

**FEATURES**

## Floodplain Strategies for Staying Dry and Staying Put

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Even before the devastating floods of 2005, local planning officials and commercial property owners were thinking about flood mitigation in new ways. After all, substantial numbers of established business buildings that support local tax bases stand on floodplain sites. Many buildings predate by decades the Federal Emergency Management Agency (FEMA) and National Flood Insurance Program (NFIP) regulations and were built before we knew what we know today about construction on floodplains.



Floodgate at Methodist Hospital at the Texas Medical Center, Houston prevents flash flood waters from flowing down truck ramp. Barriers like this also protect many underground garages.

In addition, we now realize that even entire cities are built on floodplains, and unfortunately they flood-time and again. Grandfathering won't keep anything dry. Relocating such buildings and cities is simply out of the question.

Then came Hurricane Katrina, Hurricane Wilma, record rainfalls in the Northeast, and fresh media coverage about global warming and the shrinking polar ice cap. This quadruple whammy has put the flood mitigation issue front and center as never before. Flooding is inevitable. How can local governments and property owners more effectively protect their assets already located on floodplains? What safeguards and restrictions should we put on new commercial development in designated floodplains?

### **BAD NEWS, GOOD NEWS**

The bad news is that, according to all responsible predictions, flooding will get worse, not better, for the foreseeable future. This is true in every corner of the country, not just on the Atlantic and Gulf coasts and in Hurricane Alley. Even today, NFIP gets substantial flood loss claims from every state, every year.

It is inevitable that more existing commercial properties and commercially zoned raw land in flood zones will get flooded more often. This will create more business interruptions and property losses leading to more NFIP loss claims. Some floodplain businesses have been flooded repeatedly, and they file loss claims each time.

Now the good news. First, flood damage to those buildings and their contents is largely preventable. Second, relocation or elevation (building up on stilts) are not the only options available. FEMA also explicitly allows a third option for nonresidential buildings: floodproofing in place. In the past, this option has been largely overlooked or even discouraged at the local level, perhaps because it is unfamiliar.

Today, however, in-place floodproofing is winning more favor at the local level. More existing commercial properties are successfully floodproofed right where they are so they can remain dry and stay put. In some cases, federal grants are available to defray the costs. Even without such assistance, in-place floodproofing often proves to be much more cost-effective than elevating, demolishing, or relocating the building.

### **TURNAROUND IN THINKING**

In-place floodproofing has become the new way of thinking about flood mitigation. Done properly, it really works, and this fact should be reflected in the local permitting process. Despite the devastating power evidenced by a Hurricane Katrina, the vast majority of floods are infrequent, temporary, and minor. Some last only hours; most involve less than one foot of water, once or twice a year. Why give up on a building or a site that's perfectly viable except for two or three days each year?

A decade or so ago, the attitude at the local level was much more negative about floodproofing, even though FEMA has always allowed for it. Local government planners and permitting officials either banned floodproofing outright, allowed it only as a last option, or made the permitting process so onerous that property owners gave up trying.



Floods like this almost closed down the Yorklyn, Delaware, Center for the Creative Arts (CCArts), a community nonprofit organization.

Does floodproofing really work? There's plenty of evidence that it does, for both existing and new commercial and institutional buildings. Containment companies, for example, can point to more than 5,000 successful projects dating back more than 25 years. And when floodproofing does work, it's a win-win for both the locality and the property owner.

Let's look at a few cases.

### **RECENT DELAWARE CASES**

In Delaware, in-place floodproofing recently enabled two enterprises to stay put-and stay dry-despite their floodplain locations. A third project, under way now, is expected to be equally successful. Basically, the buildings are waterproofed and all windows and doors are equipped with quick-deploying flood barriers so that the interiors and their contents are undamaged.

Equally important, an emergency operating plan is in place. In all three cases, the Delaware Department of Natural Resources and Environmental Control worked with the affected businesses and localities to ease their costs and ensure success.

One enterprise is the Center for the Creative Arts (CCArts), a nonprofit community arts center located in a former elementary school built in 1932 in the Red Clay Creek floodplain in Yorklyn, Delaware. First-floor elevation is 172 feet and basement elevation is 162 feet, but the 100-year base flood elevation (BFE), also known as the 100-year flood level, is 176 feet. The flood source is actually heavy rainfall in the Red Clay Creek basin, 50 miles north in neighboring Pennsylvania.



At Texas Children's Hospital in Houston, big sidehinged flood door (shown in stored position here) keeps basement dry despite flash floods rising to five feet outside. Not a drop of floodwater has gotten in.

Past floods had been so disruptive and damaging that CCArts considered relocating. But the organization couldn't raise the capital, so there also was talk of closing the doors for good. With help from architects and consultants, the arts center worked on a floodproofing plan, and the Delaware state government helped secure a FEMA grant to defray the costs. The inside of the facility has been bone dry ever since.

The plan for CCArts involved sealing all exterior walls and installing flood barriers in all exterior doorways to 18 inches above the 100-year BFE, per local building codes. Because the center does not employ a full-time custodian, it selected these specific flood barriers so that even a 60-year-old female volunteer could deploy them in minutes. Two of the barriers swing into place like the lower sections of Dutch doors. The other two slide out like pocket doors.

The plan also included an automatic flood phone alert to key employees, which is triggered by a flood alarm installed in the Susquehanna Basin in Pennsylvania, near the flood source. The total project cost \$200,000; a FEMA grant covered \$100,280, and CCArts picked up the balance.

Another case in Delaware is the two-step project for Bell's Supply Company in the White Clay Creek floodplain. The business occupies a 24,000-square-foot masonry-walled building with a 13-foot floor elevation in a flood plain with a 14-foot, 10-year BFE; a 17.5-foot, 50-year BFE; and a 19-foot, 100-year BFE. As a result of periodic flooding, the company has collected several millions of dollars of NFIP flood claims since opening its doors in 1970.

The first flood mitigation step, taken in 2001, was to flood protect the structure to 30 inches above the floor, or to about the 25-year BFE. This involved waterproofing the walls, installing a variety of flood barriers (based on type of opening) at all doors, and setting up an automatic telephone flood alarm to call in deployment staff if the building is in danger of flooding when the store is closed.

That project cost approximately \$130,000, \$97,000 of which was covered by a FEMA grant. This worked fine until 2003, when Hurricane Henri generated floodwaters that overtopped the barriers by six inches, causing interior damage in the millions of dollars. In 2004, the owners raised the flood

protection height to 60 inches by reinforcing the walls to handle five feet of hydrostatic pressure and installing higher flood barriers. The total cost of the additional floodproofing was about \$500,000, which will be easily recovered in the first major flood.

The third Delaware project is in progress. Standard Technologies and Machine Company is a small machine shop with a 40.9-foot, first-floor elevation in a flood zone with a 43-foot BFE. The company was substantially damaged during Hurricane Henri but couldn't afford to relocate. Because of the heavy equipment typical of machine shops, elevating the building at the site was not feasible.

The solution was to floodproof the walls to 18 inches and install flood barriers to the same height in all doorways. Of the \$320,000 cost, \$212,000 is being covered by the same type of FEMA grant that the other Delaware enterprises used.

In all three of the Delaware cases, the enterprises were able to stay put and stay dry, and the communities were able to retain community assets and ratables. The success was the result of proven floodproofing technologies, building and permitting codes that allowed in-place floodproofing to FEMA and NFIP standards, and state and local government cooperation that helped secure the FEMA funds.

### **. . . AND ELSEWHERE**

There are plenty of successes elsewhere, too, and many have not depended on FEMA financing.

In Colonia, New Jersey, Home Depot is running a successful new store on a site that had been abandoned years ago by another retailer because of flooding as high as three feet. For every year the land remained idle, the town suffered from having an eyesore on a main road and lost out on ratables and economic activity.

Home Depot made the site workable by raising the grade level by 18 inches, building a two-foot floodwall snug against the exterior wall, and providing lift-out flood barriers for all openings. Home Depot was able to take advantage of a high-traffic, high-visibility location, and the town benefited from higher employment and the recovery of a performing tax ratable.

In a 25-year-old strip mall near Scranton, Pennsylvania, Redner's Warehouse Market reopened its doors just two days after a flood-no Redner's layoffs, no loss of economic activity, no interruption in Redner's tax revenues-while its neighbors were still cleaning up two months later. The reason: Redner's had floodproofed its store so almost no floodwater got in. (What little water that did encroach came in through floor drains, not through flood barriers.) A neighboring K-Mart didn't fare as well; it lost more than \$1 million in inventory and weeks of selling time. The K-Mart manager saw Redner's success and ordered floodproofing, saying "flood barriers are a minor investment."

### **WHAT EXPERIENCE TEACHES**

What can we learn from these cases?

- In-place floodproofing, done properly, works and is supported by both FEMA and NFIP. Floodproofing protects property, cuts NFIP loss claims, and enables enterprises to get back in business sooner after a flood. It can be a much better solution than forcing a business to elevate its structure or move elsewhere.
- In-place floodproofing should include an emergency operating plan and employee training to ensure that barriers will be deployed as needed. The permitting process should include review of the building's emergency operating plan as well as its structural engineering aspects. The FEMA Web site (FEMA.gov) has good information, especially FEMA Form 81-65 and Technical Bulletin 3-93, on what to look for in emergency plans.

- Today's better flood barriers, installed properly, can keep a building interior dry as a bone. For example, during flash floods that sometimes pile up five feet of water outside, not a drop of water gets into the basements of Houston hospitals equipped with flood doors.
- Flood barriers alone do not necessarily make a building floodproof. Walls need to be waterproofed and sometimes need reinforcement to withstand the hydrostatic forces. An engineer must be involved. The FEMA Web site gives more details.
- Grant money is available from FEMA to local governments for valid in-place floodproofing projects on existing structures in floodplains. This creates an opportunity for local jurisdictions to help retain good businesses that otherwise might move to the next town. FEMA makes these grants only to local governments, not directly to property owners, and will cover costs to communities for administering the projects. FEMA's and NFIP's underlying philosophy is that a one-time investment in floodproofing can be more cost-effective than repeatedly paying loss claims.
- Even without grant money, in-place floodproofing of an existing building in a floodplain makes economic sense. It's much more economical than moving a business or elevating a building on an existing site.
- Not all floods or floodplains are the same. A lot of buildings are on sites that get flooding of just 6 to 12 inches, or even less, for a day or two a year. In-place floodproofing in these instances should be encouraged. It's effective, affordable, and far less intrusive than demolishing and rebuilding up or building elsewhere. In addition, raw land with a mild flood threat might be a perfect candidate for new commercial development and additional ratables if buildings placed on it can be properly floodproofed at the outset. Above all, floodplain projects need to be evaluated on a case-by-case basis.

### EVALUATING FLOOD BARRIERS

Unfortunately, there are no national standards for flood barriers that can be dropped into local building codes. Under FEMA guidelines, validation for the barriers flows from the licensed professional engineer who signs off on the project design. Code and permitting officials should, however, carefully examine any plan to be sure the flood barriers will work when needed.



Yorklyn CCArts on a dry day, during floodproofing project. Dotted line shows base flood elevation (BFE), also known as 100-year-flood level.

- Installed base of the barrier supplier. Because of the recent increase in flooding, some unproved suppliers are appearing in the flood-barrier business. By contrast, some trusted providers have installed bases covering 5,000 projects over the past 25 years.

These are mechanical components designed to protect against catastrophic property damage from flooding, not a piece of trim.

- Installation or installation supervision of the barriers by the barrier supplier. Most failures can be traced to improper installation by contractors unfamiliar with flood barriers.
- Post-installation testing. Testing of the floodproofing after installation should be a requirement. Testing adds only 2 percent to 3 percent to the installed cost of the barriers, but it ensures that the barriers will work during an actual flood.
- Ease and speed of deployment by people who will be available during a crisis. Different brands of flood barriers show enormous differences in ease and speed of deployment. Some barriers deploy in seconds, with just the swing of a door or turn of a latch. Others can take 10 times as long and require a toolbox or proprietary spanner. Beware of tool requirements and extra parts because they can get lost when needed most. Experience teaches that the best-trained responders may not be able to show up during an actual flood, and mandatory evacuations can curtail available deployment time. Keep it simple.

## OUTLOOK

The specter of more flooding comes as good news to nobody, but it seems inevitable. Floodproofing, however, gives local governments and property owners more and better ways to protect property and the local tax base in the face of almost certain flooding. In-place floodproofing is allowed under federal standards, and it is gaining acceptance among local planners and local code and permitting officials. The products and know-how-and sometimes the funding-to make floodproofing a success are available for the asking. PM

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### More Floodproofing Information Available on the Web

Association of State Floodplain Managers: [www.floods.org/home/default.asp](http://www.floods.org/home/default.asp)

Louisiana State University floodproofing center:  
[www.lsuagcenter.com/en/family\\_home/](http://www.lsuagcenter.com/en/family_home/)

FEMA electronic grant application:  
<https://portal.fema.gov/famsVu/dynamic/mitigation.html>

FEMA Technical Bulletin 3-93, "Non-Residential Floodproofing," for floodproofing guidance: [www.fema.gov/pdf/fima/job6.pdf](http://www.fema.gov/pdf/fima/job6.pdf); dry floodproofing: [www.presray.com](http://www.presray.com)

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