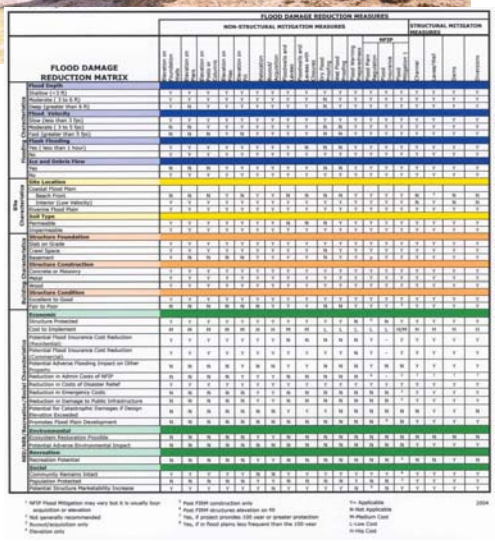
Local Flood Proofing Programs



US Army Corps of Engineers
National Nonstructural/Flood Proofing Committee

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Nonstructural/ Flood Proofing
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Local Flood Proofing Programs

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Ascension Parish, LA *
Aurora, IL
Barbour County, WV
Bartlett, IL *
Bolingbrook, IL
Boulder, CO *
Centralia, WA *
Citrus County, FL *
Dare County, NC *
Davenport, IA *
Des Plaines, IL *
DuPage County, IL
Elgin, IL
Fairfax County, VA *
Fort Collins, CO *
Frankfort, KY *
Grand Forks, ND *
Hillsborough County, FL *
Homewood, IL
King County, WA *
Lansing, IL *
Lexington-Fayette Urban County, KY
Licking County, Ohio *
Mahoning County, OH
Mandeville, LA *
Mecklenburg County, NC *
Mobile, AL
Mount Prospect, IL *
Prince George's County, MD *
Regina, Saskatchewan
Rosemont, IL
Sacramento County, CA *
Snoqualmie, WA *
South Holland, IL *
St. Charles, IL *
St. Charles, MI
St. Tammany Parish, LA *
Vassar, MI

Illinois-American Water Company, Alton, IL
Jefferson County Drainage District #6, TX
Maumee River Basin Commission, Fort Wayne, IN
Metropolitan St. Louis Sewer District, St. Louis, MO
South Carolina Sea Grant, Charleston, SC
Washington State Department of Ecology, Olympia, WA

* Community is in the Community Rating System, receiving credit for providing flood proofing information and assistance to property owners (see page 12).

Note: This list is not meant to be an all-inclusive list of communities that have local flood proofing programs. There are many other active programs that were not contacted due to time and resource constraints.

Except as noted, all illustrations are from the referenced community or French & Associates, Ltd..

Chapter 1. Introduction

1.1. Background

Flood proofing as a flood damage reduction measure: Flood proofing is a proven approach to reducing flood damage. It involves altering an existing building or its immediate area to prevent or minimize damage during a flood. Alterations may range from minor changes to the utilities, to waterproofing walls, to elevating the building above flood levels. Flood damage reduction measures are summarized in Section 1.3 and described in more detail in the references listed in Section 8.3.

The potential for flood proofing to reduce flood losses is significant. More and more communities are realizing that for financial, technical and environmental reasons, the traditional structural flood control measures will not solve every local flood problem. Flood proofing approaches to flood reduction have several advantages:

→ They can be as or more effective for certain types of flooding

→ They can be much less expensive

→ Costs are often assumed by or shared with the property owners

→ They can be less disruptive to neighborhoods and habitat

→ They can be constructed quickly, without environmental reviews and permit delays

While many people have flood proofed their homes or businesses, most have used common sense or self-taught approaches. Studies have shown that technical knowledge and financing are the greatest impediments to implementing a flood proofing project. While surveys showed that many people want to flood proof, lack of funds was listed as the most important reason why they did not. Further, flooded homeowners who received assistance from the government were more likely to flood proof and spend more money to do a more effective job.

Government programs: Federal, state and local agencies have researched techniques, promoted flood proofing as a viable flood protection measure, assisted property owners, and implemented their own projects. Some Federal agencies, notably the U.S. Army Corps of Engineers and the Department of Homeland Security's Federal Emergency Management Agency (FEMA), have financed flood proofing projects. Some states have implemented public information and financial assistance programs. However, statutory authority and limited resources have kept the Federal and state programs from reaching many people. More attention is needed from local governments.

This floodwall was installed after the owner attended a local workshop on flood proofing. The community also helped pay for the project with a rebate. It has kept floodwaters out of the house three times since it was built in 1991 (South Holland, Illinois).

Local programs: Some local governments have flood proofed public buildings or provided technical or financial support for flood proofing projects on private property. Each community's program was developed differently and is administered differently. However, all believe flood proofing is important enough to deserve their attention.

As preparation for this publication, staff from over 40 local flood proofing programs were contacted and interviewed. The experiences of these programs can be very helpful in guiding other communities in developing their own approaches to flood proofing.

1.2. This Publication

This document reviews how a community can develop and administer its own flood proofing program. The reader should follow the step by step suggestions in the following chapters:

→ First, determine whether the community would benefit by having an active local flood proofing program. This is the subject of Chapter 2.

→ Once a community decides to get involved, it should assess the factors that affect the design of its program. These are discussed in Chapter 3.

→ The easiest way to start a program is to collect references on the topic and provide information on it to property owners. Ways to do this are covered in Chapter 4.

→ If funds are needed for the local flood proofing program, Chapter 5 identifies sources that communities have used.

→ How to use the funds in cooperation with property owners is reviewed in Chapter 6.

→ The highest level of involvement for a community is to design, fund and build flood proofing projects. Guidance on how this can be done is the subject of Chapter 7.

→ Chapter 8 identifies where to get more information from agencies, organizations and references.

1.3. Flood Damage Reduction Measures

There are four ways to protect a property from flood damage:

1. Emergency measures taken at the time of the flood, such as sandbagging.
2. Structural measures that control flooding, including constructing levees or dams or modifying a waterway's channel.
3. Relocating a building out of the flood hazard area, either by moving it or buying the property and demolishing the building.
4. Modifying the building or lot to reduce the property's exposure to damage.

The last three approaches are considered permanent measures. The advantages and disadvantages of the three permanent measures are listed in the table on the next page.

Comparison of Flood Protection Approaches		
Structural Flood Control	**Acquisition/Relocation**	**Flood Proofing**
Protects development without disrupting existing buildings or patterns of development	Disruptive: successful only if owners willing to sell and leave	Protects development with minimal disruption to existing buildings and development
Can disrupt natural water flows and/or destroy wildlife habitat	Does not disrupt natural water flows or damage wildlife habitat; can improve habitat	Does not disrupt natural water flows or damage wildlife habitat, but may affect local drainage
Can protect to any flood level	Generally most cost-effective for deep flooding and/or high velocity flooding	Some measures are only appropriate for low flood hazards
Can be the most cost-effective and practical solution for areas already densely developed.	Can be the most cost-effective solution in areas of damaged or low-cost buildings	Can be the most cost-effective solution in areas with low flood depths
Large capital expenditures often make this approach cost prohibitive or dependent on state or Federal assistance	Cost depends on property values, often done with state or Federal assistance	Many approaches can be afforded by the property owner
Protects streets and land in addition to buildings	Can remove all types of property that need protection from floods	Focuses on protecting buildings
Publicly owned, operated, and maintained, so more dependable over the long run	No operation and maintenance needed to keep flood protection benefits	Operation and maintenance dependent on every current and future occupant
Built to a certain flood protection level that can be exceeded by larger floods, causing extensive damage	Only properties outside the cleared area are subject to damage from larger floods	Built to a certain flood protection level that can be exceeded by larger floods, causing extensive damage
Can create a false sense of security as people protected by a project often believe that no flood can ever reach them	Damage level does not increase if flood levels increase	Can create false sense of security, especially if mainten-ance neglected or new owners not familiar with operation
May improve property values and encourage more development	Communities lose some tax base and utility customers (may be offset by using vacated land for parks or other assets)	Preserves tax base and may improve property values
Water supply and recreational uses can be incorporated into some projects' designs	Cleared out area can be converted to recreational, educational or ecosystem restoration uses	Preserves existing buildings and land uses. Compatible with existing ecosystem
Although it may be unintended, can promote more intensive development in the flood plain	May encourage more intensive development in adjacent areas as people want to be near parks that were created on vacated land	Should encourage property maintenance and preservation of existing development
Can have adverse flood plain and ecosystem impacts, e.g., higher flood stages and degraded ecosystem	May have positive flood plain and ecosystem impacts	Usually no change to flood plain or ecosystem

The fourth approach is the subject of this document. Flood proofing is defined as "any combination of changes or adjustments incorporated in the design, construction, or alteration of individual buildings or properties that will reduce flood damage." Unlike a structural approach, the building site may remain subject to flooding; it is the building or the area adjacent to it that is modified to prevent or minimize flood damage.

The community programs described in this document funded six approaches to flood proofing. Each has advantages and disadvantages. They are summarized in the following sections:

1. **Elevating** the building, so that floodwaters do not reach the damageable portions
2. Constructing **barriers** between the building and floodwaters
3. Making the building walls and floor watertight so water does not enter ("**dry flood proofing**")
4. Modifying the structure and relocating the contents so that when floodwaters enter the building there is little or no damage ("**wet flood proofing**")
5. **Preventing sewer backup**
6. **Protecting basements**

Terminology

Flood protection level: the level to which a property is protected. Local codes require that new and substantially improved buildings in the flood plain be protected to at least the base or 100-year flood. Selecting an appropriate flood protection level is discussed on page 63.

Human Intervention: the need for one or more people to be present to take actions needed to make a flood proofing system work. Examples are on pages 5, 6, 8, and 46. Measures that need human intervention are considered less dependable, especially if there is little advance warning of flooding. See also the discussion on page 64.

Elevation: The best way to protect a house from surface flooding, short of removing it from the flood plain, is to raise it above the flood protection level and place it on fill or an open foundation that allows floodwaters to flow underneath (illustrated on the right at the top of the next page). Crawlspace construction is the easiest to elevate and piers, posts and pile construction are the next easiest.

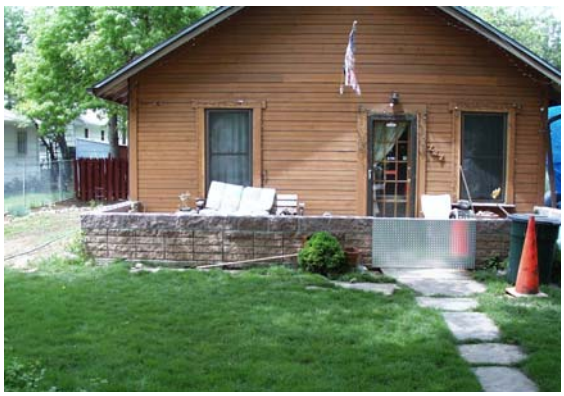
Elevation is the only flood proofing measure that reduces flood insurance premiums for residential structures. However property owners are sometimes hesitant to elevate because of concerns about the appearance of their buildings or losing their basements. If the first floor is elevated at least eight feet above grade, the project can create a new floor, suitable for access, parking or storage of items. The down side to this is it may encourage the current or future owner to finish the lower, floodprone, level, exposing it to flood damage.

Examples of elevated buildings appear on the next page and pages 24, 29, 41 and 49.

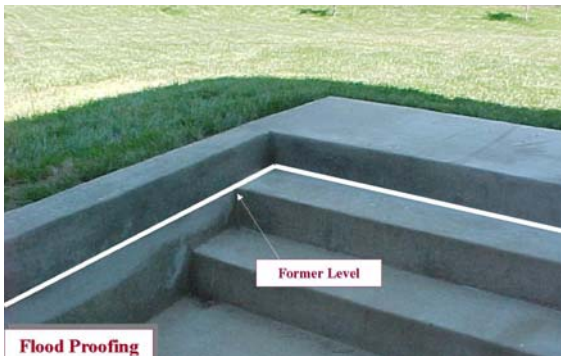
These houses in Vassar, Michigan, illustrate two approaches to elevating. The one on the left had the foundation backfilled and landscaped to minimize the adverse appearance of an elevated building. The one on the right left the lower area open, but included vents to allow water in to equalize hydrostatic pressures. The interior is bare and built of water resistant materials. However, over the years, the owner may be tempted to finish this area with carpeting, wallboard, and other materials subject to flood damage. ***W.A. Wilson Consulting***

Barriers: Barriers keep floodwaters from reaching a building. They can be made of earth, concrete, masonry or steel. Large earth barriers are called levees. In shallow flooding areas, a common approach is to construct a berm, which is a small levee, usually built from locally available fill. In urban areas where space is constricted, floodwalls may be used because they take up less room.

Barriers cannot be located within the regulatory floodway, where obstructions to flood flows are prohibited. However, unlike the other flood proofing measures, they can protect more than one building. On the other hand, their effectiveness depends on maintenance over the years, something sometimes forgotten by the private property owner.



The floodwall on the left was built by Rosemont, Illinois, to protect a Village owned housing project. Note that sandbagging is required to close the opening at the sidewalk. The site has 24-hour maintenance crews, stockpiles of filled sandbags, and a warning system, so human intervention has not been a problem. The floodwall on the right is in Fort Collins, Colorado. It has a steel doorway that stays closed, so it does not depend on human intervention.



This house in Fairfax County experienced shallow flooding. Raising the stairwell to the patio was an inexpensive solution, especially when compared to the cost of a drainage improvement project. There is no need for an opening in this barrier, so there is no worry about human intervention.

Other examples of barriers are on pages 1, 8, 46 and 64.

Dry flood proofing: Sealing a building to ensure that floodwaters cannot get inside is called dry flood proofing. All areas below the flood protection level are made watertight. Walls are coated with a waterproofing compound, or plastic sheeting is placed around the walls and covered. Openings, such as doors, windows, sewer lines and vents, are closed temporarily, with sandbags or removable closures, or permanently.

Dry flood proofing is only appropriate for structurally sound buildings on slab foundations that are free of cracks. Because most building walls and floors are not strong enough to withstand the hydrostatic pressure from more than 3 feet of water, the flood protection level should be less than 3 feet above the slab. The technique is not recommended for houses with floors below grade, such as basements, because hydrostatic pressure can collapse the walls or buckle the floor.

This dry flood proofed mental health center in Mandeville, Louisiana, can withstand shallow flooding for prolonged periods because the walls have been waterproofed.

Promoting Mitigation in Louisiana

This a dry flood proofed home in Fort Collins, Colorado. The brick facing will keep water out for short duration floods and the steel plate on hinges covers the doorway.

Wet flood proofing: Hydrostatic water pressure increases with the depth of water. Depths over 3 feet have been shown to collapse the walls of a typical house. Basements can be subject to 6 or 7 feet of water pressure when the ground is saturated. As a result, watertight walls and floors may crack, buckle or break from shallow surface flooding.

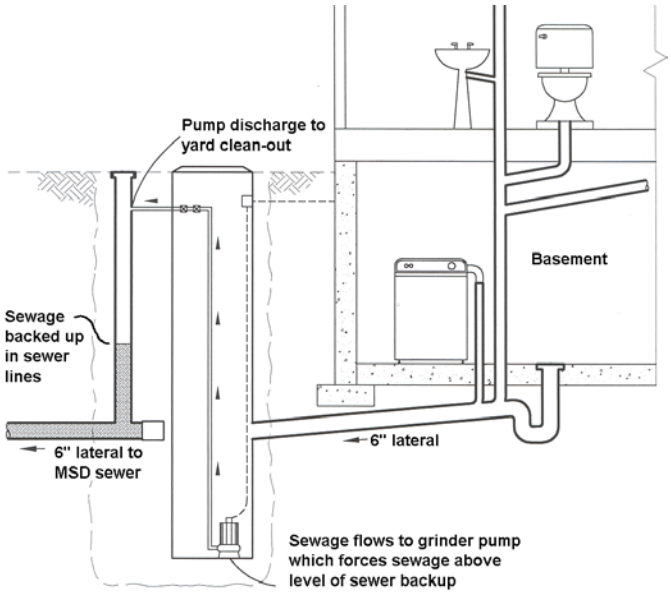
One way to deal with this is simply to let the water in and remove or protect everything that could be damaged. This approach is called wet flood proofing. Wet flood proofing measures range from moving a few valuable items to rebuilding the flood prone area.

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 (as was done for the elevated house in the right photo on page 5).. The water heater, furnace, and laundry facilities are permanently relocated to a higher level or raised on blocks or platforms. The house at 113 Calhoun had wet flood proofing features (page 29).

During the pilot test of its program, the Metropolitan St. Louis Sewer District concluded that this storage building was appropriate for wet flood proofing. The walls are metal and there is no insulation. The electrical service boxes would be moved above the flood protection elevation. The contents would be evacuated or moved to higher shelves when a flood warning is issued.

Preventing sewer backup: Sewer backup is usually caused by heavy rain. Stormwater flows into combined or separate sanitary sewers, overloading the system's capacity to carry the water to the treatment plant. The water backs up through service lines into floor drains. In some communities, sewer backup flooding is a bigger problem than overbank or surface flooding.

The more common flood damage reduction measures for sewer backup include drain plugs, standpipes, "grinder pump" arrangements, overhead sewers (illustrated on page 34) and backup valves.



The Metropolitan St. Louis Sewer District installs "grinder pumps" to prevent sewer back up.

Basement protection: Basements are subject to flooding from sewer backup, overland flows, and groundwater seepage. A basement flood proofing project needs to account for all three sources of water, usually by:

→ Preventing sewer backup,

→ Redirecting downspouts and runoff away from the building (illustrated on page 33)

→ Sealing windows or raising window wells, stairwells, and other openings that allow water in (illustrated below and on pages 46, 60, and 69)

→ Regrading or building a berm against the building walls to keep surface water from reaching the structure (illustrated on page 18), and

→ Waterproofing the walls and installing drain tile around the foundation to handle groundwater seepage.

Many basements are protected from groundwater problems by drain tiles that direct groundwater into sumps. Sump pumps are supposed to move the water from the sump out to the ground, away from the building. Very heavy rains can overload this system; power outages and maintenance problems may knock out a sump pump. Should this happen, the system designed to keep groundwater out can act as a conduit to bring water into a basement. Addressing drain tile and sump pump systems can be a very inexpensive flood proofing measure that can reduce a lot of basement flooding.

This house in Fort Collins, Colorado, was faced with basement flooding. The stairwell's retaining wall was raised and a removable closure fits in grooves in the walls. This project relies on human intervention – if someone does not slide the board in place, the building will not be protected.

Chapter 2. Benefits to the Community

This chapter reviews the rationale for community involvement in flood proofing. The first section discusses why communities have gotten involved. Section 2.2 is an overview of the Community Rating System, a program that recognizes and rewards local flood proofing programs.

2.1. Why Start a Program?

What motivates a community to fund flood proofing projects? As part of the research for this publication, communities were asked "Why did your community select flood proofing as a damage reduction measure?" Six broad reasons were cited:

→ Customer service
→ Economics
→ Comprehensive planning
→ External impact
→ The Community Rating System
→ Post-flood mitigation funding

Customer service: The answer given most frequently to the question "why did you start your program?" was to serve the constituency. If residents cannot be protected by a structural flood damage reduction or drainage improvement project, the community feels it still has an obligation to help them.

> "The primary impetus behind this program is to assist individuals who 'fall through the cracks' of larger public works improvement or rehabilitation projects….Resolution of these typical problems is often beyond the capability of the average homeowner, thus there is a need for technical and financial intervention." – **Lexington-Fayette Urban County**

Economics: The most frequently cited reason for funding flood proofing was cost - it was shown to be less expensive than other flood protection measures.

> Flood protection studies in **Fairfax County**, Virginia, and **King County**, Washington, reviewed a variety of structural and nonstructural alternatives. Where flood proofing was found to be the most economical solution, the community favored it instead of a more expensive structural project. Fairfax County noted that flood proofing is cheaper than "chasing the system a mile downstream to fix the overland route."
>
> **Bolingbrook**, Illinois, compared the $35,000 flood proofing project to a sewer improvement project that would have cost over $100,000 (page 69). It was a no brainer.

Flood proofing is also less expensive than acquisition, especially where property values are high.

> **King County** estimated that it could elevate eight homes for the price of acquiring and relocating one. Part of this large difference in cost is due to the high cost of housing in the Seattle area.

Two cautions must be noted. First, communities must remember that flood proofing does not stop street and yard flooding, damage to infrastructure, traffic disruption and other problems that accompany floods. Protecting buildings is often only one goal of a flood protection program. Health, safety, and environmental protection are other concerns. Thus, using dollars and building costs only may not produce an accurate comparison between approaches.

Second, predicting the actual costs of projects in areas with little flood proofing experience may be difficult. A homeowner may construct a project at a relatively small out-of-pocket cost. The same project will cost substantially more if it is fully funded by a government agency that pays for engineering design and prevailing wages for the contractor.

Comprehensive planning: Some communities have prepared comprehensive watershed, flood plain management, or flood damage reduction plans. During the planning process, they concluded that flood proofing should be a part of the program, especially in isolated areas that won't be protected by structural projects. The plan may recommend a variety of ways to implement flood proofing projects, such as providing technical assistance and funding.

> **King County**, Washington's, *Flood Hazard Reduction Plan* includes preliminary project recommendations for over 120 flooding and erosion problem sites in the County. The plan looked at home elevation along with other flood protection measures, such as retrofits of existing flood control facilities, relocation of homes, construction of new flood or erosion control facilities, and improved flood hazard education and flood warning. The *Plan* identified 168 homes as possible candidates for elevation.
>
> The **Metropolitan St. Louis Sewer District** funded master watershed plans for its entire jurisdiction. The plans identified numerous places where flood control projects would be cost effective and other places where flood proofing appeared to be the most appropriate approach.
>
> The **Maumee River Basin Commission's** program was identified in its *Flood Control Masterplan*, a document that was mandated by its enabling legislation.
>
> Other communities that prepared general plans that recommended a role for flood proofing include **Barbour County**, West Virginia, **Frankfort**, Kentucky, **Homewood**, Illinois, **Mecklenburg County**, North Carolina, **Prince Georges County**, Maryland, and **South Holland**, Illinois.

While not preparing comprehensive plans, other communities have opted for flood proofing as part of comprehensive approaches to help all flood prone properties. In some cases, flood proofing was chosen as a way to help areas not protected by planned structural measures.

> **Mount Prospect** and **Des Plaines**, Illinois, initiated rebate programs to help people who would not be protected by major sewer improvements.

External impact: Sometimes flood proofing is selected because the other flood protection measures have adverse impacts on other properties or the environment. Structural projects can increase flood heights and destroy habitats. Except for barriers, flood proofing projects do not alter flood flows or affect habitats; they just modify existing buildings.

Flood proofing can also be less disruptive to a neighborhood than, for example, removing houses or building a large wall.

> **Fairfax County**, Virginia, had proposed channel improvements at public meetings. Residents objected to having their back yards disturbed by bigger and wider ditches. The County has since redirected its planning efforts to focus on flood proofing solutions in these neighborhoods.

In some communities, such as barrier islands and areas protected by levees, there may be no high ground to relocate people to. Flood proofing their homes on site may be the only alternative to moving far away.

Multiple Reasons for a Program

"**King County** became interested in home elevations because they eliminate the potential risks to life and limb; eliminate the vulnerability of existing private structures to flood damage; and eliminate the repetitive and exceptionally high costs for continued insurance claims, disaster loans and grants, flood warning services, private expenditures for repairs, emergency housing and response. Additionally, elevations will not require any new publicly funded long-term maintenance costs, will make homeowners eligible for lower flood insurance costs, and has no negative impacts to residents upstream or downstream of the project, or to the riverine environment.

"Home elevations were also selected because they meet the criteria of King County's overall major goals of flood hazard reductions which are the: 1.) reduction of flood-related hazards and damages; 2.) reduction of environmental impacts of flood control; and 3.) reduction of the long-term costs of flood control and floodplain management."

Community Rating System: The Community Rating System (CRS) is a part of the National Flood Insurance Program (NFIP). Flood insurance rates are reduced in communities that apply to the CRS and show that they are implementing flood plain management activities that exceed the minimum requirements of the NFIP. The CRS is discussed more in the next section.

Most communities apply to the CRS because they have already implemented some of the credited activities. However, once in the CRS, some want to improve their insurance rate reduction, so they initiate new programs to receive more credit for more activities. Most CRS communities implement the types of public information activities described in Chapter 4, in part to receive CRS credit, but primarily to offer ideas to owners on how to protect flood prone properties.

> As noted on page 15, **South Holland**, Illinois', program traces its roots to the CRS. Other communities receiving CRS credit for their flood proofing activities are listed in the Acknowledgments section, page ii.

Post-flood mitigation programs: Usually a community becomes interested in flood protection programs after a flood. Not only is there interest in trying new approaches, there may be funds available to support new programs. In the last few years, Federal disaster assistance programs have promoted and funded flood proofing as a way to reduce future disaster assistance payments.

For example, while processing the applications for grants to repair flooded wastewater treatment plants or other public buildings, FEMA staff identify flood proofing or other mitigation alternatives. They encourage the local applicants (and provide 75% of the cost) to incorporate flood proofing instead of returning the building to its pre-disaster, flood prone condition.

> The Village of **St. Charles**, Michigan, took advantage of the Department of Housing and Urban Development's post-disaster Community Development Block Grant to fund a comprehensive flood damage reduction program after it was flooded in 1986. The program included dike construction, bridge improvements, sanitary sewer protection and elevation of homes.

2.2. The Community Rating System

The Community Rating System (CRS) is a part of the National Flood Insurance Program (NFIP). It is administered by the Insurance Services Office for FEMA. Under the CRS, flood insurance premiums for properties in participating communities are reduced to reflect the flood protection activities that are being implemented. This program can have an influence on the design and implementation of a local flood proofing program

A community receives a CRS classification based upon the credit points it receives for its activities. It can undertake any mix of activities that reduce flood losses through better mapping, regulations, public information, flood damage reduction and/or flood warning and preparedness programs.

There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. A community that does not apply for the CRS or that does not obtain the minimum number of credit points is a class 10 community. Currently there are 1,000 communities in the CRS. They account for 66% of all flood insurance policies. Most are Class 8 and 9.

Community Rating System Premium Reductions

Class	Points	Premium Discount
1	4,500+	45%
2	4,000–4,499	40%
3	3,500–3,999	35%
4	3,000–3,499	30%
5	2,500–2,999	25%
6	2,000–2,499	20%
7	1,500–1,999	15%
8	1,000–1,499	10%
9	500– 999	5%
10	0 – 499	0

Benefits of CRS participation: The initial benefit to joining the CRS is the premium reduction for flood insurance policy holders. Each year a CRS community is saving its residents thousands of dollars. Those are dollars that are spent locally and not sent off to insurance companies.

However, as FEMA staff often say, "if you are only interested in saving premium dollars, you're in the CRS for the wrong reason." There are other benefits that are more difficult to measure in dollars:

More information on the CRS can be found at http://training.fema.gov/EMIWeb/CRS/

→ The activities credited by the CRS provide direct benefits to residents, including:

- Enhanced public safety;
- A reduction in damage to property and public infrastructure;
- Avoidance of economic disruption and losses;
- Reduction of human suffering; and
- Protection of the environment.

→ A community's flood programs are better organized and more formal. Ad hoc activities, such as responding to drainage complaints rather than a regular inspection program, are conducted on a sounder, more equitable basis.

→ A community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.

→ Technical assistance in designing and implementing a number of activities is available at no charge from the Insurance Services Office.

→ The public information activities build a knowledgeable constituency interested in supporting and improving flood protection measures.

→ The community has an added incentive to maintain its flood programs over the years. The fact that its CRS status could be affected by the elimination of a flood-related activity should be considered by the governing board when considering such an action.

→ Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.

Credited activities: A CRS classification is based on the number of points earned by a community. Points are provided under 18 activities arranged under four general series:

300 Public Information
- 310 Elevation Certificates
- 320 Map Information
- 330 Outreach Projects
- 340 Hazard Disclosure
- 350 Flood Protection Information
- 360 Flood Protection Assistance

400 Mapping and Regulations
- 410 Additional Flood Data
- 420 Open Space Preservation
- 430 Higher Regulatory Standards
- 440 Flood Data Maintenance
- 450 Stormwater Management

500 Flood Protection
- 510 Floodplain Management Planning
- 520 Acquisition and Relocation
- 530 Flood Protection
- 540 Drainage System Maintenance

600 Flood Preparedness
- 610 Flood Warning Program
- 620 Levee Safety
- 630 Dam Safety

Flood proofing credits: The CRS provides direct recognition of local flood proofing programs through four of these activities:

→ 330 – Outreach Projects: Credit is provided for handouts, mailings, brochures, booths, presentations and other methods of introducing people to the concept of flood proofing.

→ 350 – Flood Protection Information: Points are earned for having flood proofing references in the local public library and detailed information or links to flood proofing sites on the community's website.

→ 360 – Flood Protection Assistance: More points are earned for visiting properties and giving appropriate flood proofing advice to the owner, as well as providing information to help people find and deal with flood proofing contractors.

→ 530 – Flood Protection: Of the four flood proofing related activities, the most points are provided for actually flood proofing buildings. The credit is based on the technique used, the level of flood protection, and the number of buildings protected.

There is also credit for activities that indirectly support flood proofing. For example, Activities 320, 410 and 440 provide data that helps set flood proofing protection levels. Activity 610 credits warning programs that give owners lead time to install closures or other protection measures.

South Holland's Flood Assistance Program

Following a flood in 1990, South Holland, Illinois, residents were angry that the Village had not done more to protect them. The Village initiated a three pronged approach:

1. It created a Flood Liaison Committee where residents and staff met and discussed options.
2. It commissioned a study of flood control alternatives. A major regional reservoir was planned, but no one knew when (and if) it would be built. The study concluded that if the reservoir would be built in 15 years, it made more economic sense to wait for it rather than finance a local flood control project. Flood proofing was seen as an affordable way to help residents protect themselves from the more frequent, shallow floods, while efforts were put into getting the regional reservoir funded and built (it went on line in 2003, but Village officials know there will still be drainage problems and "spot flooding").
3. Staff were sent to a workshop on the Community Rating System. The Village joined the CRS and then reviewed the CRS Coordinator's Manual to see what other credits could be received. A floodplain management plan was prepared and adopted, following the CRS guidelines. The plan recommended a formal Flood Assistance Program.

The Flood Assistance Program has the following components:

- A Flood Assistance Coordinator (FAC) was appointed in 1994. The person was given a full-time job in the Building Department with part-time duties to help residents with their flooding problems.
- The FAC attended training on the NFIP and flood proofing at FEMA's Emergency Management Institute and workshops sponsored by the South Suburban Building Officials Association, the Association of State Floodplain Managers, and the Illinois Association for Floodplain and Stormwater Management.
- Backup technical assistance is provided by the Village's engineering and floodplain management consultants.
- In 1996, the Village published *Guide to Flood Protection* and *Guide to Protection from Basement Flooding*. These cover a variety of topics, including flood proofing ideas.
- The Village's monthly newsletter began regular articles on flood protection topics. Each issue reminds readers about the Flood Assistance Program.
- In 1994, the Village budgeted $100,000 for rebates and loan subsidies to help residents flood proof. The rebates provide a 25% cost share, up to $2,500 for projects that protect property from sewer backup, basement flooding, or surface flooding.
- The rebates were expected to cover projects under $10,000 and a loan program would help with more expensive projects. The loan program was not initiated because there were no requests for expensive projects.
- The initial $100,000 were not used up in the first year, so were carried over into later fiscal years. To date, the Village has spent $250,000 to support 569 projects at a total cost of $1,000,000. The cost of the projects ranged from $133 to $10,000, with the average cost at $1,750.
- The breakdown by type of project:

227	Drain tile system	195	Waterproofing/foundation crack repair
21	Sump pumps or power backup	100	Sewer backup prevention
15	Dry flood proofing	11	Other

Examples of projects funded by South Holland's rebates are on pages 1 and 18.

Chapter 3. Program Assessment

If a community is considering getting involved in flood proofing, it should start with an assessment of what is needed and what support exists for such involvement. This chapter reviews the things that should be included in the assessment.

A three part assessment is recommended: first the technical aspects, then the legal constraints, and finally the administrative aspects.

3.1. The technical aspects include

→ The flood hazard: what types of flood hazards does the community face?

→ The buildings: what are the building conditions and building types exposed to flooding?

→ Other planned measures: what other flood protection measures are planned or underway that would protect buildings instead of flood proofing?

→ Appropriate projects: what flood proofing techniques will be effective in this environment?

3.2. There are two types of legal constraints that should be assessed:

→ Statutory authority: what community activities are limited by state laws?

→ Code requirements: what measures are constrained by zoning or building code rules?

3.3. The administrative aspects are discussed in the last part of this chapter:

→ Level of interest: who will support a flood proofing program?

→ Staff capabilities: what is needed to ensure that there are knowledgeable and supportive staff?

→ Contractor coordination: are there contractors knowledgeable about flood proofing measures and would they support community efforts?

→ Public buildings: what publicly owned buildings would benefit from flood proofing and make good examples?

3.1. Technical Assessment

The first part of a community's assessment is to determine if there is a technical basis to pursue flood proofing measures as appropriate flood protection approaches. This depends on the type of flooding and the type of buildings exposed to flooding.

The flood hazard: The first question to ask in the assessment is "Is the flood hazard appropriate for flood proofing?" Certain hazards preclude flood proofing altogether. Flood proofing leaves a building in the floodprone area. If that area has crashing waves, deep flooding, erosion, flash flooding, or high velocity or heavy debris flows, another protection technique, such as acquisition or relocation, should be used.

Areas subject to high velocity and flash flooding are not safe for flood proofing measures that leave people and property exposed to these high hazards.

Dry flood proofing should be limited to areas subject to slow moving, shallow floodwaters. Local barriers should not be constructed where flooding is very deep. If there are high velocities during a flood, levees and earthen berms will be subject to erosion and scour. Areas subject to fast onset, or "flash," flooding should only be protected with techniques that do not rely on human intervention (see the "Terminology" box on page 4).

The buildings: Two questions must be asked before proceeding into flood proofing:

→ Are the buildings capable of being flood proofed?

→ Do the building types favor certain flood proofing measures?

Building condition: If a building has been vacant for a long time, is dilapidated, or otherwise in bad shape, it may not be worthwhile to preserve it with a flood proofing project. It may be more cost effective to demolish the building and either clear the site or replace it with a new one that is elevated above the flood protection level.

A second concern is the condition of the structure. If the foundation is cracked, it may not support the extra weight that comes with an elevation project or it may not be feasible to waterproof or dry flood proof the walls. If the walls are cracked, it may mean there are unstable soils or a settling condition that would discourage spending more money on a structure that will continue to have problems.

If these building conditions are common in a neighborhood, the community should pursue a structural flood control project to protect the area or an acquisition project to clear it out.

Building type: Certain building construction types favor certain flood proofing measures:

→ Crawlspace or pier foundations: as they are already partially elevated, elevating these above the flood protection level can be a very effective and efficient approach.

→ Basements: buildings with floors below grade can only safely be protected from sewer backup, high groundwater, or very shallow surface flooding. Because of the threat of wall failure dry flood proofing should not be used if there is surface flooding, unless the flooding is shallow and of short duration, soils are impervious, and a basement protection berm is utilized (illustrated), Most owners will not want to lose their basement, so elevation is usually unpopular.

This house has a basement, so the owner waterproofed the walls and built a berm to keep surface water from reaching the walls. Shallow floodwaters percolate through the ground and are pumped out by the sump pump. This project was designed by the owner (an engineer) after attending a local flood proofing workshop. The Village also helped with a rebate (South Holland, Illinois).

→ Buildings on slab foundations in good condition can be dry flood proofed where the flood protection level is less that three feet above the floor level.

→ Large masonry buildings can often be dry flood proofed as their walls and floor can handle greater hydrostatic pressures than a typical house.

→ Many commercial facilities, especially garages and unheated areas, can be wet flood proofed.

→ If flood depths are three feet or less, most buildings can be protected by a barrier, provided there is room on the site and it will not cause a drainage problem for neighboring properties.

Other planned measures: Before a great deal of effort is given to designing a flood proofing program for an area, the community should verify that a flood protection or acquisition project is not already underway. If another office or agency will be funding a project that will stop flooding or remove the buildings subject to flood damage, flood proofing would be a redundant use of public resources.

If a structural flood protection or acquisition project is being considered, but not yet finalized, the community should think about the pros and cons of each. The table on page 3 itemizes the advantages of each approach. It may be that an area-wide approach, such as a regional reservoir or major acquisition and clearance project, makes more sense, especially when coordinated with other community goals and needs.

Flood proofing programs are generally reserved for areas that are not slated to be protected by another approach. In some cases, they are considered interim measures that can provide protection from smaller floods while a larger flood protection project is being designed, funded and built (see South Holland's program on page 15).

Appropriate Projects: Flood proofing is an appropriate flood protection measure only for certain flood hazards and particular types of buildings. At the end of the technical assessment, the community should develop criteria to decide which properties should be protected by which measures. For example, if an area is subject to deep flooding, only elevation projects should be recommended.

The matrix shown on the next page provides an easy approach to determine which type of flood proofing measure works best in a given situation. Many communities have developed similar tables or flow charts to provide an objective way to select the appropriate flood proofing measure.

The Corps publication, Flood Proofing - How to Evaluate Your Options, provides detailed guidelines on determining the most appropriate measure for an individual building (see Section 8.3).

The result of this part of the assessment is a list of which flood damage reduction measures the community will support in certain areas or under certain conditions. The following are examples:

> **Des Plaines**, Illinois, is subject to two types of flooding: overbank flooding from the Des Plaines River and sewer backup. It is working with state and Federal agencies and other communities in the watershed to seek a structural project for the Des Plaines River. Therefore, its funding program is limited to sewer backup protection projects.
>
> The flood protection plan developed by **Homewood**, Illinois, recommended funding only elevation projects rather than cheaper dry flood proofing projects, because the Village could not be sure that flood proofing projects dependant on human intervention would be protected given the short warning times.
>
> The **Metropolitan St. Louis Sewer District** developed a scoring system that adds and subtracts points based on key flooding and building factors. The system may eliminate a measure (e.g., a levee in the floodway) and ranks the rest based on their effectiveness and cost.

The matrix shown below is intended for use by anyone who desires a simple means of comparing the performance of various measures when exposed to various flooding characteristics. It is intended as a planning tool only. This matrix can be found at the following web site: http://www.nwo.usace.army.mil/nfpc

	FLOOD DAMAGE REDUCTION MEASURES																			
	NON-STRUCTURAL MITIGATION MEASURES																STRUCTURAL MITIGATON MEASURES			
														NFIP						
FLOOD DAMAGE REDUCTION MATRIX	Elevation on Foundation Walls	Elevation on Piers	Elevation on Posts or Columns	Elevation on Piles	Elevation on Fill	Relocation	Buyout/ Acquisition	Floodwalls and Levees	Floodwalls and Levees with Closures	Dry Flood Proofing	Wet Flood Proofing	Flood Warning Preparedness	Flood Plain Regulation	Flood Insurance	Flood Mitigation [1]	Channel	Levee/Wall	Dams	Diversions
Flooding Characteristics																			
Flood Depth																			
Shallow (<3 ft)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Moderate (3 to 6 ft)	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Deep (greater than 6 ft)	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Flood Velocity																			
Slow (less than 3 fps)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Moderate (3 to 5 fps)	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Fast (greater than 5 fps)	N	N	N	Y	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Flash Flooding																			
Yes (less than 1 hour)	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
No	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ice and Debris Flow																			
Yes	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
No	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Site Characteristics																			
Site Location																			
Coastal Flood Plain																			
Beach Front	N	N	N	Y	N	Y	Y	N	N	N	N	Y	Y	Y	Y	N	[2]	N	N
Interior (Low Velocity)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N
Riverine Flood Plain	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Soil Type																			
Permeable	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Impermeable	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Building Characteristics																			
Structure Foundation																			
Slab on Grade	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Crawl Space	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Basement	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y	y	Y	Y	Y	Y	Y	Y
Structure Construction																			
Concrete or Masonry	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Metal	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Wood	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Structure Condition																			
Excellent to Good	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fair to Poor	N	N	N	N	N	N	Y	Y	Y	N	N	Y	Y	Y	[3]	Y	Y	Y	Y
NED/NER/Recreation/Social Characteristics																			
Economic																			
Structure Protected	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	[5]	N	Y	Y	Y	Y	Y
Cost to Implement	M	M	M	M	M	H	H	M	M	L	L	L	L	L	H/M	H	H	H	H
Potential Flood Insurance Cost Reduction (Residential)	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	-	Y	Y	Y	Y	Y
Potential Flood Insurance Cost Reduction (Commercial)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	-	Y	Y	Y	Y	Y
Potential Adverse Flooding Impact on Other Property	N	N	N	N	Y	N	N	Y	Y	N	N	N	Y	N	N	Y	Y	Y	Y
Reduction in Admin Costs of NFIP	N	N	N	N	Y	Y	Y	N	N	N	N	N	[6]	-	[3]	[7]	[7]	[7]	[7]
Reduction in Costs of Disaster Relief	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Reduction in Emergency Costs	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	[3]	Y	Y	Y	Y
Reduction in Damage to Public Infrastructure	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	[3]	Y	Y	Y	Y
Potential for Catastrophic Damages if Design Elevation Exceeded	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N	Y	Y	N
Promotes Flood Plain Development	N	N	N	N	N	N	N	N	N	N	N	N	N	[8]	N	Y	Y	Y	Y
Environmental																			
Ecosystem Restoration Possible	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N
Potential Adverse Environmental Impact	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y
Recreation																			
Recreation Potential	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	[3]	N	N	Y	N
Social																			
Community Remains Intact	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	[4]	Y	Y	Y	Y
Population Protected	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	N	[3]	Y	Y	Y	Y
Potential Structure Marketability Increase	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	[5]	N	Y	Y	Y	Y	Y

[1] NFIP Flood Mitigation may vary but it is usually buy acquisition or elevation
[2] Not generally recommended
[3] Buyout/acquisition only
[4] Elevation only
[5] Post FIRM construction only
[6] Post FIRM structures elevation on fill
[7] Yes, if project provides 100 year or greater protection
[8] Yes, if in flood plains less frequent than the 100-year

Y= Applicable
N-Not Applicable
M-Medium Cost
L-Low Cost
H-Hig Cost

2004

This matrix was developed by the National Nonstructural/Flood Proofing Committee. It provides a quick way to assess under what conditions the various flood damage reduction measures would be appropriate. Flood proofing measures are also included in this matrix.

3.2. Legal Constraints

There are two types of legal constraints that should be assessed: are there any state laws that limit the community's operations and are there any local codes that restrict what types of measures can be implemented?

Statutory authority: A community's freedom to develop a program may be limited by its legal authority to spend public funds on improving private property. In some communities, legal challenges have prevented implementation of well-planned programs.

The problem of statutory authority arises from Dillon's Rule, a Nineteenth Century court ruling that found that because they are created by state government, local governments can do only what state laws specifically authorize. If an action is not authorized by statute, a community cannot do it. In some states, larger communities may be granted "home rule." A home rule community is authorized to do anything that is not prohibited by statute.

Most communities have specific or implied authority to protect people and property from flooding. However, this has traditionally been viewed as authority to work on public property (e.g., land purchased by the public or work in public waters) to control flooding. The most common legal limitation on a community's program is a general prohibition that public money cannot be spent to improve private property.

Some communities and agencies have enabling legislation that specifically allows flood proofing.

> **Prince George's County**, Maryland, does not have a statutory authority question because Maryland law authorizes local governments to spend public funds on "stormwater management" which is defined as
>
> > "...the planning, designing, acquisition, construction, demolition, maintenance, and operation and disposition, practices, and programs for the control and disposition of storm and surface waters, including floodproofing and flood control and navigation programs."

Most states do not have laws that address flood proofing so clearly. A few communities reported either that it was against state law or that there was no specific authority to use public money to improve private property. In Tulsa, Oklahoma, the City Attorney issued an opinion that read:

> Under the Oklahoma Constitution ... expenditure of tax dollars must be for a public purpose. ...
>
> Flood proofing will increase a building's value with primary benefit to the individual property owner rather than the community and therefore does not constitute a public purpose. ...
>
> It is our opinion that the City of **Tulsa** may not use sales tax funds to finance or construct flood proofing projects on private property since such expenditure would be for a private rather than public purpose. Opinion 92-36

Other attorneys have reached other conclusions when looking at other state laws. Three opinions that support public funding of flood proofing are shown on the box on the next page.

As stated by one local official (referring to the surface drainage system) "it's appropriate to work on private property if the public system doesn't work." Communities with programs to protect properties from sewer backup report that the issue of statutory authority is never raised. The sewer system belongs to the community, so it has a responsibility to see that it operates without harming others.

> **Frankfort**, Kentucky's, attorney ruled that the City's revolving loan fund could not use public money to improve private property. However, the City has acquired and demolished floodprone homes and helped fund sewer backup valves.

Even if there is no clear authority to spend local money for a project on private property, most states have statutes that permit a local government to do anything that a State or Federal agency is willing to fund. These statutes were passed in order to allow communities to take advantage of Federal housing and community development grants. Because of them, most communities can sponsor and cost share on a FEMA mitigation grant.

Needless to say, it is important that staff check with the community's counsel to determine any and all legal constraints that may limit the community's freedom to implement a flood proofing program.

Code requirements: Local flood plain management ordinances, building codes and zoning regulations place restrictions on what can be done to buildings. The community's assessment needs to check the following:

→ If the community is in the National Flood Insurance Program, buildings in the regulated flood plain are subject to the **substantial improvement rule**. That rule states that if the cost of an improvement equals or exceeds 50% of the building's market value, then the building must be brought up to the same standards as a new building.

For a residential building, the rule means that the building must be elevated to or above the 100-year flood elevation plus any required freeboard. A nonresidential building can be elevated or dry flood proofed to that level. In other words, if the cost of a major flood proofing project for a house in the flood plain (plus other improvements made to the building at the same time) exceeds 50% of the house's value, the flood proofing option is limited to elevating the building.

→ The substantial improvement rule also applies to a building that is substantially damaged by any cause. "**Substantial damage**" means the cost to repair the building to its before-damaged condition exceeds 50% of the building's market value before the damage. Note "damage by any cause." The damage can be caused by a flood, tornado, earthquake, fire or accident and the rule applies to all buildings in the flood plain.

Legal Opinions on Statutory Authority to Fund Flood Proofing Projects

Louisiana (1993): In response to a request from the Amite River Basin Commission, Louisiana's Attorney General issued an opinion that read:

> *We see no reason why the Commission cannot conduct such projects in cooperation with other public and private entities, who will also be benefited thereby. That this project will be conducted upon and thereby benefit private property, does not, in our opinion, obviate the public character of this project as encompassed within the Commission's authority to develop flood protection plans. It occurs to us that most, if not all, flood protection facilities, works and plans benefit private property and the owners thereof.*
>
> *The fact that the expenditure of public funds for projects in the public interest may result in the enhancement of private property does not denigrate the public nature of such projects and the public purposes served thereby. Opinion 93-193*

Illinois (1992): The authority under which Illinois communities without home rule could act was researched by Professor Clyde Forrest, Jr., an attorney and professor of planning at the University of Illinois. He concluded:

> *... a review of Illinois Revised Statutes has disclosed many provisions relating to municipal drainage works and housing repair programs. When the necessary actions to achieve flood proofing are viewed as serving a public purpose, protecting the health and safety of citizens of the municipality, current statutes yield an interesting array of enabling authority. ...*
>
> *It is my opinion that authority exists for a non-home rule municipality to undertake the restoration of housing areas and construction of improved storm drainage projects and to use unrestricted public funds for such purposes.*

Professor Forrest cites five statutes and one section of the Illinois Constitution. The strongest authority comes from statutory authorizations for communities to undertake community development activities, to bring buildings up to safe and sanitary conditions, and to protect their residents from the health and safety problems of flooding. In Illinois, as in most states, there is authority to spend local funds on activities whose costs are shared with a state or Federal agency.

Missouri (2002): The Metropolitan St. Louis Sewer District is authorized by its Charter to maintain, operate, reconstruct and improve projects as part of a comprehensive stormwater control and drainage system. The District's Office of General Counsel concluded that it has the authority to work on and improve private property, provided projects follow these guidelines:

1. *A "nonstructural" or floodproofing project must protect a property from the same kind of flood, erosion or sewer backup threat that would warrant a structural flood control project.*
2. *A floodproofing project must be at least as cost effective as a structural project. The plans for projects to cost more than $25,000 must document how the public benefits from the approach recommended by including a comparison of the costs of alternative approaches.*
3. *A floodproofing program must include safeguards to prevent improvements to property not related to flood protection.*
4. *More complicated floodproofing projects, such as elevating or relocating a building, must be implemented by non-District contractors who have expertise in the field and who assume liability for their work.*

→ Some communities have added **cumulative** requirements to their substantial improvement and substantial damage regulations. If several improvement projects have been permitted, the percentage of each project is added up. If the next project, brings the cumulative total of all projects over the 50% threshold, it will be considered a substantial improvement. Some communities have used a threshold lower than 50% to trigger the requirement.

→ Some communities have flood plain management rules that exceed the NFIP's minimums. Some prohibit fill or require **compensatory storage**, criteria that limit the use of levees and floodwalls.

Elevating buildings on fill created drainage problems, killed trees, and displaced flood storage, so **Mandeville**, Louisiana, revised is flood damage prevention ordinance. It now limits fill within the "roof-shed" area. If more than 24 inches of fill is needed, it must be retained in a perimeter wall or another elevation technique must be used.

→ If the community is in the National Flood Insurance Program and there is a **floodway** mapped, projects that involve fill, such as a levee, or that increases the size of the building, such as a floodwall, are likely to be prohibited. In the floodway, no project can obstruct the flow of floodwaters, so fill and floodwalls could only be constructed if an engineering study demonstrated that there would be no rise in flood levels.

→ **Building codes** may add requirements, too. One common example is that if an older building will have electrical work, all the wiring and the service must be brought up to the current electrical code. While this is an excellent requirement, it adds a cost to a flood proofing project.

→ **Zoning** ordinances may also restrict what can be done if the project is a substantial improvement. If the building is noncompliant (i.e., it doesn't meet the current zoning requirements, but it was built before those requirements went into effect), a major project may trigger a requirement to bring the site into compliance.

→ Zoning ordinances often have restrictions on the **height of buildings**, especially in residential areas. For example, the zoning ordinance may prohibit a house more than 30 feet high. If a two story house is already 28 feet high, it would be difficult to allow it to be elevated much higher (e.g., the house in Dare County on page 41).

This house in St. Tammany Parish was elevated with funding support from DHS/ FEMA. The owner paid the 25% non-Federal share. The Parish amended its zoning ordinance to measure the height restriction from the 100-year flood elevation, rather than from the ground, facilitating elevation projects for taller buildings.

3.3. Administrative Assessment

Assuming that there are no technical or legal impediments to pursuing a flood proofing program, the third part of the community's assessment is to determine whether a program is administratively feasible. Funding a program is covered in Chapters 5 and 6.

Level of Interest: The assessment should consider:

→ Is anyone interested in flooding?

→ Is anyone interested in flood proofing?

First check with the community staff. People most likely interested in these issues include the engineer, public works staff, emergency manager, and the person responsible for the National Flood Insurance Program and the Community Rating System. All of these staff members have a duty to think about flooding and ways to reduce flood losses. Their interest in various levels of a local flood proofing program should be assessed first, to ensure that there is internal support for any proposals.

Second, who in the community cares about flooding? Most communities have some residents, neighborhood organizations, the Red Cross chapter, and even elected officials who remember the last flood and are concerned about what will happen when it floods again. These people should understand that there is more than one way to deal with flooding and the community should be using all tools at its disposal.

Third, consider who would support flood proofing. Likely supporters of this approach to flood protection include:

→ Property owners who want protection from shallow flooding, local drainage problems and other flood conditions where flood proofing can be the most cost-effective solution

→ People who have been flooded and who don't want to wait for a structural flood control project and/or don't want to sell to an acquisition program and leave their homes

→ People who oppose structural projects because they are disruptive, such as property owners who don't want to loose land or landscaping to a project and environmental groups (e.g., the Fairfax County example on page 11)

→ People, such as the engineer or public works staff, who support structural projects, but realize that there are places where they are not cost effective

→ People, including elected officials, who want to provide flood protection at a lower cost than a structural or acquisition project. This would include people who want to save local funds and take advantage of state or Federal financial support (see Chapter 5)

→ Contractors who install or construct flood proofing projects, but have lost customers who did not understand the benefits or could not afford a project

→ People interested in lowering flood insurance premiums by getting CRS Credits for the community's activities

All of these people can be supporters of a local flood proofing program. Some, like property owners and contractors, may push for a funding program while others, like elected officials, may want to spend as little as possible. It is important that the members of this constituency understand the potential for, and limitations of, flood proofing. Where possible, their advice and input should be sought.

> One surveyed community reported that budgets for its rebate program varied depending on who was mayor. A mayor supportive of the program was replaced by one who opposed the idea, who was later replaced by another supporter. The last mayor also supported rebates for projects constructed during the predecessor's term.

Staff Capabilities: It's one thing to want to implement a program, it's another thing to be able to do it. One of the first places to start is to ensure that local staff understands flood proofing and is willing to be involved in a program.

Key staff to coordinate with include:

→ Engineering/public works – the staff who will be needed to answer technical questions and who know where the most likely candidate properties are

→ Building department – the staff who know what's allowed by the building code, what local contractors are capable of, and how to work with property owners

→ Public information – the staff who will prepare informational materials for the public and property owners

→ Housing/community development – the staff with experience in funding and managing home improvement projects

→ Legal office – the staff who will review the community's statutory authority and agreements with property owners and who will be concerned about any liability the program will place on the community

→ CRS Coordinator – any activity should be checked with the Community Rating System before it is finalized to ensure the maximum credit points will be earned

It is important that the community have access to one or more engineers who can provide technical support. If the engineers want more information on flood proofing, there are several references that should be in their library. These are listed in section 8.3.

Training: There are several different training opportunities. Depending on state rules, these can usually ~~can~~ count toward the continuing education requirements for Certified Floodplain Managers, building officials, and professional engineers.

→ The Corps of Engineers National Nonstructural/Flood Proofing Committee (NFPC) can present a one or two-day flood proofing workshop. Interested communities should contact their Corps district Flood Plain Management Services staff (see Section 8.1) or visit the NFPC's on the web at www.nwo.usace.army.mil/nfpc/ The workshop can be tailored to meet local flooding and building conditions.

→ Everyone interested in flood proofing should take FEMA's Emergency Management Institute (EMI) home study course, IS-279, "Engineering Principles and Practices for Retrofitting Flood-Prone Residential Structures." In spite of its name, this is a short, non-technical overview of the field. It can be found at http://training.fema.gov/EMIWeb/IS/is279lst.asp

→ EMI conducts a free week-long course, E279 Retrofitting Flood-Prone Residential Buildings. The course is intended for those with engineering, architectural, or building science knowledge. The home study course, IS-279, is recommended as preparation. EMI courses are free for qualifying local officials. *For more information:* check out http://training.fema.gov/EMIWeb/ and review "Courses at EMI."

When **King County,** Washington, investigated starting a flood proofing program, it sent staff to other Washington communities that had been managing elevation projects.

Contractor Coordination: In addition to community staff, the interest and capabilities of local contractors should be assessed. Flood proofing may be new to many contractors, or some may think they know how to do it, but have no experience. Some questions to ask:

→ Do contractors know how to elevate the kinds of buildings that will be affected?

→ Do landscapers know they need permits when working in the flood plain?

→ Are plumbing contractors aware of all the ways to handle sewer backup?

→ Do the waterproofing contractors have a good track record?

If there have not been any flood proofing projects in the past, these topics should be discussed with local contractors. More likely, there are some firms experienced in the more common types of projects, like sewer backup and local drainage problems. The building department probably knows who is good and who bears watching.

Start with the firms with the good reputations and discuss alternative roles the community might assume, such as providing information or funding support. See if the contractors would support an increased community role and see if they feel they need training or technical guidance.

Communities have also found that some contractors are not adept at handling the paperwork needed for a government funding program.

Citrus County, Florida, noted "I think my biggest stumbling block for some reason is working with the contractors... I'm convinced that there are a lot of folks that have never

done a detailed bid, and find it difficult to break out the costs based on square footage so that we are not paying for more house than currently exists."

The *Mitigation Success Stories* summary of **Vassar**, Michigan's, home elevation project reported, "The length of time that it took to elevate the structures was due primarily to the contractor's inability to schedule and communicate properly with all parties. This led to high levels of angst with everyone. Future projects will be done with a better qualified contractor."

Many communities have found that contractors provide some of the best publicity of their programs, especially of programs that help the owner pay for a project.

Barbour County, West Virginia, worked closely with local contractors, who agreed to give a discount to participants in its program.

Licensing: A key question: Does the community have a program to license local contractors and revoke those licenses if they violate local regulations or conditions of a permit? Many communities require that contractors must be locally licensed before they can receive a building permit. The license may cost as little as $5 and is not a statement of the contractor's qualifications. It's simply a method of denying building permits to companies that don't follow the rules.

Many states license certain types of contractors. The state requirements should be reviewed before initiating a local program. For example, does state or local law require a licensed plumber to work on sewer lines? Such information is important for a handout on how to deal with sewer backup.

Public Buildings: One of the best places to start a flood proofing program is on the community's own buildings or other public properties. People resistant to helping improve private property may not oppose a project on public property.

In some communities, public buildings are the only ones that the local program has funded. Staff have been able to show a direct savings to the community's treasury by preventing further flood losses.

The research found numerous examples of fully funded flood proofing projects to protect existing public buildings. These include:

Baseball stadium – Davenport, Iowa
Railroad station converted to offices –- Mobile, Alabama, and Davenport, Iowa
Community center – Tampa, Florida
Fire department headquarters and training facility – Elk Grove Village, Illinois
Municipal offices – Boulder, Colorado (illustrated on page 64)
Public housing – Rosemont, Illinois (illustrated on page 5)
Water treatment plant – Hillsborough County, Florida

A flood proofed public building can also make a good model for other property owners. Some communities have expanded on the idea of a model and made their "disaster resistant" buildings into opportunities for public education. An excellent example of his is 113 Calhoun in Charleston, South Carolina, which is reviewed on the next page.

113 Calhoun

The 113 Calhoun Street Foundation is a private, non-profit organization established by the South Carolina Sea Grant Consortium, Clemson University Extension Service, and the City of Charleston. Its mission is to create communities more resistant to losses from natural hazards – flood, wind, and earthquake – and to promote ways of living that help people conserve natural resources through sustainable building practices.

The Foundation uses the building at 113 Calhoun Street as a learning center and demonstration of low-cost tools and techniques to accomplish this mission. The building is 125 years old, located in the historic district of downtown Charleston. It was abandoned and severely damaged by Hurricane Hugo in 1989. It was decided to use it as a demonstration project for the Foundation's mission. Funding support for flood proofing was obtained from FEMA.

All renovations and improvements had to comply with the historic district rules. However, the historic designation allowed for a variance to the substantial improvement requirement that the building be protected to the 100-year flood. To elevate it to the 100-year flood level would mean raising it four feet, which would destroy its historic appearance. There was also a concern about a public building being accessible under the Americans with Disabilities Act.

The flood proofing project had the following elevation and wet flood proofing components:

- The house was elevated, but not to the 100-year flood level. A benefit/cost analysis was conducted using FEMA software. It was found that raising it one foot would have significant benefits by protecting the structure from shallow, more frequent floods. It was calculated that the probability of flood damage was reduced by 60%.
- Due to the extreme deterioration of the original foundation, it was completely replaced with a concrete footing reinforced with steel rods bolted onto the foundation. This retrofit provides the building with greater resistance to shaking and twisting from earthquake and wind forces, as well as preventing it from floating off its foundation in a severe flood. The original brick from the foundation was re-used as a veneer over the concrete block to preserve the historic character and conserve resources through their re-use.
- The crawlspace is insulated with non-water absorbing foam insulation.
- All electric, telephone and computer outlets are located above the 100-year flood elevation. There are no splices or connections below that elevation.
- The furnace, air conditioning, and all ductwork is above the 100-year flood elevation
- Wooden panels, called wainscoting, were installed up to the 100-year flood elevation. These panels are less water-absorbent than wallboard and can be removed after a flood, allowing both the panels and the wall space to dry thoroughly.
- Protection measures for wind and other hazards were incorporated, including burying the utility service lines, installing different kinds of shutters and window coverings, and using hurricane clips.

More information on 113 Calhoun can be found at www.113calhoun.org

Chapter 4. Public Information Activities

From a local government perspective, the best flood proofing project may be one that is designed and built by a knowledgeable owner at his or her own expense. Public information activities can support such work at a very low cost. They can promote the concept of flood proofing, encourage owners to accept responsibility for their own protection and take the initiative, and provide technical information and direction.

As noted in section 2.2, the Community Rating System credits three types of public informational activities that support flood proofing. This chapter is organized according to the same three levels of involvement:

4.1. Outreach projects: handouts, mailings, brochures, booths, presentations and other methods that introduce people to the concept of flood proofing (CRS Activity 330 – Outreach Projects).

4.2. Technical information: references and websites that provide detailed information about flood proofing measures (Activity 350 – Flood Protection Information).

4.3. Advice and assistance: face to face discussions that give site-specific advice to the owner (Activity 360 – Flood Protection Assistance).

Information Brings Results

"The research reported herein demonstrates considerable interest among and effort by flooded homeowners to retrofit their homes to protect them from future flood damage. Several measures were undertaken by those who retrofitted. Moreover, they spent their own money – often considerable sums – to implement the measures….

"Having some source of retrofitting information appeared to encourage retrofitting, and the measures implemented by flooded homeowners who did consult an information source were evaluated by those owners as more protective than the measures implemented by homeowners who did not rely on a source [of information]."

Floodproof Retrofitting – Homeowner Self-Protective Behavior, University of Colorado, 1991, pages 221 and 223

4.1. Outreach Projects

Outreach projects are proactive activities. They reach out to people and give them information, even when they do not ask for it. Their objective is to make people aware of the flood hazard and ways to protect themselves from that hazard. Outreach projects should encourage people to seek out more information and take steps to protect themselves and their properties.

The CRS credit for outreach projects, found in Activity 330, is based on the method used to get the message out and how much of 10 credited topics are covered. Four methods are credited:

→ Sending the message out to everyone in the community,
→ Sending the message out to everyone in the flood plain,
→ Other approaches, and
→ Preparing an overall public information strategy.

The 10 topics are:

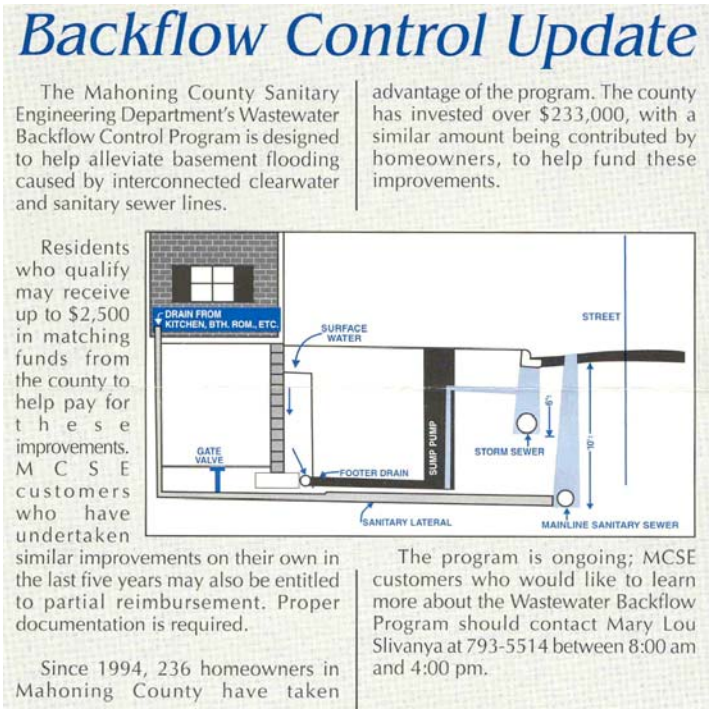
- → The local flood hazard
- → Flood safety
- → Flood insurance
- → Property protection measures
- → Natural/beneficial functions
- → A map of the local flood hazard
- → The flood warning system
- → Flood plain development permit requirements
- → Substantial improvement/damage rules
- → Drainage system maintenance

The local flood hazard and property protection measures are the two main concerns of flood proofing. However, the other topics are important to convey. It is important that people realize the limitations of a flood proofing project and the need to purchase flood insurance as a back up in case of failure or overtopping. Permit requirements, substantial improvement rules, and the warning system are also relevant.

An interactive display is one of the best ways to inform people about flood proofing.

More information on outreach projects and CRS credit for them can be found in *CRS Credit for Outreach Projects* at http://training.fema.gov/EMIWeb/CRS/docs/pub-330.pdf. The National Disaster Education Coalition includes agencies like DHS/FEMA and the National Weather Service, as well as organizations such as the Red Cross. The Coalition developed the *Guide for Standard Messages* to have consistency in the messages these groups provide to the public. The *Guide* can be seen at www.fema.gov/rrr/talkdiz/

A summary of the guidelines for developing outreach projects from these publications are on the next page. On the following pages are some excerpts of outreach projects that introduce the readers to flood damage reduction measures appropriate for the community.



Backflow Control Update

The Mahoning County Sanitary Engineering Department's Wastewater Backflow Control Program is designed to help alleviate basement flooding caused by interconnected clearwater and sanitary sewer lines.

Residents who qualify may receive up to $2,500 in matching funds from the county to help pay for these improvements. MCSE customers who have undertaken similar improvements on their own in the last five years may also be entitled to partial reimbursement. Proper documentation is required.

Since 1994, 236 homeowners in Mahoning County have taken advantage of the program. The county has invested over $233,000, with a similar amount being contributed by homeowners, to help fund these improvements.

The program is ongoing; MCSE customers who would like to learn more about the Wastewater Backflow Program should contact Mary Lou Slivanya at 793-5514 between 8:00 am and 4:00 pm.

Outreach projects, like this newsletter article, can promote flood proofing and explain the local program.

Guidelines for Successful Outreach Projects

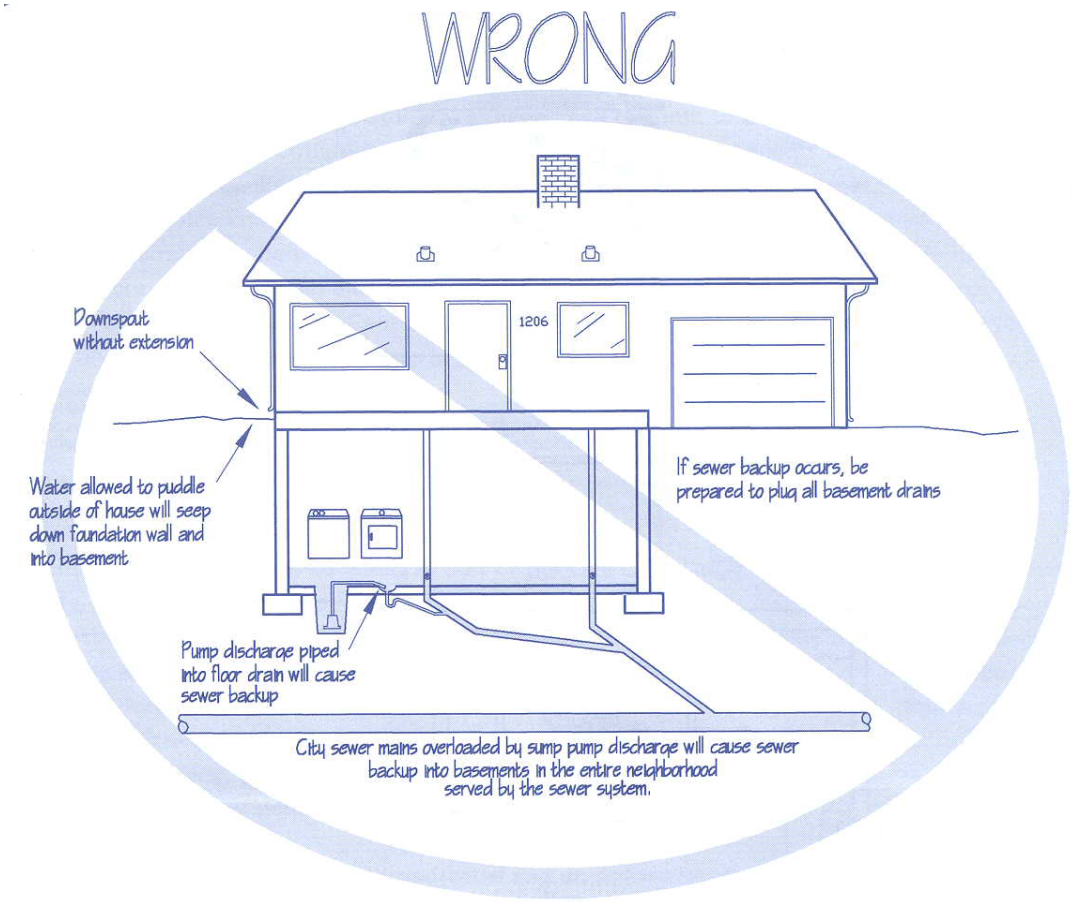
Several research projects looked into what will motivate people to protect themselves from flooding. These projects concluded that a properly run public information program can motivate property owners to protect themselves from flood damage.

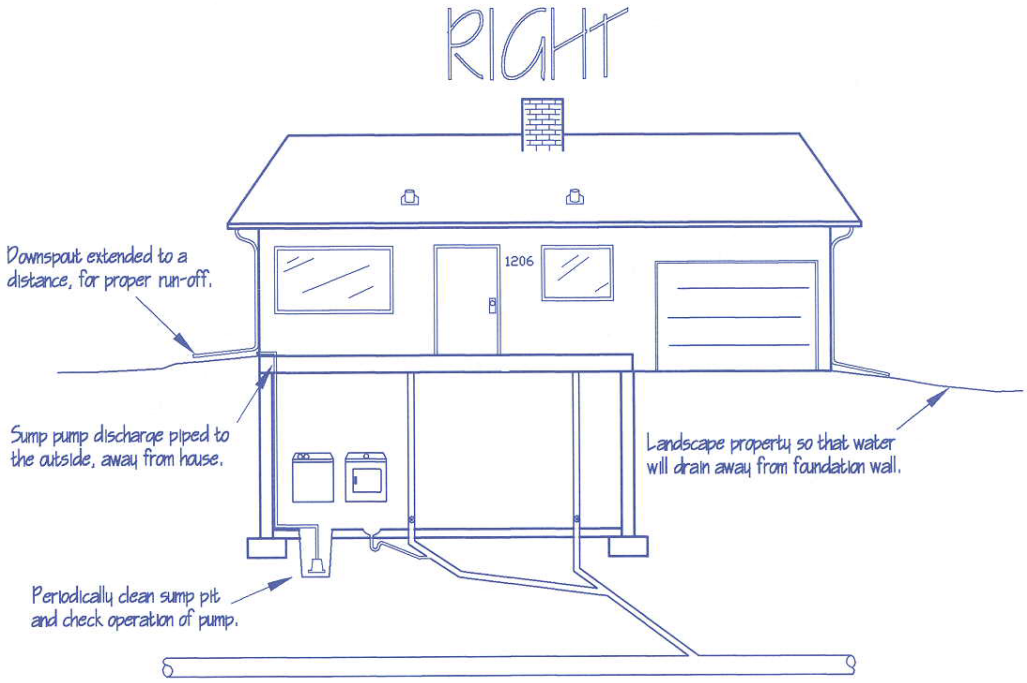
One experiment showed that direct mailing to flood plain residents was as effective as more expensive combinations of mailing, public meetings, and radio and television advertising. The research found that an effective public information program should be based on the following principles:

1. An initial outreach document should not be long and detailed. The objective is to raise the property owner's interest by explaining the general idea of flood protection. The project should describe where more information can be found.
2. A comprehensive program that reinforces the message from several sources at the local level is more productive.
3. Know the audience who will be receiving the message. Consider the audience members' ages and socioeconomic, ethnic, and educational backgrounds.
4. The message must be clear and unambiguous. It should be written to be understood by the lay person.
5. The information should be geographically personalized so that readers see that it addresses their situation. A brochure with a picture of a flooded local landmark will have a stronger impact than a state or Federal publication.
6. Individually addressed notices are more effective than general articles, maps, or letters addressed to "occupant," because they clearly tell recipients that they are affected.
7. Using the second person ("you are in the flood plain") is often simpler and more effective than the less personal third person ("recipients of this letter are in a flood plain").
8. The recipient must view the information source as credible, authoritative, and relevant. A statement by the city engineer may be more appropriate than one by the governor.
9. The information should cover the risk of the hazard without being too technical. Property owners must be convinced that they will be flooded someday.
10. The message must clearly articulate the most desirable measures. These measures must be appropriate for the hazard, affordable, and perceived as "realistic" by a property owner. They should fit in with the appearance of the area's housing.
11. Using physical props to make a presentation interactive will provide the greatest learning experience (see example, previous page).
12. Because no retrofitting measure is foolproof, especially against higher, less frequent floods, flood insurance should always be recommended. In areas subject to basement flooding, the community should investigate the availability of private insurance coverage for sewer backup and sump pump failure.

– *CRS Coordinator's Manual* and *CRS Credit for Outreach Projects*, FEMA, 2005 and *Guide for Standard Messages,* National Disaster Education Coalition, 1999

Flood Proofing Outreach Project: Grand Forks, North Dakota





Note: The "right" way should also include a sewer check valve.

Flood Proofing Outreach Project: Lansing, Illinois

This excerpt from a community newsletter is an example of an outreach project that receives full CRS credit for the topic of property protection. The Village has a separate, 20 page, handbook for property owners that devotes one or more pages to each type of flood proofing measure. All of its public information materials use the local mascot, Sammy Sandbag.

Floodproofing

Floodproofing a house means altering it so floodwaters will not cause damage. Different floodproofing techniques are appropriate for different types of buildings. See Sammy Sandbag's *Guide to Flood Protection,* which is available free at the Building Department. Use the following as a guideline:

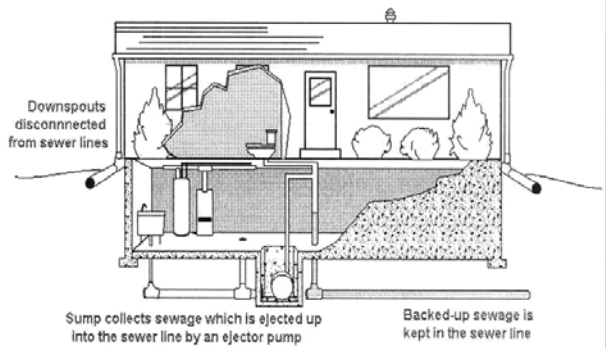
→ If you have a basement, split level, or other floor below ground level, there are lots of ways to protect your basement or lower floor from seepage and sewer backup (see illustration).

→ If your house is on a slab foundation, investigate a low floodwall, berm or "dry floodproofing" (i.e., making the walls watertight and closing all the openings when a flood comes).

→ If your house is on a crawlspace, a low floodwall, berm or "wet floodproofing" will work. "Wet floodproofing" means moving all items subject to damage out of harm's way so water can flow into the crawlspace and not cause any problems. If floodwaters go over the first floor, it is relatively easy to elevate the building to get the first floor above the flood level.

An excellent source for more information is *Homeowner's Guide to Retrofitting: Six Ways to protect Your House from Flooding* (FEMA publication 312). It can be read at the Library, ordered (for free) from the Federal Emergency Management Agency by calling 1-800/480-2520, or viewed and downloaded from FEMA's web site at http://www.fema.gov/mit/rfit/

Emergency measures: No matter what kind of building you have, some last minute emergency measures can always help. For example, you could move valuable items (photos, antiques, and other "irreplaceables" etc.) or items that are most damaged by floodwaters (upholstered furniture, stuffed toys, mattresses, foam rubber, etc.) up to a higher level. You can place sandbags or plastic sheeting in front of doorways and other low entry points. Whatever emergency protection measures you use, it is always best to have a plan written in advance to make sure you don't forget anything after you hear the flood warning. Keep in mind the flood safety hints at the end of this newsletter.



An overhead sewer is one way to prevent sewer backup

4.2. Technical Information

After outreach projects introduce people to the concepts behind flood proofing, the second stage of a public information program is to provide more details to those interested in learning more. People look for technical information in two places: libraries and websites. Both are reviewed here and both are credited by the CRS under Activity 350 – Flood Protection Information.

Libraries: Public libraries are a traditional resource for people who want to learn more about a subject. They can be stocked with flood proofing publications, most of which can be obtained free from the Corps, FEMA, the state or the community. They can also provide patrons with handouts and video tapes. People can get access to additional references through interlibrary loan systems.

Library staff can also be a partner in the community's flood proofing efforts. Libraries have their own public information campaigns with displays, lectures, and other projects, which can augment the activities of the local government.

CRS credit is based on the subject matter of the references in the community's public library. The most points are for documents on property protection. The references listed in section 8.3 could be ordered and given to the librarian for entry into the library's card catalog or computer reference system. Extra credit is provided for references that are locally pertinent, such as one published by the community or the state.

Websites: The extent of potential users of technical information on websites is growing every year.

> Nielsen/Net Ratings …reports that nearly 75% or 203 million Americans have access to the Internet from home….Women represent a higher proportion of Web surfers…"Women make the majority of purchases and household decisions, so it is no surprise that they are using the Internet as a tool for daily living." – Nielsen/Net Ratings, March 18, 2004

There are several advantages to providing technical information on a community's website:

- → Detailed information can be provided, such as great amounts of text and graphics, and even entire references,
- → It is easy to keep the information current,
- → Information can be provided to inquirers at all times of the day, and
- → Links can forward the user to additional references or agencies that can help

The CRS has several prerequisites that must be met before credit is granted for a community's website. They include those factors that make a site most useful for the lay user and are important for any site, whether or not one is seeking CRS credit:

- → The site must be easy to locate,

→ The link to the flood protection information must be clearly noted on the home page of the community's website, and

→ The site must be reviewed and updated at least once each year.

Once the prerequisites are met, the CRS credit points are based on the subject matter covered, using the same topics as for outreach projects (listed on page 31). Links to other sites are encouraged.

4.3. Technical Assistance

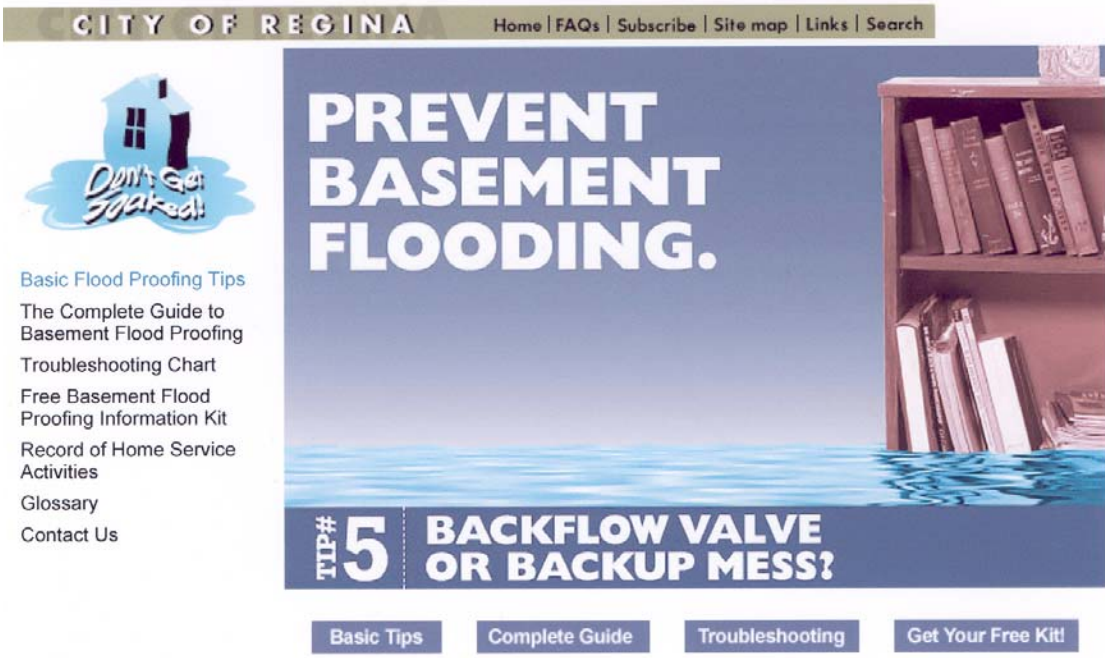
The most effective public information program is direct, face-to-face communication with an expert. The expert can assess what the property owner needs and can ensure that the appropriate information is communicated.

This requires staff that are knowledgeable and interested. Quoting directly from books or repeating formulae are not generally effective forms of assistance. The advisors must be confident and willing to help flood plain residents. Therefore, a community should limit the assistance it provides to those topics that it is ready and willing to cover.

Flood Proofing Website – Regina, Saskatchewan

The City's website has an extensive series of flood proofing guidance pages under the water and sewer department. It includes an animated series of graphics that show why houses flood, provides basic tips, and offers a free basement flood proofing information kit. All this can be found at

www.regina.ca/content/info_services/water_sewer/flood_control_diagram.shtml



Websites with Technical Information on Flood Proofing

→ Corps of Engineers' flood proofing publications can be found at www.nwo.usace.army.mil/nfpc/publications.html

→ Operated by Louisiana State University's AgCenter, the LouisianaFloods site provides many useful links to a variety of sources of information www.LouisianaFloods.org

→ FEMA's Homeowner's Guide to Retrofitting: *Six Ways to Protect Your House from Flooding* is on FEMA's website at www.fema.gov/hazards/hurricanes/rfit.shtm

→ FEMA's *Protecting Building Utilities From Flood Damage* is at www.fema.gov/hazards/floods/pbuffd.shtm

→ FEMA has a variety of fact sheets on flood protection at www.fema.gov/fima/how2.shtm#flooding and www.fema.gov/nfip/waysred.shtm

→ The Red Cross has emergency protection measures at: www.redcross.org/services/disaster/0,1082,0_585_,00.html

→ The full book, *Repairing Your Flooded Home*, is at www.redcross.org/services/disaster/0,1082,0_570_,00.html

→ The Institute for Business and Home Safety has several useful documents:
www.ibhs.org/publications/view.asp?id=343
www.ibhs.org/publications/view.asp?id=120
www.ibhs.org/natural_disasters/downloads/flood10.pdf

→ http://structuralbuildingmovers.com/movers.shtml lists contractors skilled in moving or elevating buildings, by state

The CRS credits providing technical information under two activities: 320 Map Information and 360 Flood Protection Assistance. Activity 320 credits providing information from the community's Flood Insurance Rate Map (FIRM). While this is useful, it is difficult to translate what the FIRM's 100-year flood elevation means to a particular property.

Therefore, Activity 360 provides credit for providing the following technical information:

→ Site-specific flood and flood-related data

→ Information on contractors and how to deal with contractors

→ Advice and assistance on flood proofing techniques

→ Making site visits and providing one-on-one advice to the property owner

Flood information: Providing site-specific flood and flood-related data, such as floor elevations, data on historical flooding in the neighborhood, or similar information can help inquirers relate the flood threat to their properties. This can be much more useful than being told the 100-year flood elevation from the FIRM.

Historical information can help people realize that the area floods and can convey how serious a flood can be. Often people are more willing to invest in a flood proofing measure that protects them from recent floods, rather than the remote sounding 100-year flood.

Contractor information: Most property owners do not want to flood proof their properties by themselves. People want and need to know the names of companies who can do the work. Many communities have lists of such companies from their building, housing, or community development department records.

Some communities and states regulate and license contractors for certain types of work (see "Licensing" on page 28). Providing a list of licensed contractors can be a very easy but helpful service.

Contractors can be imposing to many homeowners. Some work, such as basement waterproofing, is hidden, and the owner does not know if it was done correctly until the next storm (long after the contractor has gone). Therefore, advice on how to deal with contractors can be very valuable. This can be as simple as giving people a handout, such as the one from King County on the next page.

Additional information on dealing with contractors can be obtained from the local Better Business Bureau, local consumer protection offices, and state attorney general offices.

Technical advice: Technical advice can range from a discussion in an office about ways to protect a building (including insurance and the financial benefits of flood proofing) to site visits to written reports for the property owner. The most CRS credit points are given for the most effective approach, i.e., a site visit and one-on-one discussion with the owner.

Some communities are hesitant to provide technical assistance for two reasons: (1) they don't want to compete with local consultants or contractors or (2) they don't want to expose their staff to lawsuits if a recommended project fails.

King County

Department of Development and Environmental Services (DDES)

900 Oakesdale Avenue Southwest • Renton, Washington 98055-1219 • 206-296-6600 • TTY 206-296-7217

DDES Customer Information Bulletin #

6

Working With Contractors

• FREQUENTLY ASKED QUESTIONS •

Visit the DDES Web site at
www.metrokc.gov/ddes
for more information

King County DDES has created customer information bulletins to inform the general public about the effect of codes and regulations on their projects. These bulletins are not intended to be complete statements of all laws and rules and should not be used as substitutes for them. If conflicts and questions arise, current codes and regulations are final authority. Because the codes and regulations may be revised or amended at any time, consult King County staff to be sure you understand all requirements before beginning work. It is the applicant's responsibility to ensure that the project meets all requirements of applicable codes and regulations.

Alternative formats available upon request

This bulletin contains suggestions intended to help make customer remodeling projects as safe and economically painless as possible. If questions or concerns remain after reading the material contained in this bulletin, contact a representative at the Department of Development and Environmental Services (DDES) for assistance at (206-296-6600).

Choose a Contractor With Care

Because of increasing costs associated with new home construction and the rising price of property, many homeowners are electing to remodel their existing house rather than face the financial investment required to purchase a new home. Nowhere is the phrase, "Let the buyer beware," more important than in choosing a Contractor.

Finding the right Contractor is critical to the success of a remodeling project and finding satisfaction with the work. Following the steps outlined below should help customers select the right Contractor for the job:

1. Before contacting a Contractor about a project, take the time to define all aspects of the project and to list all the things that Contractor will need to do. Be as detailed as possible and include such information as: project scope, what materials are optimal, if there is a preference, the time frame in which to complete the work, and any other specifications relevant to the remodeling work.

2. Check with any friends who have had comparable work done and contact architects, lending institutions, and local Contractors associations for the names of Contractors they would recommend for the type of project. Contact several of the Contractors and discuss the project with them to make sure they do the type of remodeling work sought after (not all Contractors do remodeling).

First page of a four page handout from King County, Washington

The objective of the CRS credit is to provide interested property owners with *general information* that responds to their needs. Providing construction plans or specifications that should be prepared by an architect or engineer is not necessary. What is needed is enough advice to point the inquirer in the right direction.

For example, a well-meaning homeowner may try to seal up his basement walls without realizing the potential for hydrostatic pressure causing structural damage. Community staff could advise the owner to consider duration of flooding, soil types, and condition of the walls before pursuing that approach. The community staff would not prepare plans and specifications, but would provide technical considerations most lay people would not think of.

> The Flood Assistance Coordinator for **South Holland**, Illinois, is a licensed plumber and building official, well versed in sewer backup, flooding, and building construction. He attended the retrofitting course at the Emergency Management Institute and later became a Certified Floodplain Manager. He is not a engineer or architect, but he has received many letters of appreciation from property owners that he has helped.

The concern about lawsuits is a perennial one. The best defense is to provide the correct advice so the project will work when the property is flooded. If there is no flood damage, there are no grounds for a suit. The best way to ensure this is to have a trained staff person provide the assistance (see page 26). Keeping a written record of the advice given can also help, should the community have to defend what it did.

Flood audits: The ultimate level of technical assistance is known as a "flood audit." This is a site visit that reviews the flood threat, past experiences, and different approaches. The owner is given a written report with recommendations and examples of other properties that have used the recommended measures.

In some cases, the audit can be used to determine whether the community will provide funding support for a protection measure. It is more common, though, to leave it up to the owner to implement the recommendations.

> **Mecklenburg County**, North Carolina, funded acquisition and elevation projects for residential properties. To help nonresidential properties, the County paid for flood audits for 25 commercial buildings.
>
> **Bolingbrook**, Illinois, funded flood audits for several homes subject to local drainage problems. One is discussed on page 69.

Technical Assistance in Dare County

The unincorporated village of Avon is located at the southern end of Hatteras Island in Dare County, North Carolina. Many of the homes in the older portion of the Village were built in the late 1800's and early 1900's long before there were regulations on building construction. Flooding from eight hurricanes between 1954 and 1998 repeatedly damaged Dare County. Between 1985 and 1993, many of these older homes had floodwater inside the structures two or three times.

This frequency of flooding encouraged several homeowners in the Village to pay for elevating their homes without State or Federal assistance. They were encouraged and assisted in this effort by Dare County. The building inspector on Hatteras Island provided technical assistance to the homeowners. This included providing information on retrofit methods and site visits to help homeowners evaluate their options. The inspector also provided information on the condition of the building, names of contractors, potential costs and steps required to complete the project.

Dare County also encouraged the retrofit by not factoring the elevation of the structure into its tax assessment. Elevating a home reduces its risk of flooding and, in principle, increases the value of the home. Dare County's method of assessment does not incorporate this increase into the assessed tax value; thus homeowners do not feel penalized by the tax code for making the improvement.

More than forty homes on Hatteras Island were elevated in the 1990's, all without the benefit of state or Federal grants. The average cost associated with the retrofit projects was about $14,000 for a pile foundation and approximately $11,000 for elevation on a wall foundation (1993 dollars).

Most of the property owners who elevated their homes had flood insurance. Many used part of their flood insurance claim payments and additional bank loans to finance the elevation of their structures.

Home elevated in Avon by the owner

Berry A. Williams & Associates

The building inspector helped the property owners identify their flood insurance premium cost saving. This helped them see how long it would take to pay for the improvements with the reduced insurance premium. Generally, the payback period was 10-20 years. But according to the property owners, the biggest benefit is peace of mind.

The area was hit by Hurricane Floyd in 1999. Floodwater did not enter the habitable areas of any of the homes that had been elevated. However, areas beneath some of the houses were open with exposed ductwork and insulation. Only three of the elevated buildings received a flood insurance claim, and they averaged less than $2,000.

– Reported in *Evaluation of CRS Credited Activities During Hurricane Floyd*, FEMA, 2000, pages 15, 49, 50

Chapter 5. Funding Sources

This chapter reviews the various funding sources that have been used in communities around the country to help finance flood proofing projects. The next chapter covers the different ways those funds can be used.

Five general sources of funds are reviewed here:

5.1. Local taxes
5.2. Other local funds and fees
5.3. State and Federal grants
5.4. Property owners
5.5. Creative financing

5.1. Local Taxes

Most communities have a "general corporate fund" or "general revenue fund" that may be used to finance many kinds of activities, especially staff and administrative expenses. The general fund may be supported by property, sales, income and other taxes and fees.

Frankfort, Kentucky; **Rosemont**, Illinois; and **Fairfax County**, Virginia, identified general revenue as one of their sources for their programs.

Property taxes: Property taxes are the mainstay of most local governments. There are two kinds of property taxes, general and special purpose.

A special purpose storm drainage property tax finances the program in **Prince George's County**, Maryland. Revenue from this separate state-approved tax is deposited in a discrete fund. Money from this fund may be spent only on storm drainage projects (including flood proofing). Impact fees are also collected by the County and placed in this fund.

King County, Washington, has a special County-wide property tax levy that goes into its River Improvement Fund. It can be used for various river maintenance and flood protection purposes.

Projects in **Ascension Parish**, Louisiana, were cost shared with the Drainage Board, which has the authority to levy taxes for drainage protection projects. In **Jefferson County,** Texas, Drainage District No. 6 is the lead agency on flood proofing.

Sales taxes: Some states authorize communities to levy sales taxes for special purposes.

Mahoning County, Ohio, used general sales tax revenue to fund its program.

Using its home rule powers, **Mount Prospect**, Illinois, levied a sales tax of 0.25 percent for flood and stormwater purposes.

Bond issues: Bonds are usually issued to pay for large public works projects, including flood and drainage improvements.

> **Fairfax County**, Virginia, and **Homewood**, Illinois, identified bonds sold for stormwater or drainage improvement purposes as one of their funding sources.
>
> **Davenport**, Iowa, funded protection of a City owned railroad station that was being converted to an office building. The bonds are being retired with rental payments.

5.2. Other Local Funds and Fees

Sewer fees: Many communities charge a sewer or sewage treatment fee along with their water bills. These are often the source of funds for sewer backup protection projects.

> **Aurora**, Illinois, adds a $2 charge to its monthly water bills for drainage and sewer projects. It has used this fund to pay the rebates for sewer backup protection projects.
>
> The **Illinois-American Water Company** is a private company that provides water and sewer services to a variety of communities under municipal franchises. It has provided 50% of the cost of sewer backup prevention projects up to $4,000. The owner pays 100% of any costs over $,4000. Some municipalities have chipped in on the owner's share. The Company offers interest free loans to help owners pay their share, but there have been very few takers.

Stormwater utility: A stormwater utility is based on the premise that each property should be charged according to how much it uses the stormwater system (i.e., how much stormwater runoff it generates). Everyone pays. Unlike some taxes, no one is exempt.

Under the typical approach, each single family home pays a base rate, usually $2 to $5 per month. Other properties pay according to their "equivalent residential unit" amount of impervious surface. A five acre shopping center with a parking lot would pay more than a five acre lot with one building and a lawn. This method of financing flood protection and stormwater management activities is being used by more and more communities around the country.

> **Mecklenburg County**, North Carolina, funded its flood audits and other flood protection projects with stormwater utility income.

Impact fees: Impact fees are contributions from developers. They are designed to offset the cost a new development will add to the community's expenses. For example, if a new subdivision increases the amount of runoff that drains into the community's storm sewer system, the developer might be charged an amount sufficient to pay for increasing the capacity of that system.

> In **Fairfax County**, Virginia, developers are required to contribute to the cost of handling the increased stormwater runoff produced by their developments. The fees are put in a fund for drainage projects. Flood proofing can be funded when it is shown to be an economical way to handle a drainage problem.

5.3. State and Federal Grants

State funds: Some states have had special appropriations to support local programs.

> **Washington**, **Louisiana**, **Illinois,** and **Minnesota** have state programs to fund or cost share on flood protection and flood proofing projects. Washington's Flood Control Assistance Account Program receives $4 million from the state legislature every two years. Minnesota's Flood Damage Reduction Grant Program provides 50% of the local cost of flood mitigation projects. It has helped fund over 100 ring dikes to protect farmsteads.
>
> Many states have provided additional funds to help with the non-Federal cost share for FEMA's mitigation grants (see page 46). **Missouri** has allocated $100,000 of general revenue for the non-Federal match for Flood Mitigation Assistance projects.
>
> The **Illinois** Housing Development Authority's loan program is described on page 51.
>
> **Virginia** and **Florida** collect surcharges on insurance policies and place the funds in a state mitigation fund.
>
> The **Maumee River Basin Commission's** projects were initially funded by state lottery proceeds. Most recently, it received a one-time special state appropriation of $75,000 for two years. These funds go far because the Commission limits its share of projects to $5,000 each. An example is on page 64.

For more information: contact the state NFIP Coordinator to find out if there are any appropriate programs. A directory of state Coordinators can be found at www.floods.org/StatePOCs/map.asp

Community development programs: The Community Development Block Grant (CDBG) is administered by the Department of Housing and Urban Development (HUD). The objectives of the program are to benefit low and moderate income persons to prevent or eliminate slum and blight conditions and to meet other community development needs that are urgent due to serious and immediate threats to the health and welfare of the community. Flood proofing a home is certainly a way to prevent blight and health hazards.

> The CDBG has funded home elevation projects in **Terrebonne Parish**, Louisiana; **Kampsville**, Illinois; **Oakdale**, Tennessee; and **St. Charles**, Michigan.

One advantage of CDBG is that it can be used toward the non-Federal cost share for other programs (see page 53). There is also a provision for special appropriations of CDBG following a disaster declaration. CDBG Disaster Recovery Grants have been used extensively for elevation and acquisition projects.

For more information: Larger, or "entitlement," communities receive annual allocations of CDBG funds. Small communities apply to the state, which is described more at www.hud.gov/offices/cpd/communitydevelopment/programs/stateadmin/index.cfm

HUD funds have also been used to relocate or otherwise protect public housing projects. *For more information:* contact the local public housing agency.

The Economic Development Administration has programs to help communities with economic recovery after a disaster. *For more information:* www.eda.gov/

> **Davenport**, Iowa, used EDA funds to design flood proofing projects for local businesses. Implementation of the plans was left to the businesses.

Flood Damage Reduction Agencies: Three Federal flood damage reduction agencies have directly funded flood proofing projects:

→ The Corps of Engineers can fund flood proofing and/or acquisition projects both from a plan formulation and implementation perspective. *For more information:* contact the Corps district office (Section 8.1).

→ The Department of Agriculture's Natural Resources Conservation Service is able to fund flood proofing projects in smaller watersheds. *For more information:* The NRCS office is co-located with the local soil and water conservation district, usually located in the county seat.

→ The Tennessee Valley Authority has funded projects, but the program has been discontinued.

The lessons learned from these agencies' work is often transferable to local government programs. One example of this is the Corps' publication, *A Flood Proofing Success Story*, which provides documents on dealing with property owners and contractors that are applicable to all financing programs. This can be found at www.nwo.usace.army.mil/nfpc/publications.html

Disaster Assistance: If a community is hit by a flood or other disaster and the area subsequently receives a Federal disaster declaration, FEMA and the Small Business Administration (SBA) can provide disaster assistance funds. There are three disaster assistance programs that can support flood proofing:

In most cases, most property owners will qualify for an **SBA Disaster Loan**. The loans generally have interest rates that are lower than market rates. They are to cover the cost of clean up, repairing and rebuilding a damaged structure. If the building was flooded and a state or local regulation requires that the building be elevated or flood proofed, the SBA can loan an additional 20% to cover the cost of meeting the requirement.

> **Snoqualmie**, Washington, used SBA loans to fund many home raising projects in the late 1980's. The City revised its flood plain management regulations to make more mitigation funding available after future floods. Instead of using 50% to define substantial damage, the ordinance set the threshold at 10% for flood damaged residential structures.

The SBA recently experimented with a Pre-Disaster Mitigation Loan Program to provide low interest loans to small businesses for the purpose of implementing mitigation measures to protect property. There have been very few takers for this assistance and its future is uncertain.

People who cannot qualify for an SBA loan, may be eligible for help under the **Assistance for Individuals and Households program.** Under this program, FEMA provides a cash grant of up to $25,000 per household to cover temporary housing and other expenses that are not covered by other programs.

The housing assistance component has been used by recipients for small flood proofing projects, such as elevating a furnace, water heater, washer/dryer, or electrical service box above the flood level. These grants can be especially useful in areas where lower-income or fixed-income families are subject to shallow flooding.

Under the **Public/Infrastructure Assistance program**, FEMA can provide 75% of the cost of repairing or restoring facilities owned by public agencies and certain private nonprofit organizations. The program can fund flood proofing features as part of repairs to a qualifying building, if it can be demonstrated that the proposed measure is technically feasible, cost-effective, and required by a state or local regulation.

For more information: a disaster field office will be established after the disaster declaration. The assistance programs that become available will be widely publicized after the disaster declaration. The specific rules and funding levels in effect at the time of the declaration will also be explained, often at an "applicant's briefing" for local governments.

Hazard mitigation grants: FEMA administers three programs that provide grants for certain types of flood proofing projects. Generally, these are limited to projects that bring a building up to the current code requirements for new buildings. However, in some cases, they have been used for less involved flood proofing projects.

The **Hazard Mitigation Grant Program** (HMGP) provides grants to local governments to implement long-term hazard mitigation measures *after* a major disaster declaration. The program will pay up to 75% of the cost of projects, such as acquisition, relocation, elevation and flood proofing (the last for nonresidential buildings).

This home in Fort Collins, Colorado, was flood proofed with support from the Hazard Mitigation Grant Program. The window wells were raised (right) and a wall was built around the stairwell. A removable shield needs to be put in place before water reaches the top of the stairwell.

Any community in a state that receives a disaster declaration can apply for the funds, in accordance with state procedures and priorities. Projects must be shown to be cost-effective, and they may mitigate hazards other than the one that caused the disaster.

> In 2001, the State of **Oklahoma** made mitigation of repetitively flooded properties throughout the state a funding priority after an ice storm caused damage in the eastern half of the state.

The **Flood Mitigation Assistance** (FMA) program provides grants to states and communities for projects that reduce the risk of flood damage to structures covered by flood insurance. As with HMGP, FEMA pays 75% of the cost of these measures. Unlike HMGP, it is not triggered by a disaster. Each state receives annual funding and all funding applications go through the state's emergency management agency.

FMA projects must bring an *insured* structure into compliance with NFIP flood plain management requirements. They must be cost-effective and technically feasible.

The **Pre-Disaster Mitigation** (PDM) program is the newest of the three mitigation grants. The first year of funding awards was 2004, so there is not much experience in the use of these funds. As with the other two DHS/ FEMA programs, the grants are on a 75/25 Federal/non-Federal cost share.

> To receive FMA or PDM funds, the applicant community must have adopted a hazard mitigation plan. This prerequisite will be in effect for HMGP after November 1, 2004.

5.4. Property Owners

For an activity that directly benefits a property the owner can be asked to contribute. Owners who recognize that they have a real flood problem are willing to pay a large part of the cost. In the last few years, owners have paid the non-Federal 25% cost share for many of the FEMA mitigation grants in some states. In the Amite River Basin Commission Demonstration Project (page 49), the owners paid up to 50% of the final costs to elevate their homes.

After a flood, owners may have cash, such as an insurance claim or disaster assistance, that they were ready to put into repairing their home. By incorporating the right measures in those repairs, the building can be flood proofed.

Level of effort: Having the owner of the protected property contribute to the project's cost has two advantages:

→ The community's funds will go farther

→ It gives the property owner a stake in the project

By having an investment in flood proofing, the owner will have an incentive to make sure the property is properly maintained. The owner's share should be large enough to be a meaningful investment but not so large that the owner cannot afford to flood proof.

In 1993, the Village of **Homewood**, Illinois, could have paid the full cost of each elevation project. However, for the reasons stated above, it decided to have each property owner pay $1,500. This figure is based on the costs the owner would have to pay if the building were insured and flooded: $500 for the structural deductible, $500 for the contents deductible, and $500 for uninsurable items.

The City of **Vassar**, Michigan, opted to split the non-Federal cost share of FEMA grants with the owners. Each paid 12.5%.

Communities have reported that many owners do not balk at paying larger shares of flood proofing projects. In the Amite River Basin Commission's case, owners paid up to $50,000 for their share of the cost of protecting their homes (see next page).

Increased Cost of Compliance: Increased Cost of Compliance (ICC) is coverage that is included in all NFIP flood insurance policies. The coverage was created to help insured property owners pay for the cost of bringing flooded buildings into compliance with state and local flood plain management regulations.

An ICC claim payment is triggered by codes or regulations when the building is ruled to have been substantially damaged or repetitively damaged by flooding. ICC can be used to pay up to $30,000 for certain costs associated with bringing the building into compliance with the codes (i.e., elevation, relocation, demolition, or, in certain cases, flood proofing). The codes are keyed to the flood plain regulations, so ICC can only be used for substantially damaged or repetitively damaged buildings located in the community's regulatory flood plain.

ICC claim payments must be used by the policy holder to fund the flood protection project required by the local code. Because the owner paid the insurance premiums, an ICC payment is considered the owner's money and therefore can be used toward the local cost share of a FEMA mitigation grant.

ICC is relatively new and local officials and insurance adjusters are still learning how to make it work smoothly. To date over 1,300 flooded and insured properties have been elevated or otherwise protected across the country.

For more information: Increased Cost of Compliance Coverage – Guidance for State and Local Officials and FEMA's website, www.fema.gov/nfip/icc.shtm

5.5. Creative Financing

A community is limited only by its imagination. Several have found "creative" ways to find funds for flood proofing. An excellent example of creative financing can be seen in the Amite River Basin Commission Demonstration Project on the next page.

Illinois levies an income tax which it shares with local governments. For a few years the share was increased. The City of **Des Plaines** appropriated $200,000 from this "extra" money to establish a fund for its flood proofing rebate program.

The Amite River Basin Demonstration Project

Five homes were elevated in the Denham Springs, Louisiana, project that was coordinated by the Amite River Basin Commission. Property owners and Commission staff worked to receive a special demonstration grant from FEMA in 1993. The budget for the project shows the variety of funding sources used.

Federal Emergency Management Agency	$277,000
Amite River Basin Commission	50,000
City of Denham Springs: City attorney's legal services, waiver of inspection and permit fees, surveys and bench marking, security, disposal of debris	25,000
Louisiana State University School of Design	20,000
Property owners (average of $36,000 each)	182,000
Louisiana Cooperative Extension Service (expenses above payment)	12,000
McKee and Deville, consulting engineers (expenses above payment)	10,400
Eustis Engineering, soil borings (expenses above payment)	3,750
Local title attorney & notary (waiver of fees)	
Certain utilities (waiver of connect/disconnect fees)	
Sunburst Bank (discounted points and fees for two new customers)	
"True" project cost	$580,150

The shares paid by the Commission, the City, the University and the property owners can be counted toward the non-Federal match for grant programs. The waiver of fees, city labor costs, and expenses above payment are considered "in kind services" and can usually be counted toward the non-Federal match for many grant programs (see page 53).

It should be noted that the project funded more than the elevation of five homes. Other project goals included:

- → Demonstrate a procedure for raising slab structures that minimizes displacement of homeowners;
- → Document the procedure for the education of flood victims;
- → Conduct homeowner workshops on raising structures;
- → Develop a local elevation permitting ordinance;
- → Educate local tradesmen in elevating structures; and
- → Establish local technology for either a satellite office or new businesses.

This is one of the five structures that was elevated in 1995. All five escaped damage when the area was flooded by Tropical Storm Allison in 2001.

Promoting Mitigation in Louisiana

Chapter 6. Funding Arrangements

The previous chapter reviewed the many different sources of funding that can be used to finance local flood proofing projects. This chapter discusses how funds can be managed. The local programs reviewed fall into four categories of funding arrangements. They range from the least cost to the community to the greatest level of funding and involvement by the community:

6.1. Low interest loans
6.2. Rebates
6.3. Cost sharing
6.4. Full funding

6.1. Low Interest Loans

Low interest loans look attractive to a funding agency. Eventually, the funds will be repaid so they can be loaned to flood proof other properties. Loans also avoid the challenge that the community is "giving" money to improve private property.

However, flood proofing loan programs have yielded mixed results. Michigan offered them before floods had occurred, but there were few requests. Illinois' is described on the next page. In both cases, most of the appropriation was not used. The Small Business Administration's experimental Pre-Disaster Mitigation Loan had a similar lack of applicants (page 45) and may be discontinued.

On the other hand, the Small Business Administration's low interest disaster assistance loans have been widely used to flood proof properties. Its popularity may be due to the fact that it is the only source of financial assistance for most uninsured property owners following a disaster.

> **Licking County**, Ohio, and **Mecklenburg County**, North Carolina, advertised flood proofing loan programs but had no takers.
>
> A loan program for sewer backup protection administered by the **Illinois-American Water Company** has had only one applicant.
>
> **Fort Collins**, Colorado, planned on establishing a loan program using a FEMA mitigation grant. However, the grant required proof that the funds were being spent and the City could not do that with a loan fund. The approach was dropped.

Two variations on the low interest loan are the revolving loan and the forgivable loan. In a revolving program, loan payments replenish the fund and are used to fund more loans.

With a forgivable loan, the recipient is not required to pay the loan back provided the property is not sold for a certain time period. If the property is held, the loan is "forgiven" and thus serves as a grant. If the property is sold within that period, the owner must repay the principal and interest.

Both approaches are common in urban renewal and property rehabilitation programs. Staff in a community with such programs should check with their administrators to learn how such loans work and whether loans would be used by the owners of properties that would benefit from flood proofing.

The **Maumee River Basin Commission** helped a local bank establish a "loan/grant" for up to $5,000 to help fund flood proofing projects. If the homeowner occupies the structure for a period of five years or more after receiving the loan, then the bank waives the repayment requirement, thus making the loan a grant. If the homeowner sells the property prior to the five years, then the participant must repay a certain percentage of the original loan as pro-rated on the length of time in the structure. The loan would qualify toward the owner's match, but no one has yet applied.

6.2. Rebates

A rebate is a cost shared grant, usually given to a property owner after a project has been completed. It has the advantages of a low public cost share and simplicity. Many communities favor it because the owner handles all the design details, contracting, and payments before the community makes a full commitment.

Flood Proofing Loans in Illinois

In 1988, Illinois experimented with a low interest flood proofing loan program. Loans of up to $5,000 were made available at 2 percent interest. The program was established after a major flood in 1987 when it was expected that there would be a lot of interest in flood proofing. Because so much of the flooding had been sewer backup and basement flooding outside the flood plain, the $5,000 limit was expected to cover most projects.

The loans were made through cooperating banks with the interest rate subsidized by the Illinois Housing Development Authority (IHDA). IHDA's statutory authority limited its funds to housing assistance for low or moderate income families. "Low and moderate family income" was set at $35,000.

Eighteen Chicago suburbs, one suburban county and five banks participated in the program. IHDA dealt directly with interested banks. The banks processed the loan application, making sure the project was approved by the community and that there was an ability to repay. The banks treated the loan as a second mortgage, although no appraisal was required.

Once the loan was completed, IHDA purchased it from the bank. The banks collected the monthly payments from the loan applicants and made quarterly payments to IHDA. All the loans were paid off, many of them early when the owners refinanced their homes to take advantage of lower interest rates.

During the life of the program, only 14 loans were issued, in eight communities. Only $50,000 of the $500,000 set aside was used. It is suspected participation was low because the income limit made most suburban families ineligible.

In spite of the low turnout, loan recipients rated the program as a success. Most would not have flood proofed without the assistance; one called it "a godsend." An analysis of the program recommended that more loan programs should be tried, but without the income limitation and with simpler application procedures.

Community cost shares for flood proofing rebates have been as low as 20% and as high as 50%. Rebates leverage public funds. For example, for every public dollar spent in a program with a 25% rebate, the property owner pays three dollars toward the flood proofing project.

> **Mount Prospect**, Illinois, contributes 20% of the cost of a sewer backup protection project, up to a maximum of $1,000. It has funded 15 – 20 projects each year for an annual budget of only $15,000.
>
> **Lexington-Fayette Urban County**, Kentucky, has had a rebate program since 1992. It funds up to 50% of the cost of a project. It has distributed nearly $1,250,000 to protect 340 homes from surface flooding.

The administrative simplicity is due to the typical operation: the owner ensures that the project meets all the program's criteria, has the project constructed, and then goes to the community for the rebate after the completed project passes inspection.

Rebates are more successful where the cost of the project is relatively small, e.g., under $5,000. The owner can afford to finance the bulk of the cost and the rebate acts more as an incentive than as needed financial support. For more expensive projects, such as a $40,000 house elevation, someone besides the owner may pay the majority of the cost. This is discussed in the next two sections.

Operation: A typical rebate operation follows these steps:

1. The community publicizes the program and invites applications
2. An applicant talks to community staff, making sure the project will qualify
3. The applicant selects a contractor that is licensed or otherwise on a list of contractors approved by the community
4. The applicant or the contractor takes out the building permit
5. The project is constructed
6. The community inspects the completed project, ensuring that it meets all code requirements
7. If the project passes the inspection, the applicant applies for the rebate

Materials: A local rebate program will typically require the following documentation, in addition to the normal permit application and inspection materials:

→ From the community

- Publicity materials (see Mahoning County's, page 31)
- Rebate application form

→ From the applicant, at the time of application

- A description of the work
- Contractor's invoice or other evidence of the cost
- Proof of ownership

→ From the applicant, when the project is completed

- Proof of payment
- Proof of passage of the final inspection (where the rebate office is other than the permit office)

Aurora, **Elgin**, **Bartlett**, **Des Plaines**, and **DuPage County**, Illinois have rebated 50% of the cost of sewer protection projects. Some limit the funds to residential buildings. Aurora requires a history of sewer backup and rebates half the cost of the permit fees as well.

South Holland, Illinois', rebate program is discussed on page 15.

6.3. Cost Sharing

As noted earlier, rebates are more successful where the cost of the project is relatively small. As the cost of the project increases, so does the need to provide more financial assistance to the owner. Cost sharing can involve a variety of sources of funds: the community, a state or Federal grant, or a private source.

The difference between a rebate and cost sharing is one of involvement. Under the rebate approach, the owner does all the work and the community reimburses him or her for a small percentage of the cost. Under cost sharing, the community does most of the work, and the owner generally pays the smaller share. Administering a cost-shared program is covered in Chapter 7.

Non-Federal match: As noted in the previous chapter, FEMA's funding programs provide 75% of the cost of a flood proofing project. The biggest hurdle for a community is typically finding the 25% non-Federal share. The more common approaches have been:

→ Local funds: Possible sources are discussed in the previous chapter.

→ State funds: Several states have programs to pay a share of the 25% non-Federal match. These include Iowa (10%) and Washington and Illinois (25%). Sometimes these funds are limited to only post-disaster situations.

→ Eligible Federal programs: Some programs "lose their Federal identity," that is, the money is not counted as Federal money and can be used toward the cost share. These include the Community Development Block Grant (page 44), SBA loans (page 45), and Increased Cost of Compliance (page 48).

Oakdale, Tennessee, elevated 12 homes using FEMA's Hazard Mitigation Grant Program. The non-Federal match was covered with funds from the Community Development Block Grant and the Tennessee Housing Development Authority.

→ The owner: It is estimated that the majority of FEMA's mitigation grants over the last several years have been cost shared with the owner, rather than with the state or community. Federal funds pay for 75% of the project cost, the owner pays the 25% non-Federal match, and the community covers the remaining administrative expenses.

Soft match: Several communities have used "soft matches" or "in-kind contributions" to meet the local share for state or Federal funding programs. "Soft matches" are contributions other than cash, such as services, which are given a dollar value and credited toward the local share. FEMA guidance for determining the value of a soft match is "What would it have cost if the grantee had paid for the item or service itself?"

Some examples are included in the Amite River Basin Commission's Demonstration Project on page 49.

Commonly used soft matches include:

→ Community staff time spent on design, appraisals, legal reviews and other tasks needed to administer the project.

→ Community employees' labor needed to clear a site, haul off debris, etc.. In demolition projects, the community could even count the value of the fire fighters' time when a house is burned down rather than torn down and landfilled.

→ Labor performed by volunteers, such as a church organization

→ Donated supplies or equipment

→ Waiver of permit, landfill, utility and other fees

Some funding programs restrict the amount of the cost share that can be a soft match or in-kind services. For example, FEMA's Flood Mitigation Assistance Program limits soft matches to 12.5% of the total project cost.

6.4. Full Funding

While most communities will fully fund a project on public property, some have assumed responsibility for the cost of flood proofing projects on private property. Many of these are managed by public works agencies and they are viewed as simply an alternative to a drainage improvement project that the agency would fully fund.

> **Bolingbrook**, Illinois, (page 69), **Prince George's County**, Maryland, and the **Metropolitan St. Louis Sewer District** treat flood proofing as another way to fulfill their obligation to protect people from flooding. Projects are managed by the same offices that administer their flood control, drainage, or stormwater management programs.

The biggest shortcoming to full funding is the cost. Six factors make projects fully funded by the community more expensive than other funding arrangements:

1. The community pays the full share of the project (although there are state or Federal grants that can help).

2. It is labor intensive. Community staff must coordinate every step with the owner.

3. Government projects may cost more when statutes require that contractors be paid at prevailing wages for the area.

4. Government projects normally require contractors to carry insurance and post surety bonds that add to project costs.

5. Most communities want the work they are responsible for to be foolproof. Therefore, they often pay engineering and architectural fees for projects where many property owners will use a contractor. A good example of this is elevating a house. When paid for privately, few owners hire an architect because contractors are so experienced in the work. However, government agencies prefer the "insurance" provided by professional design. The result raises the total cost by 5 percent to 10 percent.

6. Fully funded government projects will usually cover all expenses. If the owner was paying for the project, he or she might do without some of the appearance items or not replace all the landscaping removed during the project.

One way to reduce the cost of this approach is to select several buildings to be protected by the same flood proofing method at the same time. This would take advantage of economies of scale in the design and construction of the projects. Also, property owners will feel more comfortable knowing that they are not alone in trying a different method to protect their homes.

In the early 1990's, **Prince George's County,** Maryland, took advantage of economies of scale by bidding its flood proofing projects in groups. Three groups were funded, covering 27, 18 and 5 buildings. Of these 50 projects, 37 have been for floodwalls/dry flood proofing with an average cost of $30,000 and 13 projects were for wet flood proofing of crawlspaces, with an average cost of $15,000 per building.

Chapter 7. Implementation

Most communities have procedures to manage projects. In some cases, they are drainage improvement projects administered by the public works agency and in some cases they are housing rehabilitation or improvement projects administered by the housing or urban development agency. In either case, it is recommended that flood proofing staff use or build on existing, proven, procedures.

While flood proofing projects have a lot of similarities with other publicly funded projects, there are some important differences. This chapter reviews the following factors that are unique to implementing a flood proofing project:

7.1. Implementation policies: prioritizing and approving projects and gaining the support of the people whose homes or businesses will be modified

7.2. Legal arrangements between the community and the owner

7.3. Design standards: what flood protection level to use and how to address human intervention

7.4. Implementation procedures: steps to follow from the initial screening through construction

7.1. Implementation Policies

This section reviews three situations where local policies will be needed:

→ How to decide which projects get funded first

→ How to review applications for assistance

→ How to involve the owners

Prioritizing projects: A limited amount of funds will be available for flood proofing projects. A system to determine where those funds should be spent can facilitate staff work and avoid challenges about who benefits from the program. The following are possible options that could determine which projects should be funded first:

→ Buildings subject to the greatest flood damage: These would likely have the greatest benefit/cost ratio. The easiest way to identify these buildings would be to determine depth of flooding over the first floor.

→ Properties in high hazard areas: Using this as a factor relates more to the safety of the occupants than reducing property damage.

→ Buildings in floodways: This would be similar to identifying buildings subject to the greatest flood damage because floodway locations are subject to the deepest and swiftest flowing floodwaters.

→ Repetitive loss properties: This is another "stand in" for buildings subject to the greatest damage. It is a priority for FEMA funding because the 2% of insured properties that have received repetitive flood insurance claims account for 35% of all claim payments. Lists of these properties are available from FEMA, although there are additional neighboring properties subject to the same repetitive flooding that may not have been insured.

→ Buildings in areas to be protected by a flood damage reduction project: Not every building in a flood plain can be protected by a flood control project. There are advantages to retrofitting these at the same time the flood control project is built.

→ Spread the sites around: Some communities have requirements that certain funds must be spent in the watersheds where they are levied. There are also political advantages to distributing project funding throughout the community.

→ Projects eligible for outside funding: Local dollars will go further if the community only has to pay part of the cost of a project. The priorities of the FEMA mitigation programs encourages communities to focus on repetitive loss properties.

→ Property owners interested or requesting a project: If the program is publicized, some property owners may come to the community and request a project. They may also show their level of interest by contributing to the cost.

→ Address certain types of properties first: The community could determine that critical facilities, public buildings or owner-occupied residences should be protected first.

Mecklenburg County, North Carolina, had been very active in elevating and acquiring homes. The County was concerned that nonresidential buildings were not being helped, so it started its program of technical assistance and audits for commercial properties.

Applicants for **Sacramento County's** (California) Home Elevation Program were identified through public outreach activities. As a result, 250 houses were put on a waiting list. The applicants were ranked for participation using a point system based on repetitive loss status, flood depth and flood frequency. Owners who elevated before the program began may apply for reimbursement under the program.

Several communities with rebate programs for less expensive projects reported that they did not have to set priorities. After the first year or two, they did not have enough applicants to spend all of the funds budgeted for the program. This was partly attributed to a lack of storms and partly to sewer and drainage system improvements that reduced the need for flood proofing projects.

After ten years, **Bartlett**, Illinois, found applications tapering off. The Village opted to increase its share from 50% to 100% rather than discontinue the program.

On the other hand, communities with a little money and a lot of demand can set their own criteria and even tie strings to their funding.

The **Maumee River Basin Commission** provided a maximum of $5,000 for any project. It also set the following criteria:

- The property must be in the regulatory flood plain, but outside the floodway (floodway sites are only considered for acquisition and clearance).
- The property must be in an area designated by the Commission's Master Plan as subject to flood proofing.
- The lowest adjacent grade should not be more than three feet below the 100-year flood level.
- The project will not exceed 50% of the building's value.
- The city and the county in which the property is located must have adopted ordinances that meet the Commission's minimum standards for flood plain and stormwater management.
- During construction, the site must have a sign giving the Commission credit for its share with a telephone number for interested parties to call.

Approving projects: Where there are more projects than available funds, a community should establish policies and procedures for reviewing and approving applications. These procedures should verify the following:

- The applicant is the owner of the property to be protected, e.g., by requiring the submittal of a property tax bill
- The property is not in violation of any local codes
- The applicant does not owe money to the community
- The project is appropriate for the building and the flood hazard
- The cost of the project is reasonable
- The applicant understands that the community is not liable for any problems with a project that the applicant selects and contracts for
- The application understands that he or she is responsible for the long term operation and maintenance of the project

If the community is handling administration and design of the project, staff will verify its appropriateness and cost. Where the applicant proposes the project, a screening process is recommended during the initial review to determine if the project is appropriate and worth funding (see page 66). In the case of rebates where the applicant is funding the majority of the cost and the cost is typically under $5,000, some communities do not require competitive bids or more than one cost estimate.

St. Charles, Illinois, provides a 25% rebate for sewer backup prevention and basement protection measures. The City has published a list of common approaches (overhead sewer, drain tile, etc.) and the maximum amount the City will pay. Anything over that amount is up the owner.

In **King County**, Washington, homeowners were required to get three bids and then the lowest "acceptable" bid became the basis for their share of the funding. However, the homeowner was not required to use the lowest bidder and could instead select a higher bid from another contractor. If so, the owner was required to pay 100% of the difference between the lowest bid and the bid that was accepted.

Fort Collins, Colorado, created a formal committee to review and recommend on applications for funding. See the next page.

Property owner involvement: Voluntary property owner involvement is vital to the initiation and long-term operation and maintenance of a flood proofing project. Keeping residents informed was a recommendation frequently voiced by communities experienced in implementing flood proofing programs.

The **Metropolitan St. Louis Sewer District** set several policies in its *Floodproofing Design Manual*, including "*The involvement of the owner is paramount.* You are working on someone's home or business and that person has the final say over what will be implemented."

It may be difficult to gain the owner's trust and involvement for the following reasons:

→ Staff may not be used to working with property owners. A public works staff may be used to building the appropriate project on public property, with little debate. Different attitudes are needed when working on private property, especially if the owner is paying some of the cost.

→ Flood proofing is often viewed by property owners as a poor alternative to a flood damage reduction project that keeps water away from them. They would rather have the problem corrected than have to modify their homes or lots, especially if they think the resulting appearance will affect their property values.

→ Flood proofing can be a major disruption to people's houses. Owners will want to scrutinize every design detail and step of the process and may call staff with what may appear to be trivial concerns.

To gain support and cooperation for any flood protection proposal, the experienced communities recommend citizen participation early in the project planning process.

South Holland, Illinois, and **King County**, Washington, used existing citizen committees to represent the interests of flood plain residents during their planning. **Mahoning County**, Ohio, used its Clearwater Task Force to review problems with stormwater entering sanitary sewer lines. The Task Force includes members of the public and the Homebuilders Association.

Homewood, Illinois, and **Frankfort**, Kentucky, developed their plans during a series of public meetings with representatives from the affected neighborhoods. The planning process reviewed the costs and benefits of all alternatives to help residents understand why their preferred flood control projects might not be feasible.

In some cases, residents may be the instigators of a flood proofing program.

In **Denham Springs**, Louisiana, residents had been waiting for years for state and Federal agencies to decide if a large reservoir would be built. Planning for the reservoir had taken a long time because of economic and environmental problems. Some residents felt that "they won't see a flood control project before they die." They went to the Amite River Basin Commission and were active in seeking the funding for the program described on page 49.

Fort Collins' Program

Fort Collins, Colorado, has long had an active program to protect its citizens from flooding. Following a severe flood in 1997, City leaders asked what else could be done. The City opted to improve its flood warning program and create a flood proofing program. The City set three objectives:

- Familiarize property owners with flood proofing measures.
- Utilize the Hazard Mitigation Grant Program to flood proof properties suffering the most repetitive damaging flood loses.
- Provide cost-effective flood proofing on an on-going basis through loan repayments.

The City received a $150,000 Hazard Mitigation Grant Program grant. The City's match was soft – there was enough work to count the salaries and benefits toward the entire 25% non-Federal share. A newsletter and other public information materials advertised the program. A committee was set up to review applications. The members represented:

- A nonprofit housing assistance organization
- A nonprofit organization that collected funds for flood victims
- The engineering faculty at Colorado State University (also on the City's Water Board)
- The building department
- The CRS Coordinator/grant manager

35 applications were received during the first round. All of them were for homes outside the regulatory floodplain. All of the projects were for relatively inexpensive dry flood proofing measures, such as raising window wells (below and on pages 8 and 46). Most cost around $5,000. The most expensive to the City was $10,000.

The City's program had the following interesting features:

- The cost share was based on the applicant's income
- No projects had engineered plans; all projects were designed by City staff, none of whom were engineers
- Many of the properties were in an historic district, which complicated grant reviews. The City eventually hired a consultant to handle the historic preservation reports required under the grant arrangement.
- One owner opted to do the work himself and received funding just for the materials.
- Maintenance is left up to the owners; the City will not inspect the properties later to double check that it is being done.
- It turned out that the loan program could not be implemented with grant funds.

The City received a second grant after another flood in 1999. However, interest in the program had waned and there were no private property applicants. The funds were used to flood proof a City-owned museum.

Some of Fort Collins' flood proofing projects to keep surface waters from entering basements

Once there is general support for a flood proofing project, continuous contact with the owners must be maintained. Their participation in the details of the project plans is vital.

Several communities reported that property owners do not realize how long it takes to design, fund and build a project. Owners drop out unless there are frequent contacts, updates, and reassurances.

> **Prince George's County**, Maryland, spent a great deal of time with the affected residents. Construction plans account for the appearance of the final product and landscaping as well as flood protection. A few minor projects, such as correcting utility line violations, were included at the County's expense to continue the good will with the owners. Contact with the owners and their neighbors was continuous throughout planning and construction. One contractor's supervisor estimated that each day he spent two hours on project supervision and six hours on public relations.
>
> The City of **Centralia**, Washington, published a booklet for property owners, *Home Elevation Program*. It includes instructions on getting bids from contractors, permit and inspection requirements, the checklist used by the building department when reviewing an elevation project, design details for the foundation and stairs, and the agreement signed between the owner and the City.

7.2. Legal Arrangements

Before public funds are spent, a contract or agreement should be signed with the property owner. The language should be approved by the community's legal counsel. Here's a checklist of items to consider for the agreement between the owner and the community:

- The owner agrees with the proposal and gives the community permission to proceed with the construction of the project.
- The owner gives the community permission to enter the property and the building to inspect the work during construction.
- The owner understands the project will provide the most protection as can be economically justified, but that the property may still be subject to damage from floods or overland flows that exceed the design flood protection level.
- The owner understands that maintenance and operation of the project is his or her responsibility and the project could fail without proper maintenance.
- The owner is aware that the purpose of this project is to protect the building and its contents and that individuals will be subject to a health and safety hazard if they try to stay in or travel to or from the property during a flood.
- The owner agrees to contact the community when considering remodeling, landscaping or otherwise modifying the property, to ensure the plans will not adversely affect the protection provided by the project.
- Upon being given a reasonable notice, the owner agrees to admit a representative of the community onto the property (and into the building, if necessary) for the purpose of reviewing the condition and performance of the project.

- The owner agrees to notify the next owner of the property of the project, the contract with the community, the importance of proper operation and maintenance, and the need for insurance coverage.

Recordation: Some communities prefer a stronger approach to the last item. Rather than trust the agreement with the current owner, they make sure that the agreement or information about the project is recorded with the property's title. A future title search will notify a prospective purchaser about the project and the need to maintain it.

Insurance: Some communities and some Federal funding programs require that the owner purchase flood insurance, at least for those properties located in the Special Flood Hazard Area shown on the community's Flood Insurance Rate Map. This can be difficult to enforce over time, unless there is a continuing relationship with the community (as would be the case of repaying a loan).

Rather than take on the administrative burden of ensuring that a property owner purchase and keep an insurance policy, the **Metropolitan St. Louis Sewer District** opted for the following language in its agreement with the property owner:

> "The Property Owner understands that a future flood may exceed the project's flood protection level and/or the project may fail. District staff have advised Property Owner of the benefits of maintaining *[flood/sewer backup/sump pump failure]* insurance to help pay for the losses, should the property be flooded."

Post-project conversion: Some wet flood proofing projects are dependent on the owner not modifying a part of the building. If an area (such as the top right photo on page 5) is supposed to be kept clear of damageable items so it can be flooded, the owner must remember to not improve it. One way to address this is with a non-conversion agreement as part of the contract with the owner.

King County, Washington, uses the following legal language for its elevation projects:

> FOR AND IN CONSIDERATION of the benefits to be derived from participation in said Home Elevation Project, I (we), _____, the owner(s) of said residence, do hereby promise and covenant that on completion of said raising-in-place, no part of the raised residence located below the level of the lowest habitable finished floor will thereafter be converted to living area for human habitation, or otherwise altered in a manner which would impede the movement of waters beneath the structure.
>
> The promise and covenant made herein shall run with the land, and shall be binding on our heirs, successors, and assigns. I (We) furthermore agree not to file a claim against King County for contents stored beneath the lowest habitable finished floor that may be damaged by floodwaters or claims for damages to the area beneath the lowest habitable finished floor as a result of conversion for human habitation.

The **Maumee River Basin Commission** funded a project that involved sealing off the basement windows. The Commission required the owner to sign a waiver with the local building official that he would never convert the basement into a bedroom because there was no longer an escape route in case of fire.

The long term effectiveness of these approaches remains to be seen. As staff and owners change, such promises and agreement may be forgotten by both parties.

7.3. Design Standards

Before the engineers and architects design a project, they will need guidance on three policy questions:

→ To what level should the property be protected?

→ Should the community fund a project that is dependent on human intervention?

→ Do historic buildings or landmarks get special attention?

Flood protection level: How high should the flood proofing project be built? When a project is funded by the owner, the owner is usually only familiar with how high the last flood was. Government agencies need to protect their citizens from flood levels that can be expected in the future and they need to treat everyone the same. Therefore, historical flood levels may not be a good flood protection level for a publicly funded program.

Here are some guidelines:

→ Encourage or fund projects to be protected to the same level as new buildings, i.e., protected to the 100-year flood plus freeboard. That is certainly appropriate for elevating buildings.

> **Prince George's County**, Maryland, established guidelines for its funding program based on 100-year flood levels developed by the County, assuming a fully developed watershed. The result is a higher flood protection level, i.e., an extra margin of protection. Generally, if the building is subject to more than 3 feet of flooding, acquisition or elevation are the usual options. If the building is subject to less than 1 foot of flooding, only flood proofing is considered. The County and the owner jointly decide the best solution for flood depths of 1 to 3 feet.

→ If the project is a substantial improvement in the regulated flood plain, the community must ensure that it will meet the same protection standards as new buildings.

→ If the project is cost shared with FEMA or another agency, that agency may have a required minimum protection level.

→ Critical facilities should be protected to a higher level than other properties, even if it means a higher cost. The national standard is to protect critical facilities to the 500-year flood level.

→ Where there is no calculated 100-year flood elevation, such as outside mapped and regulated flood plains, some communities use the flood of record or one foot above the flood of record.

→ Where it is more cost effective, provide some degree of protection at a low cost rather than 100-year protection at a very high cost.

> The **Metropolitan St. Louis Sewer District** had traditionally designed drainage improvement projects for the 15-year flood level. This was considered too low for a flood proofing project, so the District adopted the following policy:

"In the absence of a protection level mandated by law, the design flood protection level for a floodproofing project shall be that which provides the greatest protection for the cost to the public. The cost to the public should account for property damage, risk to lives and public health, and potential damage caused by hazardous materials."

This floodwall in Decatur, Indiana, was designed to protect to the 100-year flood. In July 2003, water exceeded the 100-year flood level by 8". However, the design included a 2' freeboard for just such an occasion. The seals on the closure had weathered and leaked a little, but the design included an internal drainage system and sump pump (with generator backup power), whch handled all seepage. Neighboring houses suffered major damage; this one suffered none. Total cost: $15,000. Cost to the Maumee River Basin Commission: $5,000. After seeing this success, one of the neighbors has applied for flood proofing assistance.

Human intervention: Should the community fund a project that depends on someone to take action in order for it to work? Examples include closing an opening, relocating contents, or turning on a pump. Examples of openings that need to be closed are shown above and on pages 5, 6, 8, and 46.

While an owner may look competent and promise cooperation, conditions change over time. Memories fade. The owner (or new owner) may be too weak to install some measures or may be away from the site for long periods.

The best flood proofing approach is the passive one – human intervention is something to avoid in designing a project. One way to avoid dependence on people is to use automatic measures, such as:

→ A generator with a battery that starts itself when the power goes off

→ Spring loaded closures and doors that stay closed (as in the bottom left photo on page 5)

→ "Pop up" walls (illustrated to the right)

The City of Boulder, Colorado, installed a "pop up" closure to this floodwall at a City office building subject to flash floods. The closure floats up into place automatically when the site is flooded.

These measures may add to the cost, but they may be worth it if it means the property will be protected when the owner goes to sleep or on vacation

Passive flood proofing or automatic measures are not always possible. Sometimes funding constraints and site conditions dictate some human intervention in the design. Although not the best approach, relying on human intervention may be the most economical one and, if the required actions are taken, it can work. Again, close coordination with the owners is vital so that they understand their role in protecting themselves.

Historic buildings: Historic buildings and other community landmarks deserve special attention. In many communities, historical commissions have been established to identify buildings or districts and to review and comment upon proposals to alter them. The ability to flood proof such buildings or change their appearance will be constrained by these commissions.

Buildings that have been placed on the National Register of Historic Buildings are considered national treasures. As such, structural modifications to them, even for the purpose of protecting them from flooding, may not be allowed.

The NFIP and most local ordinances allow variances to be issued so substantial improvements to designated historic structures do not have to meet all the flood protection requirements. However, the following rules need to be met:

- → The building must be a bona-fide "historic structure," i.e., on a list officially recognized by FEMA. The presence of a building in a historic district does not automatically convey this special treatment.
- → The project must maintain the historic status of the structure. The best way to make such determinations is to seek written review and approval of proposed plans by the state's historic preservation agency and/or the appropriate local commission.
- → All possible flood damage reduction measures should be taken. Although the variance to the substantial improvement rule means the building does not have to be elevated to the 100-year flood level, or be renovated with flood-resistant materials that are not historically sensitive, many things can and should be done to reduce the flood damage potential. Examples include:
  - Locating mechanical and electrical equipment above the flood protection level or flood proofing it
  - Replacing the existing furnishings with flood-resistant materials that mimic their historical appearance
  - Elevating the lowest floor indoors without changing the external appearance

This last approach has been used in some older commercial buildings with 12 foot ceilings. New floors are built four feet above the old ones. The floor is above more frequent flood levels (and maybe the 100-year flood elevation), but there is still eight feet of headroom. The building's exterior appearance is not changed.

> **Mobile**, Alabama, renovated a historic railroad station, a very large building. It was decided to dry flood proof it to two feet above grade, which is one foot above the flood of record, but three feet below the 100-year flood elevation. The project is a model for human intervention: 32 openings have to be covered with removable panels. The panels are numbered and stored on carts
>
> Dealing with historic buildings is also covered in the discussions on 113 Calhoun (page 29) and **Fort Collins** (page 60).

7.4. Implementation Procedures

This section reviews the step by step process of determining what measure to construct, designing the measure, constructing it, and ensuring that it will work in the future. An example of a step by step flow chart used by one agency appears on the next page.

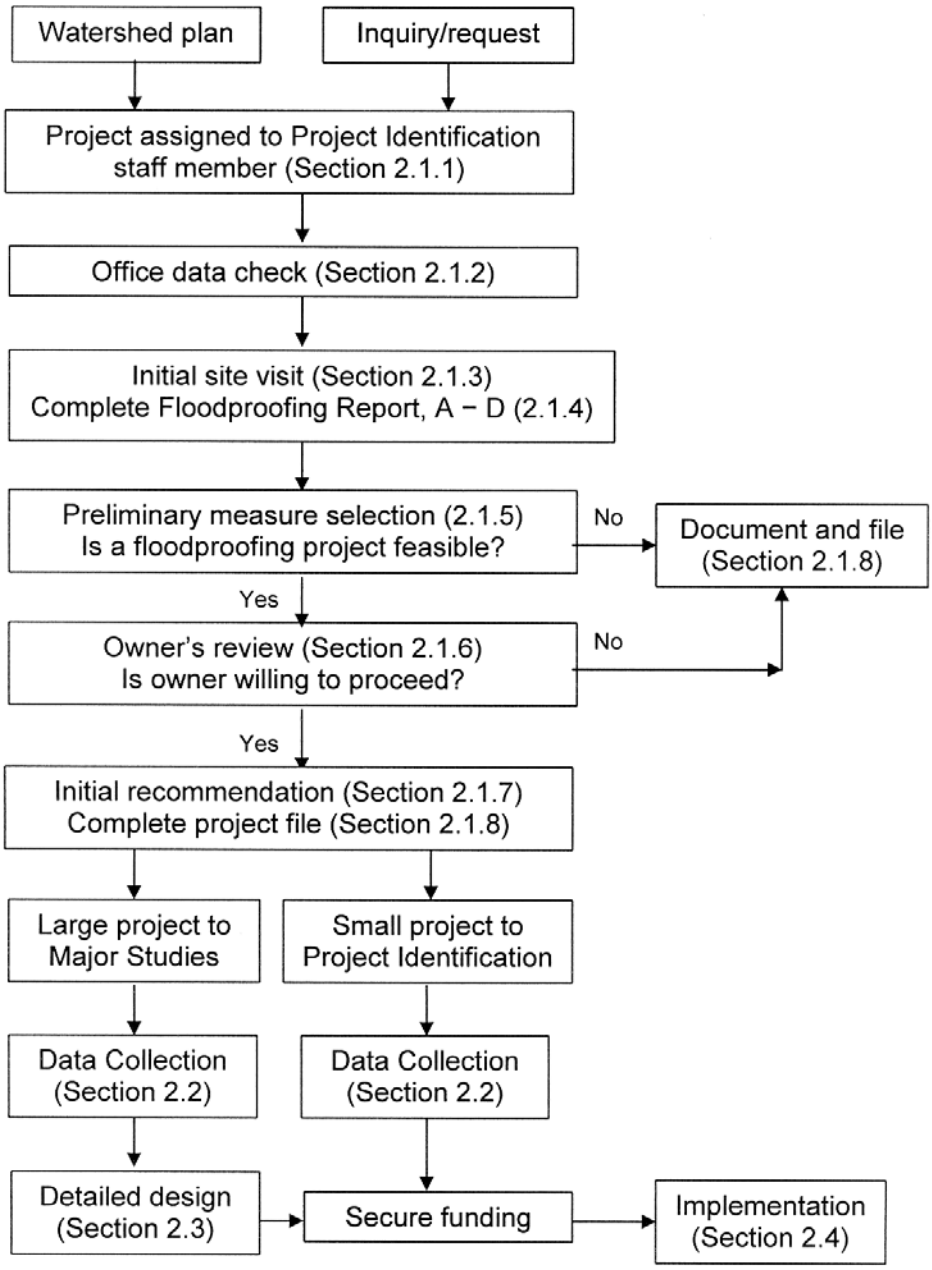
Initial review: Not every site or request for help warrants a publicly funded flood proofing project. A screening process can help determine whether to proceed with a project and, if so, what type of project should be built. It can also help document to the owner why one measure was selected over another or why one property will be flood proofed and another will not be helped.

The initial review usually includes the following steps:

1. An inquiry or task order is referred to the appropriate staff person.
2. A file or record is opened for the property.
3. A check of local plans is made to determine if the site is slated for protection by a flood control or other protection project.
4. A meeting is held with the owner, preferably at the site, and relevant data are collected and recorded. Such data include:
   - Property address, how to contact the owner, etc.
   - Building data: number of floors, foundation type, etc.
   - Historical flood levels and types of damage
   - Source of the flood problem, frequency of past flooding
   - Whether there are any additional hazards, such as high velocity flooding, no warning time, or hazardous materials on site

Metropolitan St. Louis Sewer District Procedures

The Metropolitan St. Louis Sewer District (MSD) prepared a *Floodproofing Design Manual* to guide staff through project selection, design and construction. Projects are initiated when a watershed plan identifies a site where flood proofing is appropriate or when a property owner asks for help. At the beginning of the Manual is this project selection flow chart.



5. A preliminary recommendation is made. This could be in the form of a written flood audit, as described on the next page. The recommendation will usually be one of four actions:

   - Pursue an area-wide flood damage reduction or drainage improvement project,
   - Proceed with design and construction of a flood proofing project,
   - Advise the owner how to protect the property at his or her own expense, or
   - Take no action because flood proofing is not recommended.

6. If a flood proofing project appears appropriate, a meeting is held with the owner to review the following:

   - Preliminary recommendation
   - Design considerations (flood protection level, human intervention, etc.)
   - What the project will entail, what will happen during construction, etc.
   - Likely schedule for a project
   - Cost-sharing arrangements, if any
   - Long term operation and maintenance needs
   - Legal arrangements (see page 61)

7. If the owner agrees with the recommendation, an agreement is signed and the project proceeds to the detailed design phase.

8. If a project is not appropriate or the owner does not agree to proceed, the rationale is recorded and filed. Some communities want the owner to sign a statement for the record that he or she is turning down the offer of help.

The most difficult part of these procedures is step 5, determining whether a flood proofing project is appropriate for the community to fund. Some communities will only fund a limited array of projects, such as acquisition or elevation to the 100-year flood level. Others want to ensure that every option is reviewed.

In either case, it is good to have a checklist or other record that shows what was looked at and why one approach was recommended over another. See also page 19 on determining appropriate projects.

Bolingbrook's Flood Audit

Bolingbrook, Illinois, has used different techniques to reduce flooding problems, including drainage improvements, acquisition, sewer backup protection, and flood proofing. Before the Village invests in a project, it conducts a study of the alternatives.

423 Assembly is a home at the bottom of a hill. Water drains to storm sewer inlets in front of the property. Heavy rains flood the streets and overload the storm sewers. Being a bilevel, it didn't take much water in the streets to put several feet of water in the lower level of the house. This happened in 1996, a few months before the house was purchased by the current owners. It happened again in 1998 (see photo, taken by the owners) and 2000.

The Village reviewed flood protection alternatives. It doubled the storm sewer inlets, but that was not enough. The Village Engineer estimated that it would cost over $100,000 to increase the carrying capacity of the sewer system. In 2000, the Village conducted a flood audit. This produced a 10 page report, written in lay terms for the owner's benefit. The audit reviewed the structure and the source of flooding and concluded:

> "The basic problem is that the house at 423 Assembly is at the bottom of a bowl. All drainage flows to the corner of Keystone and Assembly. If the storm sewer system cannot handle the amount of water received, the excess water will back up and stand in the street. This is the way drainage systems are supposed to work.
>
> "Unfortunately, 423 Assembly is lower than the street. The excess water standing in the street will pour out at the lowest overflow point – the driveway."

423 Assembly, July 1998

423 Assembly, February 2004

The audit then reviewed three options:

- Remove "choke points" in the storm sewer system
- Construct a barrier across the driveway
- Fill in the driveway

Photographs of houses in nearby communities that have used the last two options were included. Flood insurance was recommended, but the limitations on coverage for the lower floor was also noted.

The Village and the owner jointly agreed on the third option. The driveway was filled in and a new garage and driveway were built on the other side of the house. The Village paid 100% of the cost of the audit, the architect, and construction. The owner paid for remodeling the former garage into a family room.

Design: The details of designing a flood proofing project are covered best in FEMA's *Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings*.

Factors that need to be addressed include:

- Obtaining the latest flood data and the data used for flood plain management regulations
- Obtaining ground data, such as elevations and drainage flow
- Coordinating the plans with other building code and zoning requirements (see page 22)
- Accounting for the available warning time, duration of flooding, flood velocities, and debris
- Checking for neighboring structures, accessory buildings, and landscaping that may get in the way
- Accounting for the type and condition of the structure and its foundation
- Accounting for all sources of flood damage (e.g., a dry flood proofing project needs to address all openings, including the dryer vent and sewer line)
- Storage tanks, garages, and other structures on the site that will need to be protected along with the primary building
- Protection of utilities and utility meters
- What work must be done by a licensed contractor, such as a licensed plumber
- Ensuring the soil will support the structure or is not so porous that seepage cannot be controlled
- Frequent coordination with the owner to ensure that the final design will be acceptable.

Construction: If the project is fully funded or cost shared, the community is likely to be responsible for the construction phase, too. Most communities have existing policies and procedures for managing public works or home rehabilitation projects. They should be used where appropriate.

Factors that need to be considered during construction of a flood proofing project include:

- Selection of a qualified contractor through the traditional process, such as competitive bidding
- Whether to charge for permits and who applies for them
- Coordination with the property owner

- Inspections at the appropriate phases during construction
- Minimizing disruption to the building and landscaping
- Utility connections and reconnections
- Whether the owner can stay in the building during construction
- What to do if a flood or storm occurs during construction
- Surveying or otherwise ensuring that the project protects to the design flood protection level (a FEMA Elevation or Floodproofing Certificate is recommended)
- Obtaining a certificate of occupancy when the project is completed
- Scheduling contractor payments

The **Maumee River Basin Commission** reported that the biggest problem has been "making sure that the homeowner follows through with ALL recommendations of the planned project. Eliminating one or two components can literally doom the project to failure; i.e., installing sump pumps but not purchasing a generator to power the sumps pumps when the electricity goes out. MRBC is reluctant to make partial payments for fear that the homeowner doesn't follow through with all plan improvements. MRBC's policy at the present time requires ALL components to the plan be in-place before we release any funds."

Operation: A flood proofing project is worthless if it does not operate properly during a flood. This is the responsibility of the property owner. Any project with a substantial public investment or that relies on human intervention should have an operations or emergency response plan provided to the owner. The plan should be in language the owner can understand.

A project that requires little or no human intervention, such as an elevation project, may need a very limited operations/emergency response plan and relatively little activity on the part of the owners (e.g., move the car to high ground). A wet or dry flood proofing project that calls for various mechanical components to be operated at the right time will require a more detailed set of instructions.

Some operations for which instructions should be given are:

- What flood warning message triggers implementation of the measures.
- When to close a valve, including how to do it and where it is located
- How to close a door or window shutters on a building or gates in a floodwall, including where the closure is stored and how it should be installed
- How the sump pump, generator, and other equipment works
- Operation of a generator, including how to connect or disconnect it, how to start it, how to refuel it, and what circuits should be charged

- Safety measures, such as:
  - Evacuating the building when the flood threatens.
  - Making sure that generators do not injure power company personnel by back-feeding into the power lines.
  - Ensuring that there is adequate ventilation for generator exhaust

Maintenance: Every project will need to be maintained, even those not dependent on human intervention. The owner's maintenance responsibility should be clearly defined in the contract with the community (page 61). Sometimes, the contract will call for allowing the community to make periodic inspections to ensure that the owner is fulfilling the agreement.

If equipment suppliers offer maintenance agreements, the owners should be encouraged to contract for maintenance service

A maintenance (or operations and maintenance) plan should address:

- What needs to be done and when (usually once each year), such as:
  - Checking the structure for cracks, holes, and animal burrows
  - Checking seals for signs of wear
  - Ruining the generators, pumps, and other equipment
  - Checking the condition of batteries
  - Checking that items stored off site are still readily available
- The name and phone number of a community staff person to call when there are questions
- Not to modify the affected areas (e.g., not to block the vents in an elevated foundation) or to check with the community before considering any alterations
- Keeping flood or other insurance in force

Chapter 8. Resources

8.1. US Army Corps of Engineers

The US Army Corps of Engineers has a variety of flood damage reduction programs that are explained at www.usace.army.mil/. Four can directly support flood proofing.

Planning Assistance to States: Section 22 of the Water Resources Development Act of 1974, as amended, authorizes the Corps to provide technical planning assistance to all non-Federal public entities, such as States, Tribes, and communities, in all areas related to water resources, including flood proofing. This program is cost shared 50/50 with the non-Federal public entity. This program does not provide assistance in any phase of implementation or construction of a flood proofing project.

Flood Plain Management Services Program: Section 206 of the 1960 Flood Control Act, as amended, authorizes the Corps to provide technical assistance to all non-Federal public entities, such as States, Tribes, and communities, in all areas related to water resources including flood proofing. The Corps has the authority to provide 100% of the funding. However, due to inadequate funding in recent years in this program, the amount of assistance the Corps can provide under this program is very limited.

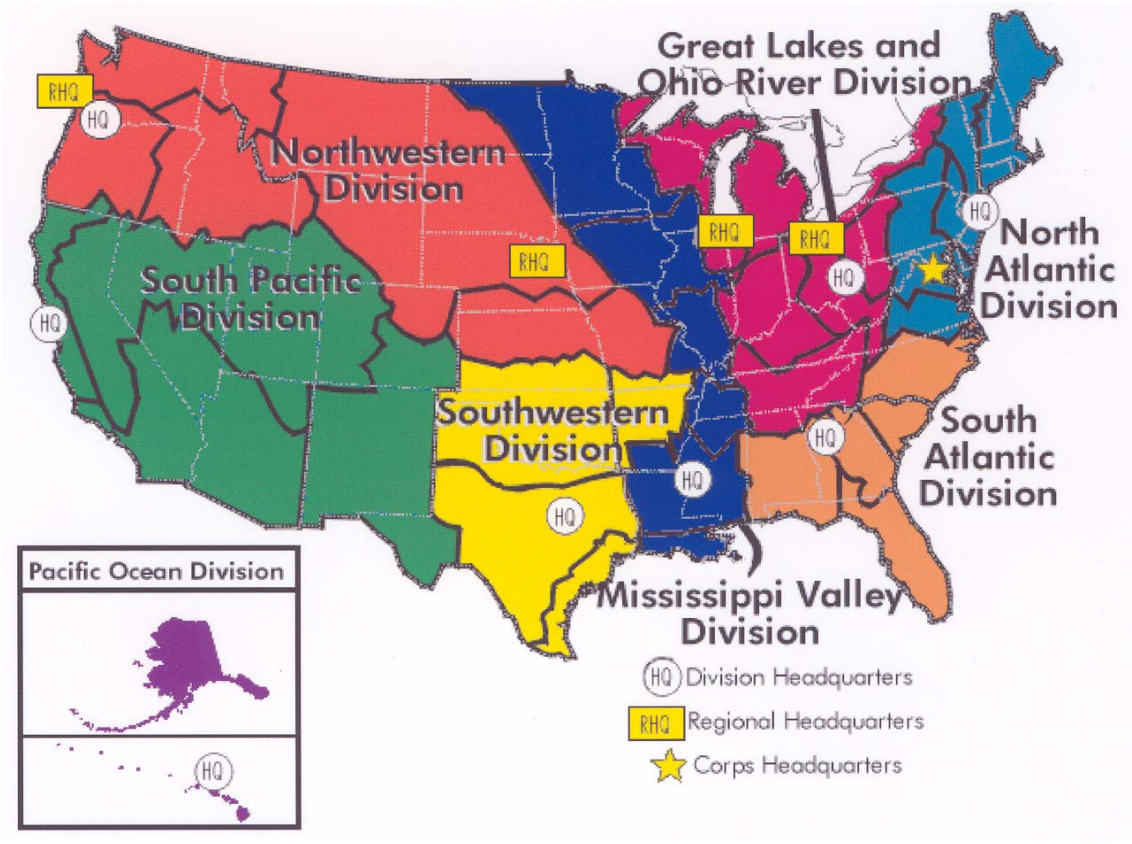
The Corps is also authorized under this program to provide the same technical assistance to all entities, including Federal agencies and private parties, on the basis of 100% of the funding being provided by the requestor. This program does not provide assistance in any phase of implementation or construction of a flood proofing project.

Flood Damage Reduction: Under Section 205 of the Flood Control Act of 1948, as amended, the Corps can provide assistance to non-Federal public entities in all aspects of flood damage reduction project development, including implementation and construction. Section 205 can help with flood proofing projects. The initial phase of this program (in which determination is made if a feasible project can be implemented or constructed) is funded 100% by the Corps.

The subsequent phase of this program in which the feasible project is investigated further is cost shared 50/50 with the non-Federal public entity. The implementation/construction phase of this program for a flood proofing project is cost shared 65% Corps/35% non-Federal. The Corps funding limit for this program is $7,000,000. Projects implemented or constructed under this program do not have to be specifically authorized by Congress.

General Investigation Program: This program is identical to the Section 205 Program discussed above, with the exception that there is no funding limit for Corps participation. However, each project must be specifically authorized by Congress.

The Corps' programs are administered through divisions. Each division has several districts which are the primary points of contact for local governments and individuals. To find the district for an area, see www.usace.army.mil/where.html#state



8.2. Funding and Technical Assistance

Federal programs:

Mitigation grants and other programs operated by FEMA can be found at www.fema.gov

Information on the Community Rating System: http://training.fema.gov/EMIWeb/CRS/

Community Development Block Grant: Larger, or "entitlement," communities – contact the appropriate office in the community's government. Small communities apply to the state: www.hud.gov/offices/cpd/communitydevelopment/programs/stateadmin/index.cfm

The Department of Agriculture's Natural Resources Conservation Service's office is co-located with the local soil and water conservation district, usually in the county seat.

The Small Business Administration's mitigation loan programs are summarized at www.sba.gov/disaster_recov/index.html

The Economic Development Administration has programs to help communities with economic recovery after a disaster. www.eda.gov/

State programs:

For guidance on regulatory requirements and what state agencies may be able to provide assistance, contact the state Coordinator for the National Flood Insurance Program. A directory of state Coordinators can be found at www.floods.org/StatePOCs/map.asp

The Association of State Floodplain Managers provides conferences and references on local flood plain management and flood proofing programs. See www.floods.org

Many states have flood plain management chapters or associations. Their links are found at www.floods.org/StatePOCs/stchoff.asp

Others sources:

Operated by Louisiana State University's AgCenter, the LouisianaFloods site provides many useful links to a variety of sources of information www.LouisianaFloods.org

http://structuralbuildingmovers.com/movers.shtml lists contractors skilled in moving or elevating buildings, by state

See also the websites listed on page 37.

8.3. References

The Corps of Engineers' National Nonstructural/Flood Proofing Committee has prepared several references which are available on line at www.nwo.usace.army.mil/nfpc/publications.html

- → *A Flood Proofing Success Story Along Dry Creek at Goodlettsville*, Tennessee, 1993
- → *Flood Proofing Bibliography*, 1988
- → *Flood Proofing - How to Evaluate Your Options*, 1993
- → *Flood Proofing Performance - Successes & Failures*, 1998
- → *Flood Proofing Regulations*, 1995
- → *Flood Proofing Systems & Techniques - Examples of Flood Proofed Structures in the US*, 1984
- → *Flood Proofing Techniques, Programs, and References*, 1996
- → *Flood Proofing Technology in the Tug Fork Valley*, 1994
- → *Flood Proofing Tests - Tests of Materials and Systems for Flood Proofing Structures*, 1988
- → *Raising and Moving a Slab-on-Grade House with Slab Attached*, 1990

Analysis of the IHDA Floodproofing Loan Program, Illinois Association for Floodplain and Stormwater Management, 1993, Park Forest, IL

Engineering Principles and Practices for Retrofitting Flood Prone Residential Buildings; Federal Emergency Management Agency, FEMA 259. 1995. Washington, D.C.

Flood Damage Reduction and Wetland Conservation – Three Successful Projects in Louisiana Have Common Characteristics, Rod E. Emmer, Ph.D., Association of State Floodplain Managers Topical Paper #6, 1994, Madison, WI.

Flood Resistant Design and Construction. American Society of Civil Engineers. SEI/ASCE 24-98. 2000. Reston, VA.

Floodproofing Resources; Louisiana State University Cooperative Extension Service. 1999. Baton Rouge, Louisiana.

Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding; Federal Emergency Management Agency, FEMA 312. June 1998. Washington, D.C.

Mitigation Success Stories, Association of State Floodplain Managers. There are several publications in this series, found at www.floods.org/publications/pubs.asp

Promoting Mitigation in Louisiana: Performance Analysis, Federal Emergency Management Agency. 2002. (A available on FEMA's website at www.fema.gov/fima/bp/casestudies.shtm)

Protecting Building Utilities From Flood Damage; Federal Emergency Management Agency, FEMA 348. November 1999. Washington, D.C. (Also available on FEMA's website at www.fema.gov/hazards/floods/pbuffd.shtm)

Repairing Your Flooded Home; Federal Emergency Management Agency. FEMA 234. American Red Cross. ARC 4477.1992. Washington, D.C. (Also available from the Red Cross' Website at www.redcross.org/services/disaster/0,1082,0_570_,00.html

FEMA's Technical Bulletin series. (Also available from FEMA's Website at www.fema.gov/fima/techbul.shtm).

- → *Openings in Foundation Walls*, FIA-TB-1, April 1993.
- → *Flood-Resistant Materials Requirements*, FIA-TB-2, April 1993.
- → *Non-Residential Floodproofing—Requirements and Certification*, FIA-TB-3, April 1993.
- → *Elevator Installation*, FIA-TB-4, April 1993.
- → *Free-of-Obstruction Requirements*, FIA-TB-5, April 1993.
- → *Below-Grade Parking Requirements*, FIA-TB-6, April 1993.
- → *Wet Floodproofing Requirements*, FIA-TB-7, December 1993.
- → *Corrosion Protection for Metal Connectors in Coastal Areas*, FIA-TB-8, 1996
- → *Design and Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings*, FIA-TB-9, 1999
- → *Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding*, FIA-TB-10, 2001
- → *Crawlspace Construction for Buildings Located in Special Flood Hazard Areas*, FIA-TB-11, 2001