

June 2006 – Flood Loss Prevention Plans

With the images of the 2005 hurricane season and related flooding still vivid in our memories, we offer these guidelines for preparing and implementing a flood loss prevention and emergency response plan. While floods can't be controlled, solid preparations and a well-implemented response can help mitigate the damage they cause. We also offer a reminder that while hurricanes and coastal flooding may be dominating the news, inland flooding can be just as devastating.

Establishing an Emergency Team

A well-trained group of plant employees familiar with all aspects of plant operations can greatly reduce losses during a flood. The team should be staffed, if possible, by people who live outside the geographic (flood) zone in which the plant is located. Experience shows that after a major flood, more than 75 percent of the workforce may be unavailable because of personal exposure to the flood.

Responsibilities should be clearly defined and roles assigned. Assignable tasks should include:

- Coordinating the plant's electrical installation shutdown, if necessary (tightness of PCB transformers should be checked)
- Monitoring gas installation (gas valves, tanks, piping)
- Protecting flammable liquids (anchoring tanks, checking piping and pumps)
- Storing, protecting and salvaging equipment and stock
- Shutting sewer line valves
- Blocking plant door and window openings
- Cleaning up after the water recedes (access to buildings should be studied)
- Providing a central location outside the flood zone equipped with a telephone line so that salvage operations can be coordinated.

Before the Flood

Pre-flood planning should assign people to the key tasks listed above. Below is a more detailed list. Be aware that under the threat of an imminent flood, it may be difficult to purchase the equipment needed to perform these tasks.

- Establish priorities for the emergency team and identify critical or high-value equipment likely to be affected by flooding.
- Properly anchor all outside storage tanks (including underground tanks) as well as any other item that might float in a flood. Underground tanks, if not completely filled at the time of the flood, may be hydrostatically lifted and thereby sustain major damage. Water can be poured into the tank before a flood to prevent this problem. Mobile containers containing flammable liquids should be secured as well.
- Separate and place in a safe location all water-reactive chemical products and flammable liquids. In case of spillage, they would create a pollution issue and a fire hazard with potentially catastrophic consequences.
- Make sure that vents from tanks and containers are extended above the maximum anticipated flood level.



The first task of an emergency response team is to prepare a flood loss prevention and emergency response plan. The plan should address exposure mitigation and preparation steps to take before a flood, a list of actions to take during a flood and a set of tasks to complete after flood waters recede.

- Whenever possible, raise plant utility equipment above the maximum anticipated flood level. This equipment might include transformers, switchgear, electrical cabinets, gas and oil control valves, critical control equipment and critical drive motors. Avoid installing critical equipment (such as computer servers) in basements.
- Elevate all critical machinery (considered sensitive and essential for the plant operations; i.e., computer equipment, plans, some spare parts, molds, etc.) and stock above the maximum anticipated flood level, or arrange for machinery and stock to be relocated to a safe place before the flood.
- Grease all metallic, sensitive surfaces of large equipment that cannot be relocated.
- Check and block, according to suppliers' instructions, cranes and overhead traveling cranes' brakes during idle periods.
- Relocate all construction equipment and machinery (e.g., timber, stocks, trailers), which could be affected by the flood. Protect outside equipment against floating debris with sandbags.
- Shore up all construction elements which are not securely propped up.
- Close any unnecessary building openings with masonry.
- Seal all cracks in floors and walls with hydraulic cement.
- Check for the possibility of water entering into buildings from backup of sewer or drainage lines.
- Provide valves or check valves on underground sewer or drainage lines to prevent flood water from backing up into the building.
- Provide steel bulkheads for windows and doorways.
- Use only waterproof sealants and coatings on building exterior to prevent seepage into the building.
- Provide access to the plant through the roof.
- Indicate valve and hydrant positions on walls or on indicating panels at a level higher than the maximum anticipated flood level.
- Consider constructing a reinforced concrete floodwall or earthen levee to protect the plant.
- Provide sandbags to protect window and door openings.
- Provide sump pits and drains to eject seepage. Seepage may occur even if all the above precautions have been taken.
- Assign a person with a cell phone to help coordinate the salvage operations. Phone numbers of all persons to be contacted in case of emergency should be available to this person.
- Assemble the names and addresses of local emergency organizations (e.g., fire department, civil protection) and companies able to provide services or equipment for cleanup, salvaging or alternative production.
- Keep copies of all important documents (computer backups, plans, microfilms, pictures) in a safe place, outside the plant and the flood area.

- Keep the following equipment available in a central, safe location:
 - Mobile pumps and pipes
 - Emergency lights, electrical equipment and tools
 - Sandbags
 - Construction elements (hollow concrete blocks, planks, etc.)
- Be prepared to create a flood loss report including actions taken, consequences and, if possible, pictures of flooded areas during and after.



During the Flood

Remember that even if an individual plant takes precautions against flooding, it can still be cut off from essential services (fire department, police department, salvage and utility companies) during the worst of the emergency. This possibility should be considered at all plants, whether or not they are located in a flood zone.

- Shut off electric power.
- Establish a patrol to keep an eye on the premises during the flood, if possible. The person performing this function should be trained to look for damage to fire protection systems and to look for fire hazards.
- Check that the production-use water pumping station will not be put out of action by a power outage (underground cables) or provide an emergency power supply (diesel).
- Provide a means of communication outside the flood area to coordinate salvage operations.
- Close doors and windows against such outside materials as branches, mud, barrels, flammable or corrosive liquids.
- Keep sandbags or other materials (concrete blocks) available.
- To limit the flood's damage from mud and other material deposits, limit the water entering the plant.
- Empty, or firmly anchor, tanks and containers of flammable liquids (oil, kerosene) and gas (particularly tanks located in basements). Elevate barrels of flammable liquids.
- Elevate or remove electrical equipment and motors.

- Equipment that cannot be removed should be protected with rust inhibitors or water repellent products to limit damage.
- Provide lift pumps with independent power supply.
- Sprinkler protection should remain in operation during the flood.
- In case of sprinkler impairment during a flood, recorded rounds should be performed every hour in the building.



After the Flood

After the flood, the goal is to resume activity as soon as possible and to mitigate potential fire hazards, especially during automatic fire protection impairments.

- As needed, contact local emergency organizations (e.g., fire department, civil protection) and companies able to provide services or equipment for cleanup, salvaging or alternative production. If the entire region is subject to flooding, such services will be in heavy demand.
- Maintain patrols of premises.
- Relocate all salvageable equipment and stock.
- Clean up buildings, pump out floodwater and grease equipment.
- Check the entire fire protection system including yard main.
- Watch rounds should be performed after the electric power supply is restored.
- Check all gas, flammable liquids transportation pipes and associated tanks.
- Establish a procedure to eliminate all debris and waste.
- Restart hot work (cutting, welding) only after automatic fire protection systems are restored and any combustible elements have been removed. Restoration of fire protection equipment is a vital consideration.

- Test all control valves in sprinkler systems. If valves are found in the closed position, check any possible leak or damaged pipe downstream before reopening the valve.
- Evacuate water and mud from valve pits.
- If fire pumps are connected to open water reserves (lakes, ponds), check any possible obstruction in the sprinkler systems (flushing of the pipes may be necessary).
- Check damages on underground mains and foundations for water tanks.
- Check fire pumps before putting them back in service.
- Check all supervisory and protection systems.

Once cleanup operations are completed, a more in-depth assessment of flood damage to equipment is necessary. The degree of damage to mechanical or electrical equipment may not be immediately apparent. A quick check of equipment such as transformers, compressors and electric motors may lead to a hasty conclusion that the flood did little damage. Damage can go far beyond the expected. Equipment can be impaired progressively.

Examples of damage that may not be readily observed after a flood include:

- Compressor intakes filled with water
- Water contaminated oil in transformers
- Electric motors with water-soaked and debris-filled windings
- Large machines which may be misaligned due to undetected damage
- Foundations of buildings and machines damaged from water washout
- Loss of potable water
- Damage to telephone lines or roads to the plant

For further information or guidance in this area, please contact your local Willis Property Risk Control Consultant, or Joe Stavish, P.E., North American Property Risk Control Practice Leader, at 1 800 8621441, or joe.stavish@willis.com.

Our objective is to assist management in its loss control effort. The comments and suggestions we have made are accordingly advisory. While we have endeavored to research those unsafe acts or conditions which could contribute to an accident or loss, it cannot be assumed that we have detected every loss potential or hazard, nor does this report assure compliance with any federal, state or local code or law.