Preparation the key to protecting against the risk of flood

Flood and flash floods occur in all 50 states. Hurricanes, winter storms and snowmelt are common causes of flood, but even a summer thunderstorm can create enough water runoff to inundate your buildings and prevent access to your buses.

Schools should preplan against the flood threat to help minimize property damage and – most importantly – enable them to continue to provide educational services to their students and community.

Know your risk – Visit the Federal Emergency Management Agency Map Service Center online at www.fema.gov to find the flood map for your area.

- **High-risk flood areas** have at least a 1% annual chance of flooding, which equates to a 26% chance of flooding over 30 years. High-risk areas are shown as flood map zones labeled with the letters A or V.
- **Moderate-to-low zones** are outside the 1% annual flood risk floodplains and labeled with B, C or X. Approximately one quarter of all claims paid for flood originate from B, C and X zones so these areas shouldn't be overlooked.
- **Undetermined-risk areas**, labeled with the letter D, are areas where no flood analysis has been conducted, but a flood risk still exists.

Monitor the situation – Keep an eye on the National Oceanic and Atmospheric Administration's (NOAA) weather network or your local media outlets to stay aware of changing conditions. Receiving information about the threat of flooding as early as possible will enable you to act more timely and implement your flood response process more successfully.

Familiarize school staff with these terms:

- **Flood watch** and **flash flood watch**. Flooding or flash flooding is possible in your area.
- **Flood warning**. Flooding is imminent or occurring now; if advised to evacuate, do so immediately.
- **Flash flood warning**. A flash flood is imminent or occurring now; seek higher ground on foot immediately.

During a flood emergency, follow the instructions of local government officials. Be particularly careful about transporting students in severe weather. Refer to "When to Hold Up the Departure of School Buses" and "School Bus Actions" in *Severe Weather Planning for Schools*.

Plan for the threat – A flood response plan should be established and distributed to all faculty and staff members in the same way you would communicate any other emergency response procedure or guideline. Consider the following in your plan:

- Who (Chief School Administrator, Facilities or Transportation Director, etc.) will have the authority to initiate the plan?
- How will staff be alerted in the event of a flood emergency?
- Which vehicles/buses and equipment are critical and will be moved first from the flood threat? Where will they be moved?
- Decide on an alternate site(s) located on high ground outside your flood zone. A widespread flood event may necessitate you to relocate vehicles/buses and equipment for several days or weeks, so choose the site with an eye toward security as well as elevation.
- Consider primary and secondary travel routes to the alternate site. Depending on the severity and speed of the flood onset, your regular travel routes may be blocked. Prohibit drivers from driving through flooded areas.

Consider that six inches of water will reach the bottom of most passenger cars, causing loss of control: a foot of water will float many vehicles; and 2 feet of running water can carry away most vehicles, including sport utility vehicles and pick-ups. Review your plan at least annually and update it as needed. It's also useful to critique your flood response following an actual event to troubleshoot and make improvements the next time the water rises.

For additional information on flood preparedness the following excerpt from *Flooding and Schools* has been reprinted with permission from the National Clearinghouse for Educational Facilities at the National Institute of Building Sciences www.ncef.org. The information that follows was prepared under a grant from the U.S. Department of Education, Office of Safe and Drug-Free Schools ©2008, National Institute of Building Sciences.

Flooding and Schools [2011]

According to the Federal Emergency Management Agency, flooding is the nation's most common natural disaster. Some floods develop slowly during an extended period of rain or in a warming trend following a heavy snow. Flash floods can occur quickly, without any visible sign of rain. Catastrophic floods are associated with burst dams and levees, hurricanes, storm surges, tsunamis, and earthquakes.

Be prepared for flooding no matter where your school is located, but particularly if it is in a low-lying or coastal area, near water, or downstream from a dam.

What Flooding Can Do [1]

[1] Adapted from Section 5.6 of FEMA 424, *Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds*.

Flooding can cause site erosion, structural and nonstructural building damage, the destruction or impairment of utilities and mechanical equipment, damage to or loss of contents, health threats from contaminated floodwater, and temporary or permanent closure.

Site damage. School grounds may be subject to erosion and scour, with the possible loss of soil and damage to paved areas, including access roads. Large amounts of debris and sediment can accumulate on the site, especially against fences.

Structural damage. Foundations can be eroded, destabilizing or collapsing walls and heaving floors.

Saturation damage. Saturated walls and floors can lead to plaster, drywall, insulation, and tile damage, mold and moisture problems, wood decay, and metal corrosion.

Utility system damage. Electrical wiring and equipment can be shorted and their metal components corrode. Ductwork can be fouled and expensive heating and cooling equipment ruined. Oil storage tanks can be displaced and leak, polluting the areas around them.

Sewers can back up and contaminate the water supply and building components.

Contents damage. School furniture, computers, files, books, lab materials and equipment, and kitchen goods and equipment can be damaged or contaminated.

Health threats. Mold growth and contaminants in flooded schools can pose significant health threats to students and staff.

School closure. Flooded schools must be closed during cleanup and repair. The length of closure and the ability of the school district to return to teaching depends on the severity of the damage and lingering health hazards. It may also depend on whether the school is fully insured or how quickly disaster assistance is made available for cleaning and repair. If the school is located in a flood plain, it may be permanently closed.

Preventing or Mitigating Flood Damage

Reducing or eliminating damage is difficult in schools not built to withstand flooding, but a number of practical measures may be undertaken:

- Improve site drainage by re-grading, adding or enlarging storm drains or culverts, and, where the site permits, adding a storm water retention area.
- Provide fail-safe backup power for sump pumps to keep them functioning during electrical outages.
- Add, clean, or repair check valves in sewer lines to prevent sewage from backing up into the school.
- Provide off-site computer backup storage for electronic school records.
- When replacing mechanical and electrical equipment, devise ways of elevating or otherwise flood-proofing it.
- If the school is multistory, consider relocating the library/media center to a higher floor.

Preparing for and Responding to Flood Emergencies

Plan what to do before, during, and after a flood. Think about which staff, materials, procedures, and equipment are absolutely necessary to protect your school and keep it operating.

Include flood preparedness in your school's crisis plan. See *Practical Information on Crisis Planning* by the U.S. Department of Education's Office of Safe and Drug-Free Schools, and *Mitigating Hazards in School Facilities* by the National Clearinghouse for Educational Facilities.

Refer to *Severe Weather Planning for Schools* for detailed information about preparing for and responding to floods and other weather emergencies. For anticipating and recovering from hurricane-related flooding, see the Council of Educational Facility Planners' *Disaster Planning, Management, and Recovery Guide*.

Recovering from a Flood
Do not enter the school if:

- floodwater remains in or around the building. It may be electrically charged from underground or downed power lines, or it may be contaminated by oil, gasoline, or raw sewage;
- the building appears to be damaged;
- you smell gas or hear a hissing or blowing sound;
- there are downed electrical wires in the vicinity.

There may be unseen damage, particularly soil erosion and scour that undermines foundations, sidewalks, and roads.

Natural gas. If possible, turn off the main gas valve from outside. Do not smoke or use oil, gas lanterns, candles, or torches for lighting inside a flooded or damaged school until you are sure there is no leaking gas or other flammable material present. When in doubt, call the gas company.

Electrical system. If there is standing water in the building or any sign of electrical damage, call the power company. Do not enter the building until it has been declared safe.

Structural damage. If there are signs of masonry cracking, wall or roof sagging, or other structural distress, have a building professional assess the situation.

Flooded basements. Flooded basements should be pumped out gradually; walls may collapse and floors may buckle if basements are pumped out while the surrounding ground is still waterlogged.

Office equipment. If office equipment is damp or wet, turn off the power at the electrical panel, unplug the equipment, and have it checked by a technician.

Water and sewage systems. Listen for news reports to determine if the community water supply is safe to drink. If water or sewer pipes are damaged, turn off the main water valve and do not use the toilets. Damaged sewage systems are serious health hazards.

Cleaning up. Clean and disinfect everything that got wet. Mud left from floodwater can contain sewage and chemicals. Discard all food and supplies that may have come in contact with floodwater. See *Flood Damage Assessment: Procedures for Cleaning Out a House or Building Following a Flood* and *Treatment of Flood-Damaged Older and Historic Buildings*.

For salvaging wet books and paper-based records, see *What Should I Do with Wet Records?*, http://www.archives.gov/preservation/holdings-maintenance/wet-records.html

Student health. See the Environmental Protection Agency's webpage titled *Children's Health and the Aftermath of Floods*.

Mold. Mold growth may the most serious problem after a flood. See *Mold in My School: What Do I Do?*

Damage and expenses. For insurance purposes, take pictures of any damage as soon as possible, and keep accurate records of repair and cleaning costs. See pages 72 to 79 of Florida's *Educational Facilities Disaster & Crisis Management Guidebook*.

For the complete text of *Flooding in Schools* including a listing of resources access the following link: http://www.ncef.org/pubs/flooding.pdf