

Section 2 – Responding to Disaster Damage to Your Historic Building

The following information will assist those who own and care for older and historic buildings that are at risk of damage from storms and floods.

Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900
334-242-3184
www.ahc.alabama.gov

Basic safety rules to follow in the event of flood or storm damage:

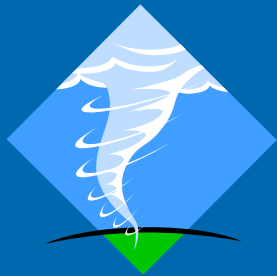


- Do not walk through flowing water.
- Do not drive through a flooded area.
- Stay away from power lines and electrical wires.
- Check to be sure your electricity is turned off. If any wiring was submerged, have it inspected before turning the power back on.
- Look before you step. Floods deposit mud which may be slippery. Floors may have been weakened. Snakes may be hiding under buildings or in upper floors that were not flooded.
- Smell the air for gas leaks.
- Vent electrical generators, heaters and charcoal grills properly if you use them. Carbon monoxide exhaust kills.
- Clean everything that got wet. Get inoculations and wear rubber gloves as part of your protective clothing. Hose-down concrete and masonry walls. Scrub other surfaces with disinfectant. Discard any food and medicine that came in contact with flood water. Flood waters carry infections sewage and hazardous chemicals.

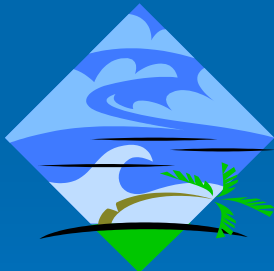
Section 2:

RESPONDING

In the event of a disaster, remember to play it safe. Your personal safety and the safety of those in your building or site are most important! If an evacuation order or warning has been issued, you and all other persons should leave the area immediately. If there is no time to leave do the following:



Tornado: Go to the storm cellar, basement or lowest level.



Hurricane: Close doors & windows. Move valuables and furniture to the center of the room. Stay in the middle of the room, away from doors and windows.



Flood: Go to higher ground. If you cannot leave the building, go to a higher floor or place with access to the roof or window.

If you have preparation time and there has not been an order to evacuate, there are several things you can do to reduce the amount of damage and loss to historic structures and content.



- **Designate a Leader**
- **Use your Emergency Response Checklist**
- **Locate Equipment & Materials**
- **Seek Shelter**
- **Be Alert!**

Stabilize the Situation

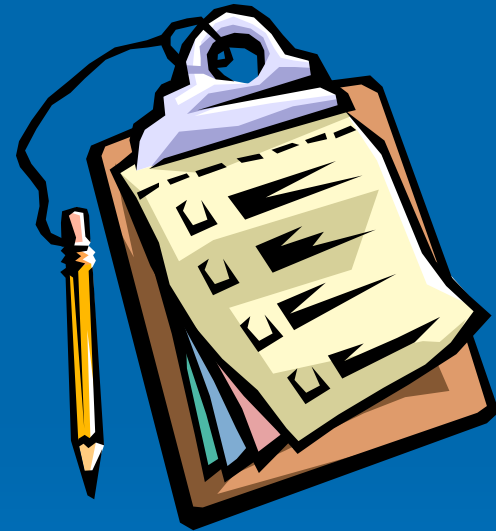
The following are temporary measures that will help prevent further damage after an emergency. Obtain professional advice as soon as possible to ensure that key features of your building are not marred or destroyed in the attempt to save the building. Preservation specialists can help you understand the damage and what to do about it.

1. Contact local and state authorities. They should be up to date on coordination of emergency response teams in your locale. Tell them you are concerned about the special character of your historic building and that stabilization and recovery will require special attention and take more time than usual.
2. Secure the site. Limit access to prevent vandalism and theft. Repair gates and doors so they can be locked. Be sure your property is on the patrol list of the police and neighborhood watch programs.
3. Contact your Insurance Company. Be cautious about making final agreements too soon. It typically takes longer to assess conditions and plan recovery for historic buildings than modern buildings.
4. Document Conditions. Prepare a visual record showing the scope of the disaster and the damage to historic materials before any cleanup or repairs are done. Use color photographs with written notes. A narrated videotape may also be useful. Inventory found items, building parts, found items, etc.
5. Control Volunteer Cleanup Crews. Post a sign on your building identifying it as an “Historic Property; requires special attention, do not proceed with cleanup or demolition without owner-approved supervision.”
6. Supervise all cleanup activities. Point out the important parts of your building that contribute to its historic character and make it clear they must be treated with care. **DO NOT THROW AWAY MATERIALS** without thinking. Many items may prove their value as the response and recovery proceed. Look for parts of your building down wind or down stream as some parts may be blown or washed some distance away.

Stabilize the Building

The following are issues which should be addressed immediately following a disaster which resulted in damage to your historic property. Each will be discussed further in the following slides.

1. Immediate Stabilization
2. Drying Out
3. Detecting Moisture
4. Hydrostatic Pressure
5. Erosion
6. Saturation of Insulation
7. Wood Rot
8. Masonry & Concrete Deterioration
9. Metal Corrosion
10. Interior Finishes
11. Exterior Paint



1. Immediate Stabilization

Identify potential deficiencies and provide temporary shoring to protect life and property while the water levels are receding. All shoring measures should be planned with the assistance of qualified and experienced structural engineers or contractors.

- Support unstable or leaning structures or features with temporary bracing and reinforcement.
- Strengthen exposed foundations and brace areas of undermining by following engineer's recommendations.
- Brace and strengthen decayed or damaged floor and ceiling structures. Check bearing locations for movement or settlement.

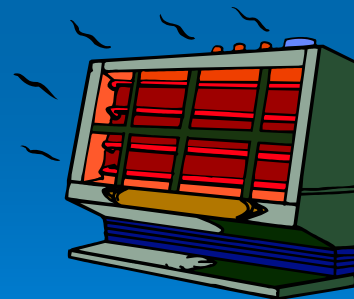
Clean and repair the structure's roof and drainage system to protect the building from future storm damage.

- Provide temporary roof coverings where the existing roof has been damaged.
- Clean, repair and reconnect gutters, downspouts and underground drainage lines.
- Notify neighbors and local officials if the storm drains are clogged.

2. Drying Out

Once flood waters recede it is important that the drying process begin immediately. The damaging effects of water can be minimized by reducing the moisture levels of both the interior and exterior.

The air in the building must be vented to the outside to speed evaporation. The most effective way to do this is to open windows and doors and allow the moisture to escape. Fans can be used to speed evaporation. Heaters can accelerate the drying process if the temperature is maintained at 70 degrees Fahrenheit, or at least 15 degrees above the outside air temperature. Dehumidifiers and air conditioners are also useful, especially if the outside air temperature is higher than that of the interior.



When using fans, heaters, air conditioners and dehumidifiers, take the following precautions:



1. Do not use any of these devices when water may make their operation dangerous.
2. Ventilation remains the primary means of removing interior moisture. All of these devices must be used in conjunction with a ventilation plan designed to exhaust moisture-laden air.
3. Using too much heat or dehumidification too soon can damage your building. The least damaging drying process appears to be one that begins by using only ventilation. As the materials begin to dry, small amounts of heat or dehumidification can be added if needed. If you use industrial drying equipment to remove moisture at a very fast rate, you may cause permanent damage to wood and plaster.
4. Warm air holds more moisture than cool air. If heaters are used without ventilation, the relative humidity on the interior may increase and spread moisture damage through the interior.

3. Detecting Moisture

Measuring the moisture content of various building materials is a critical technique in tracking the drying out of a building after flood and/or storm damage. Moisture content of wood and masonry can be measured accurately using hand-held electronic meters. The moisture content of building materials is related to the relative humidity of air within the building.

The moisture content (MC) of building materials is expressed as the percentage of the weight of water contained within the material over the weight of the material when it is dry. Wood in a normally dry building might have 5-15% MC. A one inch thick wood board might have 40-60% MC after a three day submersion in flood waters. Normally dry plaster might have 2-5% MC, and 20-30% after flooding. In general, the thicker the material, the longer it will take to dry. Moisture content should be measured at the surface as well as deep within to determine how the drying is progressing and if it is complete. Measurements should be recorded in a log book. They can be taken every other day for the first week or two until a pattern of drying is recognized. Weekly measurements can be taken after that. Ventilation and other efforts should continue until a normally dry moisture content is reached deep within the building materials.

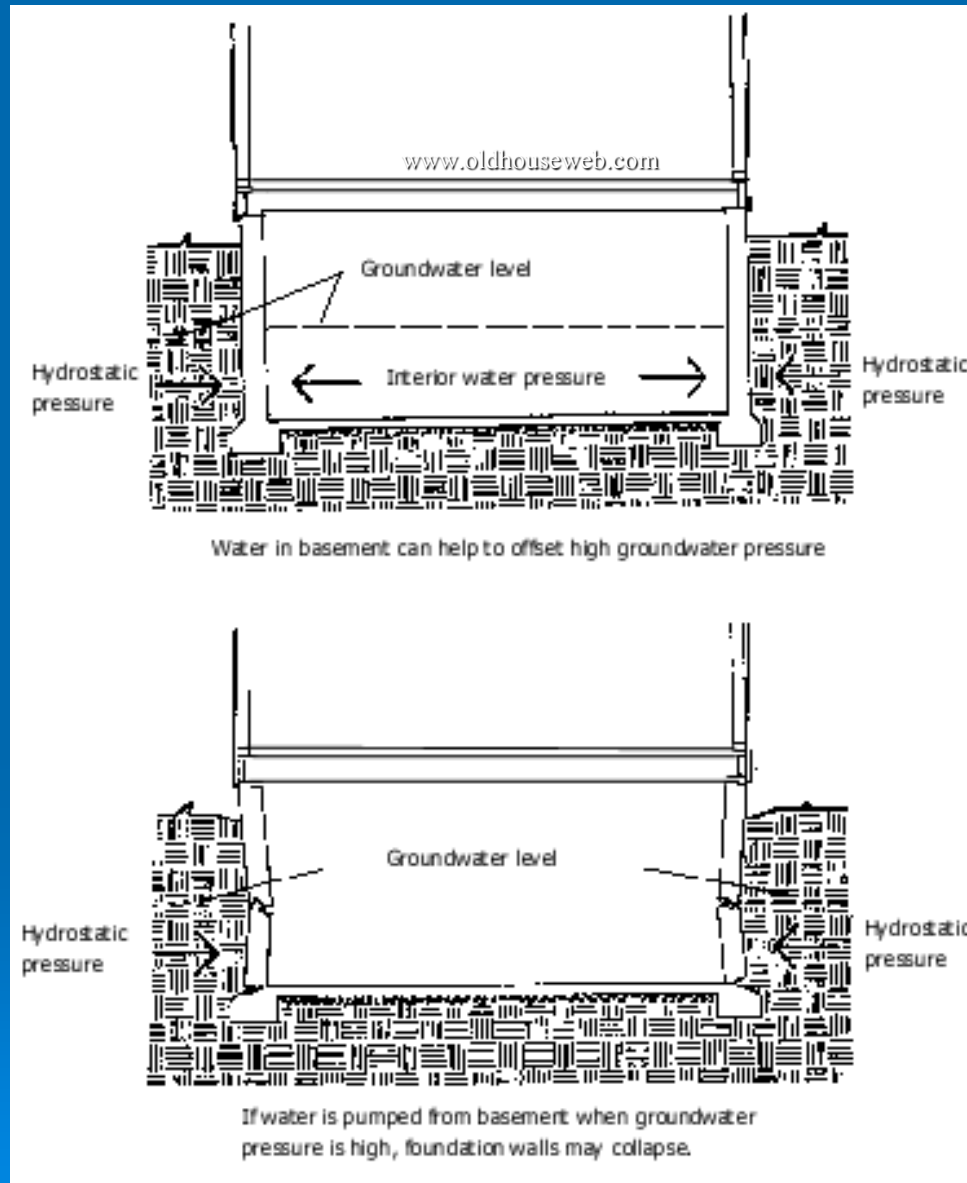


4. Hydrostatic Pressure

If your basement is flooded, it is likely that the level of water in the basement is the same as the ground water level outside the house. When this happens pumping the water from the basement will do no good. New water will seep in and this will continue until the ground water level drops. Before deciding whether to remove water from your basement you should be aware that pumping water from the basement may cause the foundation to collapse. The water may be providing the necessary pressure to balance the hydrostatic pressure of the ground water. If the ground water level is higher than your basement floor and you pump the water from the basement, the foundation walls could be pushed inward and collapse. Consider leaving the water in place until the ground water table sinks and the water recedes by itself. Some judgment is called for. If your basement contains only a few inches of water, it can probably be pumped out safely, but if the ground water level is higher than the floor, the water will return.



Example of Hydrostatic Pressure



A. Slab Heaving

When foundation walls are tight enough to hold back ground water, water may seep through the floor slab. In some instances where water pressure is very high, it may be enough to raise the floor slab. Fortunately this is not a common occurrence with historic buildings.

If your basement slab heaves up, you cannot correct the problem immediately. Wait until the soil beneath the building dries thoroughly. Part of the problem may be the presence of clay soils that expand when wet. Concrete slabs in newer buildings are usually poured over a sand bed, which helps them to resist soil pressures. Older concrete floors were often poured right over the existing dirt. If you pour a new slab or surface-coat the existing slab before the clay dries, the new slab or surface could crack when the clay shrinks to its normal dimensions.

After the water has receded and the soil has dried, if the slab is still heaved or cracks remain, there is little that you can do except repair the cracks or, in the case of severe heaving, re-pour the slab.

In older buildings the basement walls usually leak when ground water rises. This actually protects foundation walls from collapse. Unfortunately, as water passes through stone and brick foundation walls, it sometimes washes out the mortar.

B. Mortar Loss

Most older and historic buildings have foundations of masonry built with soft lime mortar. Although these walls are very durable, the lime mortar doesn't hold up well to water erosion. If you have a masonry foundation wall, you should inspect the mortar to ensure that it has not leached from the joints and made the wall unstable. If more than surface mortar has been lost, it can sometimes be replaced without dismantling the wall. A very "loose" mortar can be poured into the joints and will flow into hidden or convoluted voids.

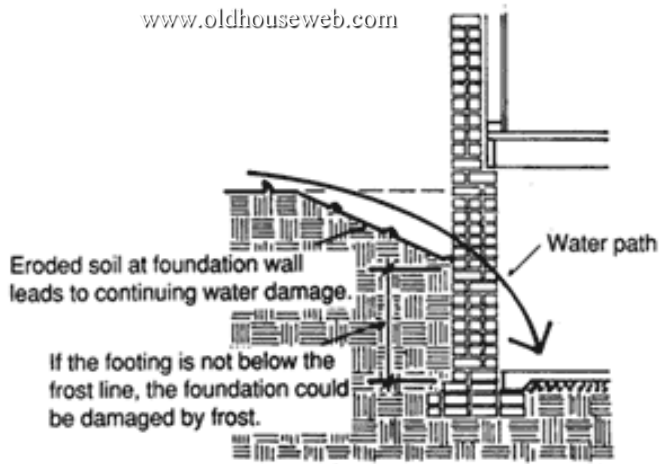
When replacing mortar in stone or brick foundation walls, make sure that the replacement mortar is not stronger than the surrounding stone or brick. If the wall is constructed of sandstone, the new mortar should contain at least two parts hydrated lime to each part of Portland cement. If the foundation wall is constructed of limestone or other relatively hard stone, a standard tuckpointing mortar may be used.

If the foundation walls are constructed of brick masonry or concrete block, there will likely be less leeching of mortar than if the walls were constructed of stone. Nevertheless, you should inspect the foundation walls for missing mortar and repair them in the same manner as above-ground walls, unless you suspect that they represent a more serious structural problem created by the flooding.

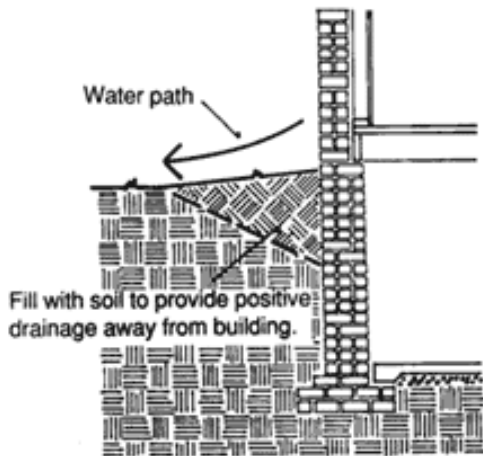
4. Erosion

Erosion following a disaster can manifest in three different ways; Foundation erosion, Soil erosion and Sinking of sidewalks and slabs.

1. Foundation Erosion - Water currents and water traveling in underground “streams” can erode soil beneath foundation walls and footings. This situation is not common but when it happens the building’s foundation will be de-stabilized and repairs will be necessary. The best evidence of structural de-stabilization is the appearance of cracks in the foundation walls and plaster or drywall walls above the foundation. Cracks from foundation erosion can be expected to worsen over time, as the building settles slowly to its new soil support. Cracks that “move” are the best indicator of this type of structural problem. Movement, particularly the widening of cracks is a sign of structural instability and the building should be examined carefully by a qualified structural engineer or architect. Some cracks may result from a temporary expansion of clay soil around the foundation. When the soil returns to its natural water content, the cracks should shrink or not expand. Other cracks may result from the moisture-related expansion of wood beams and joists that are tied to the foundation walls. These should shrink as the wood dries.



Flooding may have eroded soil adjacent to the foundation wall.



Soil should be replaced to prevent future water and frost damage.

2. Soil Erosion – Water may erode the soil adjacent to your building. The soil may be “dished” next to your building and this may result in additional damage from future rain. The soil adjacent to your building should be sloped away from your building to make sure that future rains do not drain into your building. After the flood waters subside, you should check the soil drainage pattern and re-grade as necessary.

3. Sinking of Sidewalks and Slabs – Erosion can also affect paving. From a building conservation perspective, the worst problem occurs when slabs of asphalt or concrete are eroded so they channel water into, rather than away from, buildings. As with soil erosion, this can lead to water problems from future rains. If this condition exists, the slab should either be raised (by mud-jacking, for example) or it should be removed and replaced with one that drains properly.

5. Saturation of Insulation

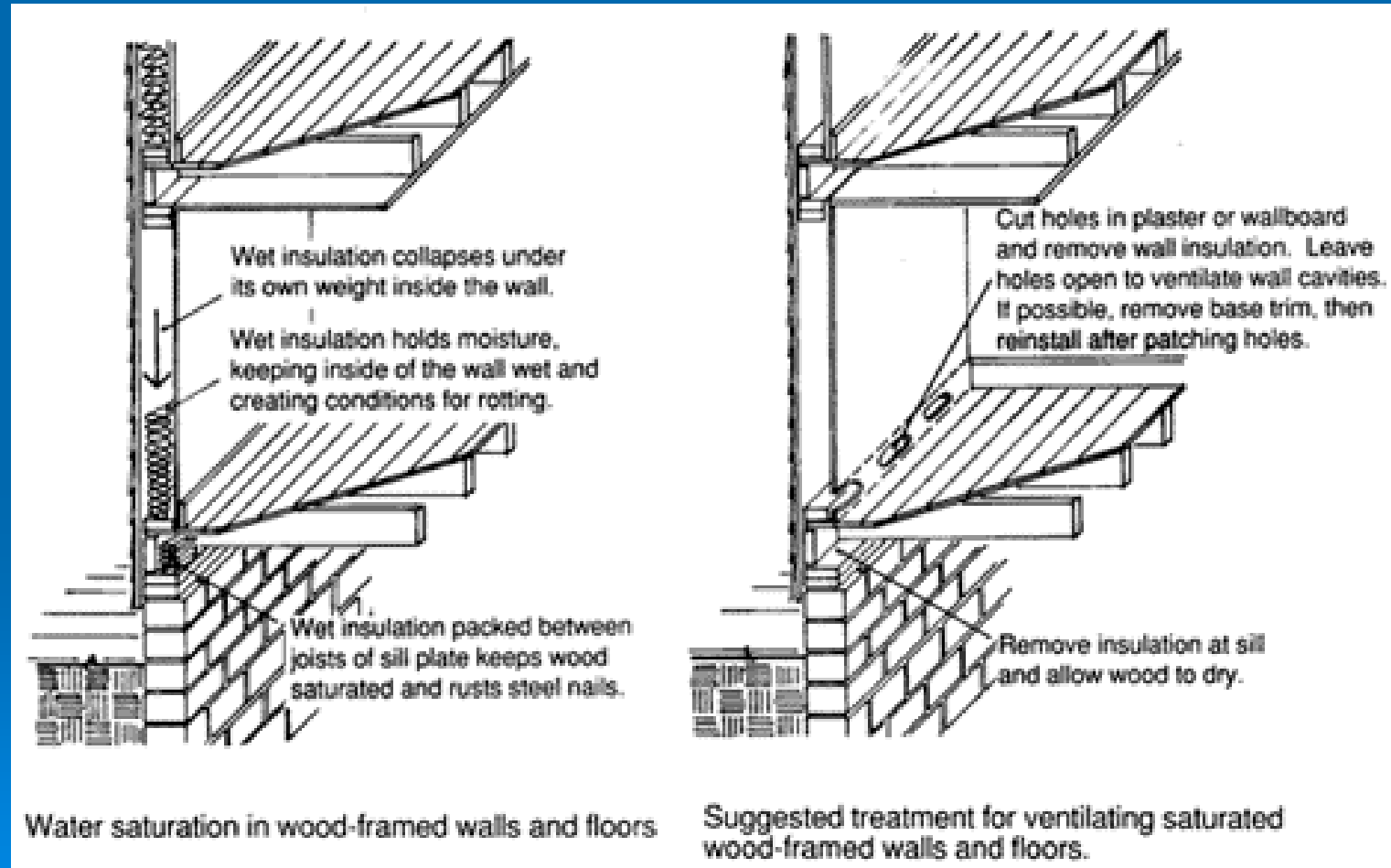
With a few exceptions any insulation that has been immersed in water should be removed.

1. After being saturated, most insulation is rendered permanently ineffective, particularly loose-fill insulations, such as cellulose, vermiculite, rock wool and blown fiberglass, which tend to collapse under their own weight.
2. Saturated insulation holds water and if left in place can prevent drying out leading to destruction of wood, masonry and steel.

Some insulations may be left in place after water contact, such as closed-cell styrene and urethane board insulation that do not absorb water. These insulations should be inspected through small holes drilled through the wallboard or paneling to determine whether they trap moisture against wood or masonry materials or against steel fasteners. If they do, the insulation should be removed to allow the wall to dry out.

Holes can be cut at the bottom of the wall to remove insulation. Often base trim can be removed to provide an area to hide the damage from the holes. Holes could also be made at the top of the wall to promote air circulation through the wall. Holes should be cut below crown moldings made of plaster and complex interior cornices to avoid damaging them. Simple wood crown molding and wallpaper borders may be removable and provide a hiding place for the holes. They could be replaced during recovery.

Other types of insulation such as fiberglass batts, must be evaluated on a case-by-case basis. Glass fibers are not water absorbent, but if they impede the flow of air in a wall cavity it may be necessary to remove them. They usually cannot be reused once removed.



Resources

Further Reading

Emergency Preparedness: Historic & Older Buildings

Safeguarding your Historic Site, Sarah James. Boston: FEMA Region 1, 1992.

Basic preparedness and recovery measures for natural disasters. Available from FEMA Region 1 office. 617-232-9540

1991 Disaster Preparedness Seminar Proceedings, Southeastern Museums Conference, 1991.

Emergency Preparedness and Response. NIC. Washington, D.C.. 47 pages. 1992.

Museum planning for emergencies and disasters. Available from the NIC.

Emergency Preparedness and Response. NIC-IMS. Washington, D.C.. 16 pages. 1992.

Pocket sized booklet with key emergency and funding programs and agencies in the Federal Government.

Emergency Preparedness: Standard Buildings

Design Manual for Retrofitting Flood-prone Residential Structures, by Dewberry & Davis. FEMA #114, 1986.

Flood Proofing Systems & Techniques, Flood Plain Management Services Program. US Army Corps of Engineers, Washington, DC: 1994.

Repairing Your Flooded Home. FEMA #234. Washington, DC: 1992. (Also available from the American Red Cross as ARC #4422.)

Step-by-step, detailed instructions for what to do immediately after flooding, including proper drying procedures, clean up, as well as general repair and flood proofing techniques. Geared to residential property owners but much material of use for historic buildings.

Alabama Preservation

Silent in the Land, Cooper, Knopke, Gamble. Tuscaloosa, AL: CKM Press, 1993.

Photographs and essays provide impressionistic comments on the 19th century Alabama landscape and its buildings.

The Alabama Catalog, Robert Gamble, Montgomery, Alabama, University of Alabama Press, 1987.

General Preservation

The Architectural Legacy of the Lower Chattahoochee Valley in Alabama and Georgia, by D. Gregory Jeane and Douglas Purcell. University of Alabama Press, 1978.

The Secretary of the Interior's Standards for Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings. Washington, DC: US Dept. of the Interior, 1995. Available from Government Printing Office.

Preservation Briefs, NPS Preservation Assistance Div., Washington, DC: 1975-present. Available from Government Printing Office.

Conserving Buildings, A Guide to Techniques and Materials, Martin E. Weaver. New York: John Wiley & Sons, Inc., 1993.

Old-House Journal Magazine. Gloucester, MA: 1973-present.

Some back issues available, with comprehensive index up to 1989. Phone 508-283-3200.

Practical Restoration Reports, John Leeke, Preservation Consultant. Portland, ME: 1989-present.

Titles: Exterior Woodworking Details, Mouldings, Exterior Wood Columns, Epoxy Repairs for Exterior Wood, Wood Gutters, Managing Maintenance. Available from the publisher, 207-773-2306.

A Field Guide to American Houses, Virginia and Lee McAlester. New York: Alfred A. Knopf, 1985.

Architectural Graphic Standards, Charles George Ramsey and Harold Reeve Sleeper. New York, NY: John Wiley & Sons, Inc.

Any of the first five editions are of special interest: 1932, 1936, 1941, 1951, 1956. The recent 8th and 9th editions have a 28 page Historic Preservation chapter.

Dictionary of Architecture and Construction, Cyril M. Harris, editor (1975). New York, NY: McGraw-Hill, 1987.

Historic Architecture Sourcebook, Cyril M. Harris, editor (1977). New York, NY: Dover, 1983.

Recreating the Historic House Interior, by William Seale. Nashville, TN: American Association for State and Local History, 1985.

The Restoration Manual, by Orin Bullock, Jr. Norwalk, CT: Silvermine Publishers, 1966 Reprint—New York, NY: Van Nostrand Reinhold, 1983.

The Technology of Historic American Building, H. Ward Jandl, editor, Washington, DC: Foundation for Preservation Technology, 1983.

What Style is It? A Guide to American Architecture, by John Popperliers, S. Allen Chambers, Jr., and Nancy B. Schwartz. Historic American Building Survey, 1977. Revised edition—Washington, DC: Preservation Press, 1983.

Recording Historic Structures, John A. Burns, editor. Washington, DC: The American Institute of Architects Press, 1989.

Preservation Specialists

These are the people who can assist you with any step along the path of prevention, response and recovery at your site. The following agencies and directories will have names of preservation consultants, building conservators, architects, engineers, landscape architects, archaeologists, craftspeople, contractors, trades people, construction and rehabilitation specialists, collections and document conservation professionals. These professionals can advise you on the special measures most appropriate for your site.

Alabama

Alabama Historical Commission
468 South Perry Street
Montgomery, AL 36130-0900
334-242-3184
www.ahc.alabama.gov

Alabama Emergency Management Agency
5898 County 41
PO Drawer 2160
Clanton, AL 35046-2160
<https://ema.alabama.gov/>

AIA Alabama American Institute of Architects
P.O. Box 240757 / Montgomery, AL 36124
1045 Ambassador Court / Montgomery, AL 36117
334-264-3037
<https://www.aia.org/alabama>

Ask for referrals to architects with historic preservation experience.

Alabama Department of Economic and Community Affairs
PO Box 5690
Montgomery, AL 361030-5690
334-242-5100
<https://adeca.alabama.gov/>
<https://adeca.alabama.gov/cdbg-disaster-recovery/>

Ask for the number of your nearest Regional Planning Commission or its historic preservation contact person.

Local authorities are usually associated with county, city or town governments and their planning departments, engineering departments, or codes enforcement offices.

General

FEMA Federal Emergency Management Agency
Region IV

1371 Peachtree St., NE / Suite 700

Atlanta, GA 30309

404-853-4200

404-230-4230 (fax)

<https://www.fema.gov/assistance>

NTHP National Trust for Historic Preservation

National Trust for Historic Preservation

600 14th Street NW, Suite 500

Washington, DC 20005

202-588-6000 / 800-944-6847

<https://savingplaces.org/>

info@savingplaces.org

<https://savingplaces.org/disaster-recovery>

OHJ Old House Journal

2 Main St.

Gloucester, MA 01930

508-283-3200

Restoration Directory and bi-monthly magazine

<https://www.oldhouseonline.com/>

<https://www.oldhouseonline.com/category/old-house-directory/>

APTI Association for Preservation Technology
International

PO Box 8178

Fredericksburg, VA 22404

703-373-1621 or 1622

Referral Service and Membership Directory

<https://www.apti.org/>

National Park Service

Preservation Briefs

<https://www.nps.gov/orgs/1739/preservation-briefs.htm>

Secretary of the Interior's Standards for the Treatment of
Historic Properties

<https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm>

Federal Tax Incentives for Preserving Historic Properties

<https://www.nps.gov/subjects/taxincentives/index.htm>

- "The activity that is the subject of this presentation has been financed in part with Federal funds from the National Park Service, U.S. Department of the Interior. However, the contents and opinions do not necessarily reflect the views or policies of the Department of the Interior, nor does the mention of trade names or commercial products constitute endorsement or recommendation by the Department of the Interior.
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Office of Equal Opportunity
National Park Service
1849 C Street, N.W.
Washington, D.C. 20240