt call the **City Utilities/Water Quality (720-898-7800)**.

14. Drain your basement carefully.

HOW TO DRAIN A BASEMENT

Pumping a basement out too fast can result in broken walls and floors if there is still water in the ground. To do it safely, follow these steps:

- 1. Make sure the electricity is off.**
- 2. If there is no floodwater on top of the ground, start pumping the water out of the basement.**
- 3. Pump the water level down two to three feet. Mark the level and wait overnight.**
- 4. Check the water level the next day. If the water went back up, it's still too early to try to drain the basement.**
- 5. Wait overnight. Then pump the water down two to three feet again. Check the level the next day.**
- 6. When the water stops going back up, pump down another two to three feet and wait overnight. Repeat steps 4 through 6 until all water is pumped out of the basement.**

Water in the saturated ground puts tremendous pressure on your basement walls and floors. The water inside your flooded basement is counteracting this pressure. If you don't follow the instructions in the box for emptying the basement gradually, your walls and floor will lose the support they need to counteract the pressure from the water outside. The weight of the saturated earth could then cause the walls to crack and collapse, buckling the floors and seriously damaging your home.

- 15. Get rid of the mud and silt.** Most of the health hazards brought by a flood are in the mud and silt that is left after the water drains away. It is therefore very important to clean it out as soon as possible. This is a lot easier if you do it before the mud dries out. Follow these steps:

First, shovel out the mud.

Next, make sure the electricity is turned off. Remove all light bulbs from sockets that have been flooded. Disconnect and throw away flooded wall switches and outlets. They should be replaced later with new ones.

Hose the house down, inside and out. If you have an attachment that sprays soap, wash and then rinse the walls and floors. Hose the furniture, too, and other major items that got muddy.

Double check that the electricity is off, then thoroughly hose out the electrical outlets, switch boxes,

and light sockets that you opened up.

- 16. Don't let the water sit on the floor too long.** Mop it up right away, especially if your floor is particle board or another wood product that tends to fall apart when wet.

Step 3. Get Organized

Before you try to clean up and repair everything, you need to assess your damage and develop a recovery plan. An organized approach will make the best use of your time and money. Follow these steps:

1. Call your insurance agent. How much of your loss is covered will depend on your policy. Your agent will also tell you what to throw away, and what to save for the adjuster to examine. Find out if your insurance covers living expenses while your house is being repaired. If you don't have coverage, your agent can still advise you where to get help with cleanup and repairs.

TIPS ON INSURANCE CLAIMS

You are supposed to be reimbursed fairly for your loss, but you are not supposed to profit from a disaster.

You cannot collect more than the face value of your policy.

You cannot collect for uninsured items, such as landscaping.

Most adjusters receive a flat salary for each case they handle. There are no financial incentives to encourage the adjuster to give you a small claim payment.

Your adjuster will probably be from out of town. Get his or her name, company, and telephone number.

In most cases you will be reimbursed for the actual cash value of an item, not its replacement cost.

If you have problems, your policy should list an office and telephone number to call.

2. Check for structural damage. Broken basement or foundation walls, shifted stairs, or slanted floors or walls could mean that the foundation, floors, or walls will have to be rebuilt from the ground up. Repair safety hazards such as broken stairs before you proceed any further.

3. If you have structural damage, check with the City Building Division before you start any reconstruction or sign any repair contracts. You will need a building permit to repair structural damage. If the damage to your house's structure exceeds 50% of the value of your house, the federal government and the City's code will require you to elevate it above the 100-year flood level.

4. Ask the big question. Odds are that the area where you live will flood again. Before you spend a great deal of money and effort repairing and rebuilding, ask yourself, "*Do I really want to be flooded again?*" If you think that you would be better off in a different location, talk to the Engineering Division to see if the City or other agency would like to buy your property and clear the floodplain for open space use.

5. Start listing the damage. List the damage on a form like the household inventory form. If possible, take pictures or videotapes of the damaged items as you clean up. Keep receipts for cleanup supplies, equipment rental, hired help, and temporary housing expenses. Keep a sample of items such as a piece of carpet to show the value of what you have thrown away. Good

records are needed for insurance claims, applications for disaster assistance, and income tax deductions.

6. Make a recovery plan. A recovery plan is simply a list of jobs that need to be done. Planning can help you save time and money. Besides, being methodical and keeping everyone busy can ease tension. You will start seeing progress as you finish each project. Start making lists. Begin with the projects such as "replace furnace" and "dry the walls."

7. Decide what you can and can't do. You can save money by doing much of the cleanup and repair work yourself. However, jobs like shoring up broken foundations and replacing electrical service boxes are best left to the professionals.

8. **Decide if you need financial assistance.** After a flood there are usually extra sources of help if you need to replace items or hire a professional and you don't have insurance. Check the local newspaper, radio, and TV stations for notices about Red Cross, church, and government disaster programs. Even if you are insured, or think you can cover all your expenses, it makes sense to take advantage of whatever additional help is available. In the case of government assistance, you have already paid for it with your tax dollars.
9. **Keep the windows open** as much as possible to allow things to begin drying out.
10. **Get a copy of *Repairing Your Flooded Home*** from the City or the Red Cross. It will explain the rest of the steps you should follow to finish cleaning and repairing your building. If you've followed all the steps listed in this chapter, start with Step 4 in *Repairing Your Flooded Home*.

Important Numbers

Police & Fire Emergencies: 911

Ambulance: 911

To report an electrical or gas hazard, call XCEL Energy: 1-800-895-1999 (elec.)
1-800-895-2999 (gas)

To report flooding: 720-898-7720 (7:30 a.m.–4:00 p.m.)
720-898-7820 (after hours)

Family meeting place: _____

Alternate family meeting place: _____

Neighbors: _____

Red Cross: 303-722-7474

City of Arvada services:

Water supply or to ensure the water is drinkable: 720-898-7800

Building Inspection Division on building permit rules and if you see construction near a creek or ditch without a permit sign posted: 720-898-7620

Department of Public Works, Streets Division if you see dumping or debris in a creek or ditch:
720-898-7720

Insurance agent: _____

Homeowner's insurance policy:

Company: _____

Number: _____

Flood insurance policy:

Company: _____

Number: _____

Hardware stores: _____

Lumber companies: _____

Flood Safety Outdoors

Do not walk through flowing water. Drowning is the number-one cause of flood deaths. Most of these drownings occur during flash floods. Six inches of moving water can knock you off your feet. Use a pole or stick to make sure that the ground is still there before you go through standing water.

Do not drive through a flooded area. More people drown in their cars than anywhere else. Don't drive around road barriers; the road or bridge ahead may be washed out. Two feet of water will carry away most automobiles.

Stay away from power lines and electrical wires. Electrocutation is also a major killer in floods. Electrical current can travel through water. Report downed power lines to Public Service (571-7811) or call 911.

Flood Safety Indoors

Turn off your electricity if your building is flooded. Follow the instructions on page 33. Some appliances, such as television sets, can shock you even after they have been unplugged. Don't use appliances or motors that have gotten wet unless they have been taken apart, cleaned, and dried correctly.

Watch for animals. Small animals like mice and snakes that have been flooded out of their homes may seek shelter in yours. Use a pole or stick to poke and turn items over and scare away small animals.

Look before you step. After a flood, the ground and floors are covered with debris including broken bottles and nails. Floors and stairs that have been covered with mud can be very slippery.

Be alert for gas leaks. Use a flashlight to inspect for damage. Don't smoke or use candles, lanterns, or open flames unless you are sure that the gas has been turned off (see page 34) and the area has been thoroughly aired out.

Carbon monoxide exhaust kills. Use a generator or other gasoline-powered machine outdoors. The same goes for camping stoves. Fumes from charcoal are especially deadly—never use charcoal to cook indoors.

Clean everything that got wet. Flood waters have picked up sewage and chemicals from roads, factories, and storage buildings. Spoiled food and flooded cosmetics and medicines are health hazards. When in doubt, throw them out.

Take good care of yourself. Recovering from a flood is a big job. It is tough on both the body and spirit. The effects a disaster has on you and your family may last a long time. See page 35 on how to recognize and care for anxiety, stress, and fatigue.