PART FOUR

FLOODPROOFING

LOCAL FLOOD PROOFING PROGRAMS

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Introduction

Studies have shown that financing is often the greatest impediment to implementing a flood proofing project. While many people want to flood proof, lack of funds was listed as the most important reason why they did not. Some federal agencies have financed flood proofing projects. Statutory authority and limited resources keep the federal programs from reaching many people.

A few local governments have financed or provided financial support for flood proofing projects. Each community's program was developed differently and is administered differently. The experiences of these communities can be very helpful in guiding other flood prone communities in developing their own approaches to flood proofing.

Purpose

This paper identifies lessons learned that can help communities interested in financing flood proofing projects. It is not a recipe for developing a model program, because each community must design its own approach based on local flood hazards, building conditions, financial needs, and resources. Detailed information is found in a recent Corps publication, *Local Flood Proofing Programs*, which is also the source for this paper.

General Considerations

Before initiating a flood proofing funding program, certain factors need to be considered by community officials. Six of the most important factors are covered in this paper:

1. Ensure that the projects to be funded are appropriate for the flood hazard.

2. Identify the source of the funds.

3. Get others in the community interested in and supportive of flood proofing.

4. Involve the property owners in the flood proofing and funding decisions.

5. Ensure that the community has the legal authority to fund the projects.

6. Ensure that local staff will be free from liability.

Appropriate Projects

The financial benefits of flood proofing can be very attractive to community officials. It is usually cheaper to protect a building in place than to acquire and/or remove it. However, flood proofing techniques that leave a building in the flood plain are not appropriate in areas subject to the high hazards of deep flooding, erosion, flash flooding, high velocity flooding, or heavy debris flows.

Flood proofing is an appropriate flood protection measure only for certain flood hazards and particular types of buildings. A community should develop criteria to decide which properties should be protected by which measures. The Corps publication, *Flood Proofing—How to Evaluate Your Options*, provides guidelines for determining the most appropriate measure for an individual building.

Communities should generally restrict flood proofing projects to areas subject to low velocity and/or shallow flooding. Some limit their funding to the safest types of projects as seen by these examples:

- Des Plaines, Illinois, restricts its funding 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.

- The Illinois Department of Transportation, Division of Water Resources, helped establish a low interest loan program for communities in 1988. It gave the communities guidelines to determine which types of projects could be funded based on the flood depths and building types.

- 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.

Funding Sources

Wanting to finance flood proofing projects is one thing; having the money to do it is quite another. Communities may encounter one or two problems in devoting funds to flood proofing: having adequate funds to start a

new program, and/or having the legal authority to spend the money on flood proofing.

Property Taxes. Property taxes are the mainstay of most local governments. There are two kinds of property taxes, general and special purpose. 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. Frankfort, Kentucky; Rosemont, Illinois; and Fairfax County, Virginia, identified this kind of fund as one of their funding sources.

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 special fund. King County, Washington, has a special county-wide property tax levy that goes into its River Improvement Fund.

Sales Tax. Some states authorize communities to levy sales taxes for special purposes. The Economic Development Council of Kemah, Texas, is supported by a 0.5% sales tax. The Council funds various community improvement activities including drainage projects, flood plain acquisition and flood proofing.

Bond Issue. 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.

Impact Fees. Some drainage projects in Fairfax County, Virginia, are paid for by contributions from developers. They are required to contribute to the cost of handling the increased stormwater runoff produced by their developments.

Creative Financing. A community is limited only by its imagination. Several have found "creative" ways to find funds for flood proofing. For example, Illinois levies an income tax, which it shares with local governments. The city of Des Plaines appropriated $200,000 from this "extra" money to establish a fund for its flood proofing rebate program.

State Support. Some states have had special appropriations to support local programs. In 1988, the Illinois Housing Development Authority set aside $500,000 for low interest loans for flood proofing.

Federal Support. Several federal agencies, such as the U.S. Army Corps of Engineers and the Tennessee Valley Authority, have directly funded flood proofing projects. The lessons learned from this work are often transferrable 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. The Department of Housing and Urban Development's (HUD) Community Development Block Grant and the Federal Emergency Management

Agency's (FEMA) Public Assistance and Hazard Mitigation Grant Programs provide funds for communities to administer.

Community Interest

What motivates a community to fund flood proofing projects? Those that have investigated or implemented funding programs cited one or more of the following five broad reasons.

Economics. The most frequently cited reason for funding flood proofing was cost. It was shown to be less expensive than other flood protection measures. In some cases, as in Fairfax County, Virginia, and King County, Washington, studies of local flood problem areas reviewed a variety of structural and nonstructural alternatives. 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. Second, predicting the actual costs of projects in areas with little flood proofing experience may be difficult.

Comprehensive Planning. Some communities have prepared comprehensive flood plain management or flood damage reduction plans. During the planning process, they concluded that flood proofing should be a part of the program. King County, Washington, prepared such a comprehensive plan, which made project recommendations for over 120 flooding and erosion problem sites in the county.

External Impact. Sometimes flood proofing is selected because other flood protection measures have adverse impacts on other properties or the environment. Flood proofing can also be less disruptive to a neighborhood than, for example, removing houses or building a large wall.

Community Rating System. The Community Rating System (CRS) is a part of the National Flood Insurance Program (NFIP). Once in the CRS, some communities want to improve their insurance rate reduction, so they initiate new programs to receive more credit for more activities. For example, officials in Kemah, Texas, and South Holland, Illinois, have implemented public information programs and have planned funding programs.

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. 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. HUD's Community Development Block Grant program also has a post-disaster funding program. The Village of St. Charles, Michigan, took advantage of this program to fund a comprehensive flood damage reduction program after it was flooded in 1986.

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 the recommendation most frequently voiced by communities experienced in implementing flood protection plans. This requires both the right attitude and sound technical data that can be explained in lay terms.

Statutory Authority

Two legal questions sometimes arise when considering government involvement in flood proofing: the statutory authority to spend public money on improving private property, and liability for protecting private property. In some communities, legal challenges have prevented implementation of well-planned 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 there was no specific authority to use public money to improve private property.

In Illinois, 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 most states, there is authority to spend local funds on activities whose costs are shared with a state or federal agency.

Liability

What if a flood proofed property is later damaged by a flood? What if the owner failed to maintain a protection measure? These questions have been debated nationally for some time. A community has five ways in which it can protect itself from lawsuits:

1. Staff should become technically competent in the field.

2. Staff should limit flood proofing advice and projects to areas where it is appropriate, i.e., areas of lower velocities and flood depths.

3. The community should enter into a contract or agreement with each property owner. The agreement should specifically exempt the local government from liability.

4. Staff should follow nationally recognized flood proofing guidelines.

5. The community may want to purchase liability insurance or establish a self-insurance pool or plan to protect itself.

Funding Arrangements

The previous section reviewed the factors that a community should consider in establishing a program to fund flood proofing projects. This section discusses how funds actually have been managed. The local programs reviewed fall into one of the following five categories.

Full Funding of Projects on Public Property

Under this approach, a community selects flood proofing as the best way to protect its public facilities from flooding. This is the easiest approach to implement, as it avoids the problems of coordinating activities with a property owner, legal complications of how money should be spent, and concerns about liability.

Full Funding of Projects on Private Property

Under this approach, the community assumes full responsibility for designing, contracting, funding, and managing the flood proofing project. It is similar to full funding on public property except that there needs to be a great deal of coordination with the property owner.

Cost Sharing with State or Federal Funds

Another way to reduce the direct cost to the community is to piggyback with another agency's program. The two most common programs are HUD's Community Development Block Grants and FEMA's post-disaster Hazard Mitigation Grants. The CDBG has funded 100% of the cost to elevate homes in Terrebonne Parish, Louisiana; Kampsville, Illinois; and St. Charles, Michigan. Several communities have used "soft matches" like in-kind services, which are given a dollar value and credited toward the local share.

Cost Sharing with the Property Owner

Having the owner of the protected property contribute to the project's cost has two advantages; the community's funds will go farther, and it gives the property owner a stake in the project. By having an investment in flood proofing, the owner has an incentive to make sure the property is properly maintained.

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 and Illinois offered them before floods had occurred, but there were few takers. On the other hand, the Small Business Administration's 4% disaster assistance loans have been widely used to flood proof properties.

Conclusion

The potential for flood proofing to reduce flood losses is significant. Many people have flood proofed their homes or businesses, often by using common sense or self-taught approaches. In the last 10 years, federal, state and local agencies have been researching techniques, promoting flood proofing as a viable flood protection measure, and assisting property owners in implementing projects.

LOW INTEREST LOANS FOR FLOODPROOFING

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Introduction

A major flood in the western and northwestern Chicago suburbs in August 1987 affected over 100 communities, closed O'Hare Airport, and resulted in a Presidential disaster declaration. Some of the areas had flooded in 1986 and some communities were interested in new approaches to flood protection. Because much of the damage was due to shallow flooding and sewer backup, floodproofing measures were viewed as an inexpensive way to protect many people. State agencies promoted floodproofing and offered advice and technical assistance through handbooks, at public meetings, and at Disaster Application Centers.

One program initiated after the flood was a low interest floodproofing loan program. This paper is a review and evaluation of that program. It is based on interviews of participating local officials, bankers, loan applicants, and loan recipients. It is taken from a project conducted by French & Associates for the Illinois Association for Floodplain and Stormwater Management under a contract funded by the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance Program.

The Loan Program

The Illinois Housing Development Authority (IHDA) is a quasi-independent state agency dedicated to helping low and moderate income families obtain housing. IHDA is not financed by annual appropriations. It has a pool of capital that it invests and its operating income comes from interest earned on investments. IHDA can be somewhat flexible in its program design. However, it is limited by law to support low and moderate income housing. It must also ensure that its loans and investments are safe. It cannot give away money and it cannot undertake risky projects.

Soon after the August 1987 flood, IHDA approached the Illinois Department of Transportation, Division of Water Resources (DWR), with an offer to set aside $500,000 for low interest loans. Because there were already many sources of funds for repairs and reconstruction, it was agreed to make the funds available for floodproofing projects. The two agencies' staff developed the basic outline of the program, which is summarized in Table 1. IHDA needed a

program that met its legal constraints and DWR wanted one that would promote additional local flood mitigation efforts.

***Table 1.** IHDA loan program summary.*

- IHDA would make low interest loans available to low or moderate income families, i.e., the total family income is less than $35,000.
- The loans would only be made available within communities approved by DWR.
- The loans would be limited to floodproofing measures as approved by local building departments; they could not be used for disaster repairs.
- The loans would be made through local banks with IHDA providing funding support to the banks.
    - The loans would be for a maximum of $5,000.
    - The interest rate on the loans would be 2%.
    - The loans must be paid off within five years.
- Administrative costs of processing the loans (title searches, etc.) would be borne by someone other than IHDA or DWR.
- The loan recipient must purchase flood or sewer backup insurance, as appropriate.
- To participate, a community must pass a resolution of intent to participate, which promises that the community will:
    - publicize the program,
    - send staff to DWR training on floodproofing,
    - review plans of loan applicants to ensure that the projects are appropriate for the flood hazard, and
    - prepare and adopt a flood hazard mitigation plan by June 30, 1988.

Community Participation

Over 100 Chicago suburban communities were affected by the flooding. The program was publicized to all of them via letter and public meeting. Eventually 18 municipalities and one county signed up. They were organized into five groups with one bank serving several communities.

Allocation of the funds was a critical issue because it was expected that the $500,000 would be used up quickly. A formula was developed based on the number of residents counseled at the Disaster Application Centers' mitigation tables. This was felt to represent the number of people in each community who could benefit from floodproofing and who needed financial assistance. The formula resulted in allocations of $65,000 to one community, $45,000 to three, and $20,000 to the other 15 communities.

Program Implementation

The funds were not released quickly. Many details had to be worked out, especially on the financial arrangements. IHDA's Board of Directors was not ready to rush into committing a half million dollars in a new program that had no guarantees. It was six months after the flood when the Board passed the needed resolution and negotiating agreements with the five banks took three more months.

Meanwhile, most of the communities passed their resolutions, publicized the loans, and began their mitigation planning. Thirteen communities passed the resolution by the January 31 deadline. Fewer sent staff to the training. By the June 30 deadline, only 10 had completed acceptable mitigation plans. The plan reviewer noted, "None of them are exemplary plans."

One reason some communities did not have an incentive to meet the deadlines was the lack of applications for loans. By the end of 1988, IHDA reported only 10 loans for a total of $36,900. IHDA and DWR agreed to honor a few pending applications and then shut the program down in May 1989. By then, 14 loans were approved from four banks for a total of $51,600. The amount of the loans ranged from $2,000 to $5,000. The average was $3,685. The median and the mode was $3,500.

Interview Findings

It was difficult to reach all of the participants five years after the loan program operated. Interviews were conducted with 13 of the 19 communities, three of the five banks, and 15 loan applicants (nine loan recipients and six people whose applications were turned down). In general, the local officials were frustrated with the low turnout after all the work they did, the lenders took

the program in stride and incorporated it into their regular procedures, and the recipients of the loans were pleased with the way it was administered.

The respondents agreed on the following specific issues:

- There was a good deal of publicity and the message was delivered in a variety of ways, but many felt there should have been more.
- The application requirements were not burdensome, although a reduction in the paperwork and confusion would be appreciated.
- The 2% interest rate was supported by all.
- Bankers and local officials felt that the $35,000 family income limitation was an important reason why more people did not apply.
- There may have been more applicants if the amount of the loan was more than $5,000, although that amount should cover most projects appropriate for the flood hazard.

One interesting finding was the relatively high satisfaction level of the residents. Some of them had very positive comments, like "very helpful, thanks much," "we would have done something after the 1986 flood if we had the money," and "it was a godsend for us." All of the loans were paid off, often because it was required in order to refinance the first mortgage as interest rates went down.

Projects Funded

Table 2 shows the types of projects the applicants wanted to implement. Four applicants had plans for multiple mitigation measures. Therefore, the numbers add up to more than 15. All but one of the single projects were for sewer backup protection. The multiple projects dealt with basement and yard flooding. Sump pump improvements included drain tile work and battery backups. Dry floodproofing included sealing cracks and

***Table 2.** Projects funded.*

Sewer backup protection:	
Overhead sewers	4
Sewer backup valve	8
Basement flooding protection:	
Sump pump improvements	3
Dry floodproofing	3
Surface flooding protection:	
Yard regrading	1

replacing basement windows with glass block.

Most of the projects are the kind that takes an experienced contractor to install. This fact, plus the initial project review by the local building departments, means that the projects can be expected to work. All of the measures could be implemented within the $5,000 limit.

Conclusions and Recommendations

It is generally held that disaster victims would not participate in a loan program; that they would need grants instead. Illinois' low interest floodproofing loan experience, while small, does not support this contention. Even low and moderate income families wanted and obtained loans dedicated solely for floodproofing. Applications were still submitted as late as a year after the flood.

There remains the frustrating question, "Why didn't more people apply?" This report cannot provide a definite answer to that question. Suppositions had been proposed: too late after the flood to interest people, too little publicity, too low an income level, too much paperwork, and not enough money to cover other floodproofing projects. These suppositions formed the basis of the questions put to the bankers, local officials, and applicants.

With one exception, the answers did not reveal any clear opinion of those involved with the loan program. The exception was that most of the bankers and local officials felt that the income level limited the number of applications and the number of approved applications.

The only other conclusion that can be drawn is that there might be more applicants if all aspects of the program were improved and implemented more quickly with less confusion. In other words, have the procedures, forms, publicity, etc., for a low interest loan program ready to go before the next flood.

More details on the IHDA loan program, the procedures followed, the forms used, the interview findings, and the recommendations for future loan programs are found in *Analysis of the IHDA Floodproofing Loan Program*, September 1993, available from the Illinois Association for Floodplain and Stormwater Management.

A FLOOD PROOFING SUCCESS STORY

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Introduction

House raising is one type of flood proofing that can be used to reduce or eliminate flood damage to floodprone homes. A successful flood proofing project was completed in Goodlettsville, Tennessee (near Nashville). The project, known as the Dry Creek Project, consisted of raising in place 19 homes.

A different administrative approach assisted the Corps of Engineers, Nashville District, in the implementation a successful, cost-effective house raising project. A nonstandard approach was used which reduced administrative costs by minimizing Corps of Engineers' involvement and maximized homeowner involvement. Satisfaction was achieved by allowing homeowners to control many aspects of the project.

Project Background

The Nashville District flood proofed those 19 houses by raising their first floors above the 100-year flood elevation. The flood proofing project cost was $568,000, and the benefit-cost ratio was 1.2. The house raising began in March 1989 and was completed in June 1990. When flood proofing was considered for the 19 houses, a review of the Corps of Engineers' house raising experience revealed two problem areas: high costs, and homeowner apprehension.

The solution to both problems involved minimizing the Corps of Engineers' role and maximizing the homeowner's role. This was accomplished by changing the standard Corps of Engineers' procedure and allowing the homeowners to select their own contractors and direct the work. In very simple terms, the Corps of Engineers said to each homeowner, "You get your house raised, and we will pay for it."

Project Implementation

Information Phase

Project implementation began by communicating with the homeowner. The homeowners were required to obtain at least three proposals from

contractors of their choice and submit them to the Corps of Engineers. All contractors' proposals for the Dry Creek Project were less than the government estimate. The Corps of Engineers' review of the proposals was to insure that the fundamental requirements were covered and other major items of work were agreed upon, such as the size of porches and decks, sidewalks, driveways, and landscaping.

The Corps-homeowner agreement was the last step prior to construction. The agreement contained only four requirements:

1) The house had to be raised at least 1 foot above the 100-year flood elevation;

2) Construction had to pass the codes inspection by the City of Goodletts-ville (the prevailing code for home construction and improvement);

3) A provision of flow through the foundation to eliminate hydrostatic pressure had to be allowed for; and

4) The homeowner had to execute a covenant provided by the Corps and later recorded at the courthouse stating that the space below the new first floor would never be converted into living space.

After the terms of the agreement were met, the Corps of Engineers paid the amount of the "offer."

Construction

All the homes in the program were one-story brick veneer, in sound structural condition. The homes ranged from 1,000 to 1,475 square feet, and the raise heights varied from 2 to 6 feet. All homes had crawl spaces under the main portion of the structure. Several residences had finished garages on slabs about 1.5 feet lower than the first floor. The slabs were not raised. Table 1 presents a descriptive list of the homes.

The typical steps and time requirements for construction are:

1) Obtain city permits.

2) Complete a pre-construction inspection and inventory.

3) Complete site work. This usually took 3 to 5 days, i.e., brick removal and disposal, dismantling fences and moving shrubbery, knocking holes in the foundation walls, cutting garage slabs for lifting beams, and other miscellaneous activities.

Table 1. Dry Creek flood proofing project summary.

DRY CREEK FLOOD PROOFING PROJECT SUMMARY*			
SIZE of HOUSE (sq. ft.)	RAISE HEIGHT (ft.)	CONST. COST**,***	COMMENTS
1000	5.33	$26,200	3 exits
1000	6.00	$29,500	3 exits
1000	5.33	$29,500	3 exits
1000	4.67	$29,500	3 exits, A/C
1420	4.67	$35,000	3 exits, finished garage, offset
1450	4.00	$35,350	2 exits, A/C, fin. garage, offset, paved drive, big porch
1430	3.33	$34,050	2 exits, fin. garage, offeset, fireplace, paved drive, 2 big porches
1475	4.00	$33,000	3 exits, offset
1425	3.33	$32,500	2 exits, garage, offset, paved drive, alum.siding, big front porch
1425	2.67	$31,000	2 exits, garage, offset, big front porch
1450	2.00	$30,800	2 exits, finished garage, large attached carport
1065	4.67	$29,700	2 exits, offset
1275	2.00	$30,200	2 exits, finished utility room (on slab), A/C, partial stone face
1450	2.00	$31,800	2 exits, finished garage w/false ceiling, C/L fence
1400	2.00	$31,800	2 exits, finished garage w/false ceiling, A/C
1450	2.00	$28,500	front porch, garage (rehang 2 doors & window, interior steps)
1014	2.00	$25,900	2 exits, paved driveway
1000	2.00	$27,200	2 exits, attached utility room, wood fence, concrete patio
1450	2.00	$31,600	2 exits, finished garage w/false ceiling, large front porch

* Brick veneer houses in sound structural condition with crawl spaces.
** Includes $4,000 per structure for Corps of Engineers' administrative costs.
*** 1989-1990 prices.

4) Vacate home on the day of house raising and disconnect water and sanitary drainage lines.

5) Raising was usually accomplished with synchronized hydraulic jacking systems and timber cribbing. This required about 1 to 2 hours per vertical foot.

6) Complete temporary utility reconnections and erect temporary steps. Local ordinances should be followed regarding habitability during housing raising activities.

7) Complete the remaining work in from 2 weeks to 3 months, i.e. new footings, masonry block laying, brickwork, plumbing, limited electrical work, new porches and decks, and site cleanup and landscaping.

Factors impacting the time included weather, capability of contractor, availability of sub-contractors, and type of structure.

The only formal "inspection" by the Corps of Engineers was to certify that the terms of the Corps-homeowner agreement were met prior to payment. The Goodlettsville codes department and the homeowners provided the "quality control" for the construction.

Costs

Raising-in-place construction costs for the 19 houses ranged from $25,900 to $35,350, including administrative cost (see Table 1). The major variables that influenced the costs were the number of entrances/exits, height of raise and foundation perimeter, size of existing porches, offsets, and finished garages. Corps of Engineers' administrative costs of about $4,000 per structure were incurred.

Conclusions

The Dry Creek flood proofing project was a success. The project objectives were achieved.

1) Flood proof the houses in a cost efficient manner.
2) Maximize homeowner satisfaction.

There was nothing unique about flood proofing the houses along Dry Creek; no new construction techniques were developed, and no unusual techniques were used. The uniqueness of the project was the administrative philosophy. This philosophy was to "keep things simple, and stay out of the way as much as possible."

References

U.S. Army Corps of Engineers, National Flood Proofing Committee
1993 *A Flood Proofing Success Story along Dry Creek at Goodlettsville, Tennessee.*

Appendix

Using Dry Creek Costs as an Estimating Tool

This appendix discusses the applicability of using the cost data included herein as a basis for estimating costs on similar projects at other locations. An equation was developed based on the Dry Creek house raising costs. The variables in the equation are size of structure and raise height, and the equation takes the form:

COMPUTED COST = K + (Ks)(size) + (Kh)(raise height)

Constants are: K;

Ks, "size" is the square feet of the ground floor, including attached garage;

Kh, "raise height" is in feet.

The constants derived from the Dry Creek data are:

K = 11,360; Ks = 12.6; and Kh = 970.

This equation should give reasonable planning-level estimates for screening alternatives. Anyone using the equation or its results should recognize the limitations of this method.

THE EQUATION SHOULD NOT BE APPLIED TO SITUATIONS WHICH ARE DRASTICALLY DIFFERENT FROM THOSE AT DRY CREEK. SPECIFICALLY, THE EQUATION SHOULD NOT BE USED ON HOMES IN POOR (UNSOUND) CONDITION OR HOMES ON SLAB.

The Cost Analysis Table on the next page shows the actual cost, the computed cost using this formula, and the percentage of difference for each house raised in the Dry Creek Project.

Table A-1. Cost analysis.

STRUCTURE NUMBER	SIZE (square feet)	RAISE HEIGHT (feet)	ACTUAL COST*	COMPUTED COST**	PERCENT DIFFERENCE (Compound vs. Actual)
1	1000	5.33	$26,200	$29,130	+10
2	1000	6.00	$29,500	$29,780	+ 1
3	1000	5.33	$29,500	$29,130	- 1
4	1000	4.67	$29,500	$28,490	- 4
5	1420	4.67	$35,000	$33,782	- 4
6	1450	4.00	$33,350	$33,510	- 5
7	1430	3.33	$34,050	$32,608	- 4
8	1475	4.00	$33,000	$33,825	+ 2
9	1425	3.33	$32,600	$32,545	0
10	1425	2.67	$31,000	$31,905	+ 3
11	1450	2.00	$30,800	$31,570	+ 2
12	1065	4.67	$29,700	$29,309	- 1
13	1275	2.00	$30,200	$29,365	- 3
14	1450	2.00	$31,800	$31,570	- 1
15	1400	2.00	$31,800	$30,940	- 3
16	1450	2.00	$28,500	$31,570	+10
17	1014	2.00	$25,900	$26,076	+ 1
18	1000	2.00	$27,200	$25,900	- 5
19	1450	2.00	$31,600	$31,570	0

* Includes $4,000 per structure for Corps of Engineers' administrative costs
** Compared Cost Where K = 11,360; K_s = 12.6; K_h =970

EXAMPLE:

House No. 5:
COMPUTED COST = K+(K_s)(size of house in square feet) + (k_h)(raise height in feet)
= 11,360 + (12.6)(size of house) + (970)(raise height)
= 11,360 + (12.6)(1420) + (970)(4.67)
= $33,782

FLOODPROOFING OPEN HOUSES

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Introduction

Floodproofing open houses provide flood protection information and advice to floodprone property owners. More than a dozen floodproofing open houses have been conducted in Illinois since 1981 and they have been used in other states in the last few years, particularly after a flood or when it has been concluded that a structural flood control project is not feasible. This paper reviews the findings of a survey of open house participants to determine if the open houses were productive and, if so, how they could be improved.

Floodproofing open houses have four major parts:

1. A slide show or video to provide an overview of floodproofing, insurance, and other flood protection topics;

2. Contractors and government staff available at tables to talk one-on-one with the attendees about their products, services, or agency programs;

3. A "mitigation table" where people could review their flood situation with an objective expert and receive advice on what to do and who at the open house could help; and

4. Manuals on floodproofing and property protection and handouts provided by the contractors and government agencies, which are given to all participants.

The Illinois Association for Floodplain and Stormwater Management received a Hazard Mitigation Assistance Program planning grant from the Federal Emergency Management Agency. The Association contracted with French & Associates to survey the participants of two open houses conducted in the south Chicago suburbs in 1991 and 1992.

The Survey

Of the over 300 participants at the two open houses, 160 returned completed questionnaires. They came from 14 suburbs, the bulk of them from Homewood, Flossmoor, and South Holland. Eighty-one percent of the attendees

had been flooded in November 1990 and 76% had been flooded before then. Sixty-six percent had basement/crawlspace flooding and 7% had flooding in the first floor.

Publicity

These two open houses had a much larger turnout than previous ones conducted within two weeks of floods. The survey responses support the supposition that more lead time coupled with local publicity will bring in more people. Newspapers, local notices, and word of mouth were the major sources of information about the open houses, all of which need lead time. Of the 85 who read about the open houses in the newspaper, 62 listed that as their only notification.

Effectiveness of the Open Houses

Open houses can be judged to be effective if the attendees implement flood protection measures. The ultimate effectiveness can be told if the protection measures actually reduce flood damage in later floods. The survey respondents had one to two years to implement a measure. Those who attended the earlier open house suffered a severe storm two weeks after, which may have provided an important reminder of the need for flood protection.

The survey found that the 2/3 of the respondents (107 of 160) implemented one or more flood protection measure *after* they attended the open house. As expected, the rate of implementation was higher for those who went to the earlier open house. The majority of those who implemented something did more than one thing. One respondent undertook seven projects. The measures taken are shown in Table 1.

The measures implemented ranged from inexpensive to expensive, from minor alterations to major changes to the building. While it cannot be proven that the open houses were the only reason why the measures were taken, it is likely that they had a considerable impact on the property owner's decision.

As expected, most of the implemented measures dealt with basement or sewer flooding. It is interesting to note that every flood protection measure was implemented by at least three participants from each workshop. It is also significant that there are more cases of expensive measures, such as overhead sewers and backup valves (which cost $3,000 to $4,000), than of the inexpensive measures like standpipes.

Table 1. Flood protection measures implemented by 107 participants after the open house.

Installed overhead sewers (11)	
Installed sewer backup valve (13)	
Installed standpipe or sewer drain plug (13)	
Installed or added a new sump pump (36)	
Repaired or replaced a sump pump (28)	
Waterproofed basement walls (23)	
Regraded yard/built wall to keep water away (34)	
Protected windows or window wells from flooding (13)	
Bought flood insurance (17)	
Obtained sandbags/made emergency action plan (11)	
Other:	
Drain tile improvements (4)	
Sewer line improvements (2)	
Dry floodproofing (3)	
Raised building (2)	
City fixed problem (2)	
Installed backup electrical power (2)	
Encouraged others to floodproof (1)	

n=215

The number that bought flood insurance is lower than expected. However, flood insurance may not be useful for the majority of the people concerned with basement and sewer backup flooding. There was a higher rate of insurance purchase for the South Holland attendees and South Holland has a greater overbank flood problem than the other suburbs that were represented.

Effectiveness of the Measures

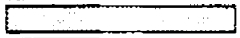
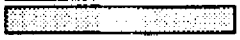
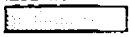
Were the measures successful? Some of the area was flooded after the open houses were held. However, it must be noted that the later floods were at least two feet lower than the 1990 flood, so some measures would not have been tested. Twenty-nine respondents had had a flood that tested the flood protection measures they installed *after* the open houses. Twenty-three of them (79%) stated that the measures helped prevent or reduce flood damage. Ten of these implemented one measure and the other 13 implemented multiple measures.

Of the six respondents who reported that their measures did not work, one is having the problem corrected under the contractor's guarantee. Four others did not implement what was needed for their reported flood problem, one because she could not afford to. It is not known why the sixth person's measure did not work.

Conduct of the Open Houses

The survey respondents were asked which activities proved most helpful and how they were helped. The handbook, the slide show, the videos, talking with contractors, and talking with other homeowners were rated as most helpful. Talking with government officials was rated as less helpful. However, it should be noted that most of the local officials were present to explain permit requirements, not to provide floodproofing assistance. Further, as noted later, many respondents wanted more information about government programs. The types of assistance people received are summarized in Table 2.

Table 2. Responses to the question, "How did the floodproofing open house help you?"

Helped me better understand my flood problem (19%)	
Helped me better understand government programs (12%)	
Got flood protection ideas from the handbook (17%)	
Got protection ideas from the slide show or the video (13%)	
Got flood protection ideas from a government expert (7%)	
Got flood protection ideas from a contractor (13%)	
Used the services/got materials from a contractor (5%)	
Showed me where to go for more information or help (7%)	
The Open House confirmed what I had planned to do (8%)	

Fears that contractors would prey on flood victims, would have an unfair advantage, and would make a lot of sales were not supported. Few contractors made sales and the respondents wanted to talk to more contractors in the future.

Recommendations

Eighty-five percent of those who responded to the question "Would you recommend that more open houses be held in the future?" said yes, either in other areas, later in the same area, or both. Open houses should continue, not only because the participants recommended so, but because the majority of the participants later implemented flood protection measures. Most of those measures worked for those properties that were later flooded.

In addition to acting as a vehicle to provide information, open houses facilitate interaction between floodprone residents and their local officials. The many positive comments show that residents appreciate the service from their local governments and the chance to talk to their local officials.

Self-help flood protection should be viewed as part of a larger community flood protection effort. Open houses should be publicized as one of several flood protection efforts of the community. Neither the publicity nor the conduct should communicate an attitude that the local governments are abandoning their residents.

This conclusion should be viewed in the context of an area subject to shallow overbank flooding, sewer backup, and basement flooding where protection measures are less expensive and less disruptive than other floodproofing measures, such as elevation and floodwalls.

More details on these findings are in a report, *Analysis of the 1991 and 1992 Floodproofing Open Houses*, available from the Illinois Association for Floodplain and Stormwater Management. The report's recommendations are incorporated into a separate report by the Illinois Association, *How to Conduct a Floodproofing Open House.*