

RISKTOPICS

FLOOD CONTINGENCY PLANNING
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INTRODUCTION

Is your property located in a high flood risk area? Your flood exposure can be determined using available, local or national, flood map systems. If your facility is exposed or if several locations of your company are exposed to flood, it is recommended that a formal flood disaster recovery plan be formulated by the central operative management of your company to protect the site ('contingency').

OBJECTIVE

Flood related losses have significantly increased over the past years. While the origin of the floods and the meteorological conditions that lead to flooding usually cannot be prevented, the effects of flooding and the extent of damage it can cause can be controlled or reduced.

Flood exposures can be present almost anywhere. Whether a facility is located in a mountain valley, in a basin, along a lake, river, channel, ditch or adjacent to the sea, the potential of flooding needs to be considered.

Flood sources can include heavy rain, melting snow, seismic activity, tropical cyclones (typhoons or hurricanes), and obstructed waterways due to water-borne debris or ice. These sources can lead to flash flooding, surface water overflow, riverine flooding, seiche (water level changes in lakes), tidal flooding, coastal storm surge, and tsunamis. All of these forms of unusual water flow across the ground are collectively known as 'flood'.

If your facility is exposed to flooding from any source, the following checklist should be helpful in developing a flood emergency plan. The guide offers technical recommendations based on current knowledge and is generally valid. Keep in mind that the guide is not exhaustive and cannot replace country specific regulations or duties of the property owner.

GUIDANCE

Flood assessment

- Carry out a detailed flood assessment for all locations exposed to flood using qualified internal staff or external contractors.

In addition to flood heights based on existing maps and recurrence intervals, consider having a flood model prepared for higher value locations. Models can include fluvial or tidal/storm tide simulations. Regularly check with government issued hazard maps for changes in exposure and building zones.

Proactively understand current building regulations close to water bodies and be involved early in hazard mapping and zoning changes.

Flood protection

- When implementing flood protection, the goal is to protect the premises with construction features or actions that protect property against the water level associated with what is referred to as the 100-year flood event. On large premises with several buildings that have individual priorities, individual protection goals for water levels other than the 100-year event may be desirable. When prioritizing, not only property values but also expected business interruption needs to be analyzed.

What is the 100-year flood?

The term '100-year flood' refers to a statistical event that has a 1% chance of happening in any given year. It is important to recognize that this does not mean that the event will only happen once in a 100-year period. Rather, a 100-year flood event can happen more than once in any given year, and it can occur once a year over several years in a row. So, understand that the 100-year flood is simply a statistical benchmark, and should only be used as such. The water level of a 100-year event may be referred to as HW100 and the corresponding floodwater flow as HQ100.

Protection

Protection can include, but is not limited to,

- Flood barriers or gates to protect the building perimeter. Where building walls and foundations have substantial construction capable of handling flood loads, it may only be necessary to protect building wall openings such as doors, windows, louvers, and vents. Where building walls and foundations can not withstand flood loads, perimeter flood barrier systems or wall improvements may be needed. Where building walls and foundations can withstand flood loads, protective features may be limited to flood gates at wall openings. Flood loads should include the static and dynamic forces associated with the water as well as impact loads associated with water-borne debris.

What are examples of flood barriers and flood gates?

Examples of building flood barrier systems can be found at the Flood Control America, LLC web site or at the Total Flood Solutions UK web site.

<http://www.floodcontrolam.com/>

<http://www.totalfloodsolutions.com/>

Examples of building wall opening flood gate protection can be found at the Presray Corporation web site:

<http://www.presray.com/>

- Building drainage features to remove storm water. To ensure that rainwater can properly run off of building roofs and balconies, consider a 100-year rainfall event and plan the design and capacity of roof drains or scuppers, roof gutters, and balcony drains accordingly.
- Outside drainage features to remove storm water. To ensure that rainwater can properly be carried away from buildings and other important structures, consider a 100-year rainfall event and plan the design and capacity of storm water runoff features accordingly. Consider site topography and the runoff capacities downstream. Paved outside areas, such as driveways and parking lots, should always slope away from the buildings and never towards them. To enhance the percolation capacity, consider 'green' parking lots rather than impermeable concrete or asphalt surfaces. The blockage of drain lines, culverts, ditches, or bridge overpasses may introduce an unforeseen increase in the flood risk to your premises. Where possible, control debris that can introduce obstructions to features needed to drain storm water from your site.
- Dewatering pumps. At times, it is necessary to have below grade points of building access (such as sumps, basements or service tunnels). These access points should be designed to minimize the collection of rainwater and storm water runoff. Dewatering pumps should be provided to remove water that does collect. Provide redundant dewatering pumps, and provide dewatering pumps with both normal and emergency sources of power.
- Waterproofing. If prone to groundwater intrusion during flood events, waterproof walls and raise curbs at wall openings.
- Sewer line backflow protection. If prone to sewage water back-up during flood events, install back-flow valves to prevent sewage flowing back into the premises.

Risk improvement

If your current level of flood protection is inadequate, consider one or more of the following:

- Improve existing flood defenses by strengthening or heightening them. Exhaust vents and other outlets as well as air intakes and other inlets should be located above the 100-year flood water level. The elevation of these features should be increased as needed.
- Support existing flood defences by building secondary embankments. These can be as simple as sloped grass/earth embankments ('soft') or more complicated with crest walls or concrete barriers ('hard').
- Improve the flow of storm water away from the site by re-grading the site, re-pitching driveways and parking lots, and installing diversionary curbs or berms to redirect water from buildings or important structures. If more aggressive action is needed, consider an engineered flood barrier or levee system.
- Always plan for some residual overtopping or overflowing of flood defense systems – this may even be part of the plan. Intruding water can be handled by adding permanent or portable dewatering systems. Again, where pumps are used, provide redundant pumping units, and both normal and emergency sources of power.
- Use tested and approved products that passed a flood test/defense test from an approved body, whenever possible.

The flood plan

Develop and implement a flood plan. Regardless of size and complexity, most plans should consider the following:

- Determine the lead time needed to implement the flood plan.
- Establish a reliable alert system to trigger the flood plan. The plan must be initiated with sufficient time to complete all tasks.
- Verify that sufficient trained personnel will be available at all appropriate times to implement the plan. If the flood exposure only manifests itself during specific seasons, it is important to plan for the availability of needed staff during the exposed period. This becomes more challenging if the exposure is year round.

Note – Historic flood exposure seasons are changing due to various factors including climate change and demographic impact (eg. Midwest US floods were historically in spring with snowmelt and associated rain). However, the 1993 and other more recent floods have occurred in the summer months strictly due to heavy rainfall.

Preparation

- Inspect and repair doors, windows and other building openings.
- Verify that all installed back-flow valves and closures are fully functional.
- Back-up computer data and protect computer equipment. Backup tapes or servers should be placed off- site. Identify critical equipment and machinery prone to water damage and make a corresponding inventory.
- Prepare to inform staff about the situation.
- Review construction projects. Remove loose equipment and temporarily brace new construction.
- Verify that all flood-exposed unmoveable outside structures such as fuel storage tanks, pad mounted electrical transformers, emergency generators, and cooling towers are anchored to secure foundations.
- Identify outside storage and portable equipment that must be relocated from flood exposed areas before flood waters inundate the site.
- Identify parking lots exposed to flood water inundation. Be prepared to relocate vehicles and trailers to higher ground before flood waters inundate the site.

What can become a water-borne flood missile?

There is well established experience that water-borne objects can damage buildings. Many objects can readily become water-borne flood missiles including vehicles, trash dumpsters, and fuel tanks. According to the US Federal Emergency Management Agency, as little as 30 cm (12 in.) of water can float many vehicles.

Do not store elements that could float and act as missiles or create a hazard to environmental damage in flood prone areas of your premises. Secure any timber, logs etc. and have preventive means (moving, fastening them) ready in case a flood is imminent. Identify elements that need securement or shutting off.

The following are examples of plan elements that should be taken once a flood/severe weather warning has been received:

Staff safety

- Procedures to ensure that management is notified of possible flooding or severe weather warnings from appropriate authorities or agencies. Subscribe to emergency weather report system where available. See <http://severe.worldweather.wmo.int/> for a global source of such information.
- Safeguards must be established to make sure that members of the flood response team and other employees never expose themselves to danger when responding to flood incidents.
- It is always desirable to maintain appropriate personnel on site during a flood emergency to maintain care, custody, and control over the site. It is desirable for other personnel to evacuate once flood preparations have been completed. However, the safety of people is a first priority, and life safety should guide all decisions whether building occupants evacuate or remain. Remember, special arrangements may be needed for disabled building occupants.
- Fill emergency generator and fire pump fuel tanks (if present).
- Inspect all fire protection systems to ensure they are in service.
- Always implement safe process shutdown procedures.

Temporary protection

- Erect temporary physical flood barriers to protect the building or gates to protect selected doors and building openings. Protect windows as appropriate with suitable shutters.
- Check previously identified areas where water drainage is restricted. These are the points where water-borne debris can become lodged and form obstructions. This includes drain pipes, culverts, and bridge overpasses. Such obstructions can seriously increase water depths during a floods (ie. cause a 50-year event to produce flooding equivalent to a 100-year event) as the water will unexpectedly accumulate behind the obstruction and leave its previous course due to the blockage.
- Close perimeter gates to prevent debris floating into the site.
- Relocate outside storage and portable equipment from flood prone areas.
- Relocate vehicle and trailers from parking lots that are exposed to flooding.
- In case temporary manual protection systems are used, always ensure that the lead time is sufficient to complete installation.

What factors affect flood plan implementation time?

When developing a flood contingency plan, it is essential to allow adequate time to install temporary manual protection systems. The time from the weather alert to the moment all manual protection is in place must include:

- Time to inform all needed personnel.
- Time for personnel to travel to the site.
- Time to move tools, equipment, and manual protection systems to the point of use.
- Time to install the manual protection systems.

It is essential that the time needed to implement the action plan be compatible with the flood exposure lead time. Lead time is strongly dependant upon the site's surroundings and can be as short as a few minutes (eg. flash flooding from mountain thunderstorms) or as long as several days (eg. lake level rising from heavy rains or major river flooding).

Building contents and utilities

- Move stock as high as possible within the building or off-site.
- Isolate any low level electrical equipment.
- Elevate critical machinery or computer equipment as much as possible.
- Check the operation of emergency pumping equipment.
- Close any manual sewer backflow prevention valves.

Emergency equipment and supplies

Obtain and store emergency equipment and supplies in a protected location. Equipment and supplies may include:

- Emergency lighting.
- Lumber, nails.
- Tape.
- Sandbags, sand or more modern alternatives, which are not subject to contamination.
- Tarps.
- Power (battery powered) and hand tools.
- Chain saws.
- Non-perishable food and water.
- Two-way radios.
- Portable electrical generators and pumps.

After the flood

- After the flood has receded, initiate clean-up operations when safe to do so and have all utilities checked by a competent person before use.
- Have a list of people and businesses ready that can help you recover from the flood. These include builders, plumbers, decorators etc.
- Document the flood event. In particular, report on detailed flood water levels with location and time indicated (written description, photographs, etc.). This will help for future planning.

Check and review the plan regularly

- Consider the flood hazard for every new construction or renovation. It is in any case more economical to implement flood measures during new construction rather than organizing expensive retrofitting. Cost/benefit analyses clearly show that the costs for implementing flood protection are a fraction of costs for flood damage.

CONCLUSION

Where a facility is exposed to flooding from any source, it is essential to assess the extent of the exposure and develop an appropriate flood contingency plan to control the exposure. Once the contingency plan is developed, train all involved staff, practice the plan, and learn from the things that work well and from those that do not. Outside emergency response services should be involved in the planning. Live the plan!

REFERENCES

FEMA 348. Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems. November 1999. FEMA. Web site accessed 27 January 2009.

http://www.fema.gov/pdf/fima/pbuffd_complete_book.pdf

Flood. FEMA. 13 June 2008. Web site accessed 27 January 2009.

<http://www.fema.gov/hazard/flood/index.shtm>

PPS 25. Planning Policy Statement 25: Development and Flood Risk Practice Guide. 2008. Communities and Local Government. London, UK. Crown.

VdS 3521. Schutz vor Überschwemmungen. Leitfaden für Schutzkonzepte und Schutzmassnahmen bei Industrie- und Gewerbeunternehmen. 2007. VdS Verlag. (German only).

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