8 Keys to Mitigating Flooding Risks

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Superstorm Sandy inundated the hallowed caverns of lower Manhattan and caused enough personal and financial disruption elsewhere in the city and region to spawn a boom in flood-resiliency efforts. As a consequence, the engineering community has been tasked with delivering cost-effective resiliency solutions for assets that range from single-family homes to entire cities. The foundation of flood damage prevention efforts lies at the local level, and a number of relatively low-cost solutions exist to reduce flood damages and associated claims. Here are eight practical ways to reduce the impact of the next major flood event.

1. Seal the envelope

The vast majority of assets within the floodplain are existing structures. Raising entire structures, while feasible and cost-effective for smaller facilities, is not usually an option. The dry flood-proofing industry, which has grown considerably in the past few years, provides cost-effective solutions for sealing a structure's envelope against floodwaters. Products now exist to make all building openings watertight, including flood-resistant windows, doors and louvers. Likewise, timber and masonry exteriors can be sealed to prevent the entry of floodwaters. Of course, even a well-sealed structure is at risk: As water rises and pools outside of a building, it introduces the possibility of overloading the walls. A structural engineering industry has grown to meet this potential problem, almost always presenting cost-effective solutions.

2. Prevent "back door" entry

The world was introduced to the dirty little secret of flood inundation in an episode of Netflix's hit series, Orange is the New Black, which is set in a women's prison. It chronicled the arrival of a major hurricane and its impact on the fictional inmates' flooded dorms. While the storm raged outside, the incarcerated ladies were enjoying the warm and dry conditions of their facility (if you can actually "enjoy" being in prison — but I digress), when the toilets and sinks erupted with floodwaters. This event illustrated the phenomenon of flood inundation through utility conduits. All unpressurized utilities are vulnerable,

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including sewer, telephone and electric conduits. Thankfully, the fix is simple and inexpensive, whether or not you're behind bars. Install a backflow preventer — a small, off-the-shelf device — and the problem is solved.

3. Secure the power

Loss of power has far-reaching damage-claim implications, in both the physical world and in the arena of economic opportunity losses. At the local level, the risk of power loss can be mitigated by elevating the building-specific power infrastructure above the design flood elevation, and securing a means of backup power. Elevation of infrastructure is a particularly important improvement in older buildings, where traditional architectural planning sited the power infrastructure in the basement. In instances where the infrastructure cannot be repositioned to higher floors, the resiliency marketplace has stepped in to offer flood-proof safe-room technology. These technologies provide perimeter vaults that keep critical infrastructure dry, even during extreme flooding events.

4. Back it up

Taking a page from the disaster-planning handbook, cloud computing provides system redundancy that allows work to continue, even if a local system is off-line. When it comes to flood resiliency, a facility's backup power system — a key element of claim management — is analogous to the cloud. Backup generator use has grown exponentially, providing a cost-effective means to hedge against damages caused by power loss.

5. Feel the berm

Flood berms and levees are civilizations' longest-standing and most effective means of flood protection. The flood-resiliency industry has recognized this fact, and has developed products that can be deployed in advance of a storm to provide an impenetrable barrier around an asset. Portable products, many of which are modular, have been deployed to protect facilities of all sizes, from small substations to around entire campuses. Originally developed for river flooding, the products are equally effective at protecting against tidal and storm-surge events.

6. Heed the warnings

Thanks in part to new computer-modeling software, weather forecasters are experiencing greater success at providing multiple days' advance warning of impending storm events, including where, when, and how hard a storm will hit. The information is often highly specific, for instance, laying out storm-surge levels and pinpointing vulnerable areas. Unfortunately, the practical response to these warnings often fails to match the methodical nature of the forecasts. For example, when Superstorm Sandy bore down on the New York metro area, New Jersey Transit parked thousands of rail cars in a floodplain, resulting in more than

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A thoughtfully developed flood-response plan, with regular training and practice, provides an exceptionally cost-effective way to minimize a storm's negative effects. A well-devised plan includes the complex, large-scale measures — such as deploying temporary berms — as well as the absolute basics, like making sure your generator's fuel tank is full.

7. Know the rules

None of these tool-kit components can be effective without a concerted effort to understand the risks associated with flooding. In the United States, the bulk of responsibility for risk evaluation falls on FEMA, the International Building Code (IBC), and the American Society of Civil Engineers (ASCE). In the aftermath of Sandy, FEMA's 100-year return period flood elevations provided the baseline for stronger building codes, mandating a flood-resiliency standard for new and substantially improved structures.

Other measures present a more conservative (read: less stringent) approach, based not on the 100-year flood levels but on projections of sea-level rise. For example, President Obama's 2015 Executive Order requires the design of all federally funded projects to consider these effects. Likewise, IBC and ASCE building codes have incorporated safety measures to increase the elevation at which facilities are considered reasonably safe from flooding, with the strictest requirements reserved for critical facilities such as hospitals and first-responder facilities.

8. Make a plan — and rehearse it

Ultimately, most owners of flood-vulnerable real estate and infrastructure fail to prepare adequately for a storm event for the simple reason that they don't know where to start. Despite the dire results and increasing frequency of severe floods, evaluating their risk and creating plans to mitigate it is still a niche business, and one which requires multiple professional disciplines. However, in response to the need for better disaster response — and not to mention, the opportunities it presents — teams of professionals, most often led by engineers, are cropping up, particularly in more vulnerable locations. The level of planning and preparedness measures vary, depending upon the complexity of a site. But the typical process includes the following steps:

- Survey the asset
- Determine the vulnerabilities
- Consider a range of solutions (economic and engineering feasibility)
- Select, design and implement a solution
- Prepare and implement a flood-response plan

The least expensive, yet most critical product is the flood response plan. The infrastructure and mechanical features of flood-protection systems almost always require some human intervention. Although the systems will rarely be called into action, a plan that's both well-designed and regularly rehearsed is critical to risk mitigation.

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