Kepets, Arie
Before Disaster Strikes
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Protect your facility from flood damage

Before Disaster Strikes, - Protect your facility from flood damage

Arie Kepets

It is no surprise that the weather is changing around the world. In many communities, a 'storm of the century' occurs every year, and 100-year floodmarks are surpassed with each new storm. Although classified as natural disasters, floods are more problematic today largely because of human activities. The major culprits are the effects of urbanization - paved surfaces, parking lots, and housing developments. The reduced surface area, which reduces the absorption -it of rain and snowmelt runoff, is resulting in increased storm-runoff levels and urban flash flooding. One dare not even think of what could happen if global warming exacerbated these conditions.

As a result, many treatment facilities should investigate floodproofing Ordinarily, floodproofing makes good business sense, but it rarely is performed. Part of the problem may be linked to previous approaches taken by the U.S. Federal Emergency Management agency (FEMA) an t e National Flood Insurance Program (NFIP), which provide assistance and help to disaster-struck areas. The readily available emergency relief funds and heavily subsidized flood insurance premiums, with the general disregard for associated risk, have encouraged plants to disregard preventative measures.

VENTS ARE OFTEN OVERLOOKED AS POINT OF ENTRY OF FLOOD WATER

But recent changes in funding, rules, regulations, and codes are forcing plants, as well as businesses and other industries, to implement measures that minimize damage and losses caused by flooding. FEMA has requested changes in flood insurance availability and in insurance premium rates so that premiums would reflect risks and losses. Other proposals would limit loss payments to a single payment per location, which could restrict payments in high-risk locations and favor sites that take steps to reduce damage. While steps to cap ever-escalating insurance payments, disaster relief funds, grants, and loans are directed at residences and businesses, they also affect municipal and publicly owned facilities.

In addition, the U.S. Environmental Protection Agency has weighed in with its own floodproofing incentives. Stiff fines have been threatened and levied, on a case-by-case basis, on facilities that discharge untreated effluent, even if such passthroughs are the result of flooding and other natural disasters.

Getting Started

Before deciding on the method of flood protection, flood levels and extent of area usage should be determined. Flood levels are based either on locally available flood zone maps for new construction or markings left by previous floods. Twelve inches (30 cm) should be added to these levels to 'factor in' floatables, increased levels caused by winds, and the inevitable storm that surpasses the 100-year level. Flood levels should be determined for every opening within the facility to accommodate varying grades and locations.

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PARTIAL HEIGHT BARRIERS - LIGHT WEIGHT ALUMINUM CONSTRUCTION - EASILY REMOVABLE.

Once levels are established, area usage should be defined. Frequency of usage, wheeled vehicle traffic, and equipment and wheelchair accessibility should be noted. Such information will help in determining which floodproofing options to use.

Floodwalls are permanent barriers, such as low brick walls, that protect a facility or equipment, while levees are walls that are intended to divert flows. They are used mostly on large plains or along riverbanks. Floodgates and barriers often are used to seal access openings in floodwalls and levees. For example, electrical gear, transformers, and chemical storage tanks enclosed by a floodwall can be accessed by opening a floodgate.

Windows, vents, and ducts can be sealed with 'permanently' mounted, Removable shields that can be removed for escape or air circulation. Openings in floors or roofs can be sealed with hatches.

Bulkhead doors can be used for below-grade openings, or openings that would be submerged beneath the flood level. These doors are completely watertight and protect entries to basements, tunnels, and galleries that house frequently accessed equipment. These doors can be designed to provide total protection under many feet of standing water.

Gates can be used for openings ranging from 76-cm doorways to truck-access openings to 6- to 12-m wide. Openings intended for wheeled access require a gate with a sill arrangement that will not be damaged by heavy vehicles nor prevent wheelchair access. (While configuring gates and barriers, designers should comply with the American with Disabilities Act if the entryway is designated as being wheelchair accessible.)

For above-grade openings, or openings partially below the flood level, partial-height barriers are recommended. Such barriers frequently are constructed of lightweight aluminum for easy placement and removal.

If these options are not cost-effective, facility managers may consider floodproofing equipment through replacement or modification. For example, it may be cheaper to replace existing pumps and drives with watertight models. Or, if a pump already has suitable packing and sealing, it can be adapted for submersible operation if the electrical circuits are protected.

Sandbags are not a recommended floodproofing method for several reasons:

- Availability: A facility would need to have the proper amount of bags, sand, and equipment immediately in an emergency.
- Labor and time: Sandbags, each weighing about 50 lb. (23 kg), must be loaded and piled at all entryways to a facility. At one facility, it took two workers 2 hours to sandbag 10 facility openings. In contrast, a bulkhead door can be closed by one person in a few seconds.
- Disposal or storage: After a flood, the sand and bags must be disposed or stored. If they are not disposed, they can soon become an eyesore.
- Durability: Bags deteriorate after several uses, whereas a floodgate is a one-time investment.

BELOW GRADE BASEMENTS - ELECTRICAL ROOMS, ELEVATORS CAN BE PROTECTED WITH WATERTIGH DOORS

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Recommended Approaches

More and more, local building codes across the nation are being amended to ensure that new construction as well as renovations conform to FEMA guidelines. Relocation and elevation, wet floodproofing, and dry floodproofing are some measures written into building codes.

Relocation and Elevation

Relocation and elevation can apply to entire facilities or key components of facilities. While relocating a facility to an area outside the floodplain is not practical for many wastewater treatment facilities, moving components such as electrical supply transformers, generators, and control apparatus often is much h s simpler. Other equipment - monitoring equipment or generators - can be elevated above the flood level.

When relocation or elevation is not practical or interrupts operation, floodwalls and levees should be considered.

Wet Floodproofing

The main goal in wet floodproofing is not to keep water out, but to minimize structural building damage caused by hydrostatic pressure. Therefore, wet floodproofing should be considered for areas or buildings that can be 'sacrificed' at minimal cost or that contain equipment that can be dried or replaced inexpensively. For example, an addition to the administrative building at one wastewater facility was placed on columns, and the ground level served as a parking lot. During a flood, the parking lot would be submerged, **but the** higher levels would remain dry. Hydrostatic pressure, or the pressure exerted by water, should not be taken lightly. Rushing water, as in a flash flood, demonstrates this immense power by upsetting or destroying virtually anything in its path. The dangers of hydrostatic pressure also apply to contained, still water - about 50 lb. (23 kg) of pressure is exerted for every cubic foot (0.03 meter) covered by standing water. If contained in a building, water will seek equilibrium by pushing outward on walls. For this reason, the walls of buildings undergoing wet-floodproofing should be given the same structural evaluation as floodwalls, levees, and floodgates and barriers to ensure that they will not collapse. A simple solution is to provide several openings for water to exit as well as enter a building.

Dry Floodproofing

ELECTRICAL VAULT IS SECURED BEHIND A FLOOD WALL WITH REMOVABLE FLOOD PANELS PROVIDING BOTH PROTECTION AND ACCESS

Unlike wet floodproofing, dry floodproofing should be used on buildings that contain sensitive or expensive equipment that cannot be removed quickly. Dry floodproofing completely seals the exterior of buildings or facilities to prevent any water entry. Usage and application determine the choice of floodproofing mechanisms, but usually removable floodgates and barriers are fitted over doors, driveways, windows, and vents. Again, because they are subjected to hydrostatic pressure, floodproofing equipment suitability and structural integrity should be considered carefully during design.

Dry floodproofing typically is more expensive than wet floodproofing, but depending on the equipment or the

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area's flooding frequency, it may be worth the extra investment.

Common Mistakes

Flood events can have devastating effects, so it is helpful to be aware of mistakes commonly made in floodproofing, such as

- Overlooking areas that currently need floodproofing or will need floodproofing after an expansion or change in usage;
- Overlooking all routes for rising water to reach and enter a contained area;
- Floodproofing to improper heights and pressures; and
- Installing floodproofing methods that interfere with everyday operation.

Code requirements and financial incentives should not be the driving forces behind floodproofing. However, facilities in flood-prone areas likely would save money and prevent headaches by investing in flood protection.

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