Maritime Museum Emergency and Disaster Preparedness and Recovery Manual

Prepared by
The Council of American Maritime Museums
with matching support from
The Institute of Museum Services

May 1, 1995

In museum loss control, an emergency doesn't have to become a disaster, but without a disaster plan in place it's likely that it will.

Evelyn Gilbert, National Underwriter, 1992

Deadliest United States Natural Disasters

1900	Galveston, Texas	Hurricane and flood	Over 6,000 dead; 3,600 homes destroyed
1889	Johnstown, Pennsylvania	Dam collapse and flood	Over 2,200 dead
1871	Peshtigo, Wisconsin	Fire	Over 1,200 dead; 2 billion trees burned
1906	San Francisco, California	Earthquake and fire	Over 700 dead or missing; more than 10 square kilometers of city razed
1925	Missouri-Illinois-Indiana	Tornado	695 dead

Insured Losses in Recent Major Disasters

1992	Hurricane Andrew	$16.5 billion
1989	Hurricane Hugo	$4.2 billion
1993	East Coast winter storm	$1.5 billion
1991	Oakland fires	$1.2 billion
1989	San Francisco earthquake	$960 million
1992	Southern California wildfires	$950 million
1992	Los Angeles riots	$775 million

Recent Maritime Museum Disasters

George M. Verity, a 1927 sternwheel towboat owned by the Keokuk River Museum, suffered flooding in her bow compartments during the 1993 Mississippi River flooding.

USS Inaugural, a WWII minesweeper, was swept away from her berth and sank during the 1993 Mississippi River flooding.

USS Pampanito, a WWII submarine in San Francisco, suffered $180,000 in damage plus another $250,000 in damage to its pier when it was hit by a ✌hundred year event✍ in 1988. The Loma Prieta earthquake in 1989 damaged the museum's gift shop, library, and artifact storage facility, which was declared unsafe and had to be moved.

William Mitchell, a 1934 sidewheel steam dredge, broke free of her mooring, hit three bridges, sheared off a smokestack, and suffered extensive damage to her second deck during the 1992 flooding of the Mississippi River.

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Office of the President
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Manitowoc, WI 54220

May 1, 1995

Dear CAMM Members:

It is my pleasure to acknowledge the support of the Institute of Museum Services, which provided a matching grant enabling the Council of American Maritime Museums to produce the *Maritime Museum Emergency and Disaster Preparedness and Recovery Manual*. Without this support, this manual could not have been assembled and published. While we hope we never have to use such a plan, eventually somewhere, sometime, disaster will strike. Wise use of this model plan, adopted to each specific museum's needs, will increase our ability to prepare for a disaster and to carry out a successful recovery should a disaster occur.

An additional result of this project is the CAMM Disaster Network, which we are now in the process of initiating. The willingness of our fellow members to assist us in the event of a disaster is most reassuring.

This manual would never have taken shape without the combined talents of three concerned entities. First, special recognition and thanks is due to the Emergency Preparedness Committee: Jane Allen, Philadelphia Maritime Museum; Robert Hauser, New Bedford Whaling Museum; Dana Hewson, Mystic Seaport Museum; and Paul DeOrsay, Philadelphia Maritime Museum. Without their professional and technical experience, and their dedication and cooperation, this manual would never have come about.

I also recognize and thank Ralph Eshelman, former director of the Calvert Marine Museum, for his diligent service as consultant and overall coordinator of the project. Without question, Ralph was the driving force behind the manual, from its inception to its completion. CAMM is indebted to Ralph for his leadership and devotion to this very important project.

Last, I thank Mystic Seaport and its director, Revell Carr, for their institutional support. Mystic willingly stepped forward on numerous occasions to assist with writing and producing the manual. Their support guaranteed that the manual was completed in a thorough and expeditious manner.

Sincerely,

Burt Logan, President
Council of American Maritime Museums

May 1, 1995

Dear CAMM Members:

The Council of American Maritime Museums Emergency Preparedness Committee is pleased to present to the CAMM membership the enclosed copy of *Maritime Museum Emergency and Disaster Preparedness and Recovery Manual*. In addition to the ring-bound hard copy, which can be easily updated and modified, we have also provided a disk using IBM- and Macintosh-compatible Word Perfect 5.1 format so that you can select and alter sections of this manual for your specific needs.

When the Emergency Preparedness Committee began working on this task, it was our belief that we needed only to collate the information that was already available regarding maritime-related disasters. To our chagrin, we soon realized that there are significant gaps where research, practical experience, and general consensus on methodology are sorely lacking. Therefore, this manual is not intended to be the final word, but only the beginning of what must be considered a long-term undertaking to bring together the information needed to make this project complete. Future research, new technology, and increased sharing of practical experience will necessitate periodic updating and modification of this manual. To this end, we encourage anyone with constructive criticisms, additional information, and new or conflicting ideas to inform CAMM so that future editions can accommodate this information as appropriate. Additionally, we suggest that this committee serve as a permanent committee responsible for the updating of the manual and the CAMM Disaster Network. Furthermore, this committee could serve as a catalyst for continuing dialogue and encouraging future research on this subject. A comprehensive, annotated, maritime-related bibliography would prove most useful.

We thank our president, Burt Logan, who successfully prepared and submitted the Institute of Museum Services proposal resulting in the funding that made this manual possible. We are especially indebted to the following authors, who were willing to share their expertise and contribute important sections to this manual: Gregory Byrne, National Park Service; George King, Mystic Seaport Museum; David Mathieson, Mystic Seaport Museum; Peter Vermilya, Mystic Seaport Museum; and Dana Wegner, U.S. Navy Curator of Ship Models. We are also indebted to Paul O'Pecko, Librarian, the Blunt White Library, Mystic Seaport Museum, for his willingness to inventory and house the CAMM Emergency/Disaster Reference Library, which will be made available to anyone for reference purposes.

The following CAMM members provided copies of their plans for review: Calvert Marine Museum; Columbia River Maritime Museum; Historic St. Mary's City/*Dove*; Mystic Seaport Museum, Inc.; North Carolina Maritime Museum; Philadelphia Maritime Museum; and Texas Seaport Museum/*Elissa*. The following additional institutions and organizations provided copies of their plans for review: Historic Naval Ships Association of North America, Inc.; J. Paul Getty Museum; Jekyll Island; Museum Council of Philadelphia and the Delaware Valley; Roanoke Museum of Fine Arts; and Shadows on the Teche. The Federal Emergency Management Agency provided a wealth of printed reports, manuals, and a video. Jesse W. Lewis, Jr. of Crisis Consultants contributed advice on public relations during a disaster or emergency. The following individuals reviewed various drafts of this manual, improving it greatly, and provided additional recommendations and sources of information: Barbara Roberts, conservation consultant; Michael Henry, Watson & Henry Associates; Anne Witty, Columbia River Museum; Paula Johnson and Paul Johnston, National Museum of American History. Finally, we thank Sue Ellen Thompson, who edited the final draft, and Stuart Parnes, Mystic Seaport Museum, who carried out the task of printing the final product.

While we hope you find this manual useful for updating your own disaster plan, we hope you never need to use it for a disaster. But if you do, we hope that it will assist you in being better prepared, that it will reduce any potential damage, and that it will make your recovery as speedy, professional, and painless as possible.

Sincerely,

Ralph E. Eshelman
Project Coordinator
Eshelman & Associates

Jane Allen
Philadelphia Maritime Museum

Robert Hauser
New Bedford Whaling Museum

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I. INTRODUCTION

North America has a long and varied maritime legacy, extending from the prehistoric Native American boat building traditions of skin-covered boats and bark and dugout canoes to the modern world's largest navy. Maritime resources include ships, small craft, aids to navigation, boat building facilities and tools, fish harvesting and processing equipment and structures, shipwrecks, scrimshaw, maritime prints and paintings, ship models, figureheads, logbooks, charts, and personal items belonging to fishermen and seamen. The maritime museums of the United States and Canada are charged with the collection, preservation, and interpretation of these maritime resources. Yet by their very nature, the resources that form the core of our maritime heritage are at risk. Wooden boats and ships have a limited lifespan. Shipyards, seafood processing houses, dry-docks, lighthouses, canals, wharves, and docks are exposed to extreme forces of nature such as flooding, storms, high winds, and waves. Saltwater is corrosive to metal. Wood is susceptible to teredo attack.

Recently, and particularly since hurricanes Hugo (1989) and Andrew (1992), disaster planning has become a popular topic among cultural institutions. But with the exception of a short paper for historic naval vessels[1], we are aware of no guide that specifically addresses maritime-related emergencies. It was for this reason that the Council of American Maritime Museums (CAMM) initiated a proposal to the Institute of Museum Services for funding such a guide.

Funding from the Institute of Museum Services was received on August 16, 1993. The following were appointed to a committee to complete this project: Ralph Eshelman, project coordinator; Jane Allen, curator, Independence Seaport Museum; Robert Hauser, conservator, New Bedford Whaling Museum; Dana Hewson, vice-president for Watercraft Preservation and Programs, Mystic Seaport Museum, Inc.; Burt Logan, director, Wisconsin Maritime Museum; and Paul DeOrsay, then director, Texas Seaport Maritime Museum, and now assistant director at the Indpendence Seaport Museum.

The committee met during the 1994 CAMM annual meeting in Washington, D.C. and made a preliminary report to the membership. A questionnaire was sent to all CAMM members to determine a baseline of disaster preparedness among the membership. The committee met again at Mystic, Connecticut in September 1994. A preliminary draft of

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[1] Russell Booth, "Disaster Preparedness For The Historic Naval Vessel" in *A Curatorial Handbook For Historic Naval Vessels* (Historic Naval Ships Association of North America, Inc., 1993), pp. 53-56.

the manual was circulated among select CAMM members and conservators for their advice. In preparation for the 1995 CAMM Annual Meeting, which would focus on the topic, a revised draft was forwarded to all CAMM members prior to the meeting. A portion of the annual meeting centered on a review of the manual draft. The final revised version represented by this document was forwarded to all CAMM members on June 1, 1995.

NOTE: Disaster preparedness and recovery methods may vary, depending on whom one contacts for advice, what new research and technology are available, and what conditions one encounters in an actual disaster. The recommendations presented in this manual reflect widely accepted practices, but opinions may differ. We cannot guarantee that the measures suggested here will work for your particular situation. Common sense and familiarity with the situation, therefore, should always take precedence over written disaster procedures. However, we welcome suggestions on how this manual might be improved.

II. THE NEED FOR DISASTER PREPAREDNESS

> *Those responsible for caring for cultural resources have a responsibility to develop firm policies to protect these resources in times of natural disaster. Much can be done to minimize damage to historic architecture and museum collections resulting from a disaster with planning and prudent actions. To do less is to fail in the responsibilities we have accepted and to treat our heritage with callous disregard.*
>
> —Robert R. Garvey, Jr. and Peter H. Smith, *Protecting Historic Architecture and Museum Collections from Natural Disasters* (1986)

II. A. WHAT IS A DISASTER?

A disaster is an unexpected event with seriously destructive consequences. The cause of a disaster may be natural (such as earthquakes, floods, or hurricanes) or human (such as mechanical failure, vandalism, or carelessness resulting in fire, hazardous waste spills, or bursting pipes).

II. B. WHAT ARE THE ADVANTAGES OF HAVING AN EMERGENCY AND DISASTER PREPAREDNESS AND RECOVERY PLAN?

1. Planning can save lives and property.

2. It's your job. Organizations like yours receive their non-profit tax exempt status in exchange for serving as a "public trust"—that is, for acquiring collections and assuming the responsibility for their preservation, documentation, and interpretation. A good emergency preparedness and recovery plan assists you in fulfilling this public trust.

3. Having a good plan in place helps you manage a disaster to minimize damage and understand recovery techniques that will mitigate future losses.

4. A good plan may help your cultural institution to obtain funds from various agencies, foundations, corporations, and individuals.

5. A good plan may aid you in getting coverage from insurers. Some agencies require such a plan as part of your loss control procedures.

6. Prevention is always cheaper and easier than recovery from a disaster.

II. C. PURPOSE OF THIS DOCUMENT

It is the intent of this document to guide any cultural institution facing potential maritime-related disasters in how to:

1. Assess the needs of its unique site and collections;

2. Prepare a management and recovery plan based on this assessment;

3. Test the plan; and

4. Assemble an annotated reference list of staff, professionals, vendors, services, and volunteers who can provide on-site help or equipment and materials.

While this manual concentrates on maritime-related disasters, general information and references are also provided to assist institutions in establishing plans for all types of disasters and emergencies. As with any plan, testing, new technology, and new ideas necessitate, at the very least, annual evaluation and updating. CAMM welcomes comments on how this manual can be improved.

II. D. TEN STEPS TO SUCCESS

1. Form a disaster team NOW if you do not already have one.

2. With the team's help, assess the vulnerability of your site and collections to emergencies and disasters.

3. Formulate a preparedness plan.

4. Stockpile essential emergency equipment and materials.

5. Formulate a recovery plan.

6. Practice management and recovery actions of the plan.

7. Update the plan and review it with staff on an ANNUAL basis.

8. Perform a post-disaster assessment after every occurrence and revise the plan accordingly. Present the revised plan to staff for review and suggestions.

9. Reorder emergency supplies used in the disaster and modify the supply list based on

the experience.

10. Rehearse the revised plan.

The sections that follow will guide you in writing or updating your emergency/disaster preparedness and recovery plan. Although it can be time-consuming task, you owe it to your institution, your collections, and your profession to have such a plan and to make sure that everyone is familiar with its contents.

III. ASSESSING YOUR VULNERABILITY

The mightiest works of the proudest humans are slight and fragile compared to natural forces.

Barclay Jones, *Museum News* (1990)

Every museum setting is unique, and every museum collection is different. Some museums are located along coasts or rivers, while others are on lakes or are landlocked. Some are located in earthquake zones and some in flood plains; some are housed in historic ships or buildings, and others may be located in new structures built specifically to house them. Before a good disaster plan can be written, you need to assess what emergencies and disasters are most likely to affect your setting, collections, and structures. Preparing for an earthquake may be a low priority in Florida, where a hurricane presents a much higher risk. Similarly, responding to a seismic-generated wave is a high priority for museums located on the ocean along the West Coast, while it is of minor concern to museums at higher elevations. But without proper planning and recovery, even small events, such as boiler failure on a cold night, can result in frozen pipes and water damage that clearly qualify as a disaster.

Examine local conditions, such as large trees near museum buildings that may pose a hazard in hurricane conditions. Are you located in an area subject to brush fires? Are you located near a nuclear power plant, chemical company, railroad, airport, or dam? All of these are potential hazards that need to be considered in your plan.

How you handle a small incident determines whether it will be a disaster or not.

Paulette Thomas, Virginia Historical Society

The following list is intended to help you identify threats to your institution and prepare a plan for dealing with them. Specific preparedness and recovery procedures can be found in Appendix 6.

III. A. MARITIME-RELATED DISASTERS

1. **Flooding**. Any museum with part or all of its property within a flood plain must be prepared for this potential disaster. If you are not sure whether you fit this situation, contact your state emergency management office or the Federal Emergency Management Agency nearest you (see appendix 1). During the Mississippi Valley flooding of 1993, the 162-foot steam sternwheel towboat *George M. Verity*, built in 1927 and owned by the Keokuk River Museum, suffered flooding in her bow compartments. This prevented the museum from reopening

until mid-1994. The cost of repairs and loss of gate revenue dealt a double financial blow to the museum. During the same flood, the WWII mine sweeper USS *Inaugural*, at the Gateway Arch in St. Louis, Missouri, was swept away from her berth and sank. The Mississippi River Museum received no damage to boats from the flooding but experienced an estimated 60 percent loss in revenue during the peak summer visitation season. Some smaller museums suffering flood damage may not reopen.

Potential Regions of Concern: All coastlines, river and stream flood plains, areas below dams, or any area with a previous history of flooding.

2. **Nor'easters**. Named for the direction from which their winds blow, nor'easters are extratropical low pressure areas with high winds that rarely reach hurricane force, but that have caused erosion along major portions of the East Coast and are often accompanied by heavy rains and snows. The 1992 Halloween nor'easter affected coastal property from Newfoundland, Canada to Miami, Florida. The most famous nor'easter was the 1962 Ash Wednesday storm, which generated open-ocean waves over ten meters high and more than $300 million in property damage along a 1,000 kilometer stretch of the Atlantic coast. A nor'easter sunk *Alexander Hamilton*, the last paddle wheel steamer on the Hudson River. While not as powerful as hurricanes, nor'easters are difficult to predict and due to the wide area they can affect, occasionally cause more destruction to property than a hurricane.

   Potential regions of concern: The entire east coast of North America, especially low-lying coastal and exposed areas. Lighthouses and lifesaving stations are especially at risk, due to high beach erosion potential.

3. **Hurricanes and tropical storms**. Although more powerful than nor'easters, hurricanes and tropical storms typically threaten only a small stretch of coastline about 100-150 kilometers in width. A tropical storm is defined as a tropical depression with cyclonic wind circulation (counter-clockwise in the Northern Hemisphere) of 39 to 73 miles per hour. A hurricane is defined as a tropical storm with cyclonic wind circulation of 74 miles per hour or higher. Any rotating storm is technically a cyclone, though such storms are called hurricanes in the Atlantic, typhoons in the Pacific, and cyclones in the Indian Ocean. Hurricane Barbara in August 1953 severely damaged the lantern of the 1791 Cape Henry Lighthouse in Virginia. The repairs took five years to complete.

Potential regions of concern: The east coast of North America and the Gulf Coast, especially low-lying coastal areas. Inland flooding is also a potential problem. Hurricane season runs from June 1 to November 30 each year, although a Category 1 hurricane (winds 74 to 95 mph) hit Cape Hatteras, North Carolina on November 17, 1994.

4. **One-hundred-year events or freak wind storms**. Microbursts, especially violent thunderstorms with winds over 100 miles per hour, can occur almost anywhere. But when they are associated with long fetches (open areas, such as oceans, where wind is uninhibited by structures, trees, land masses, etc.), they can result in large waves as well as wind. The submarine *USS Pampanito* in San Francisco suffered $180,000 in hull damage, $250,000 in pier damage, and $200,000 in loss of revenue when it was hit by a "hundred year event" in 1988. Her anchors dragged and a three-inch synthetic line attached to a tug snapped.

   Potential regions of concern: Everywhere, but especially open areas, such as bodies of water, where there are no wind breaks.

5. **Seiches**. A back-and-forth movement in a lake or other land-locked body of water, varying in duration and resulting in fluctuation of the water level, is known as a seiche. The variation in the water level and the interval between low and high water levels is a complicated function of water depth, bottom profile, wind speed and direction, and barometric pressure. Water level can vary as much as eight to ten feet from one location to another. Cleveland, Ohio experienced an eight-foot seiche in the early 1990s.

   Potential regions of concern: All land-locked bodies of water, including the Great Lakes region.

6. **Earthquakes**. The oscillatory and sometimes violent movement of the earth's surface following the release of energy in the earth's crust is called an earthquake. Earthquakes are usually caused by the dislocation of segments of the earth's crust, but they also can be caused by volcanic eruption and man-made explosives.

   a. **Tsunamis**. Incorrectly called tidal waves (they have nothing to do with tides), tsunamis can be generated by vertical displacement of the earth's crust, volcanic eruption, and submarine landslides. The resultant waves travel about 600 miles per hour, 100 miles or more apart. They are undetectable at sea, but as they approach shallow waters may crest to heights of 100 feet or more and crash inland at speeds of 30 miles per hour. The first wave is usually not the

largest, with subsequent waves striking the coast at five to 40-minute intervals.

About 50 tsunamis have struck the Hawaiian Islands since the early 1800s. At least one tsunami has partially penetrated the Columbia River. Tsunami-generating earthquakes have occurred all around the Pacific Rim, including Alaska, California, and Hawaii. The Scotch Cap Lighthouse, built in 1903 on a 90-foot bluff in Alaska, was swept away on April 1, 1946 by a tsunami wave estimated to be 100 feet tall, killing five keepers. The California San Andreas Fault is primarily a horizontal displacement fault and therefore can not cause a tsunami. However, California experienced a tsunami watch, including evacuation of some coastal areas, in October 1994.

Potential regions of concern: Hawaii and Alaska are at high risk; the Pacific coast of Washington, Oregon, and California, is at moderate risk. Tsunamis can also travel up rivers and streams that open to the ocean.

b. Landslide/mudslide. Museums located on marine or flood plain sediments and/or fill in earthquake zones - are at high risk of foundation failure and landslide/mudslide damage. Sediments with high water content become extremely unstable when disturbed by events such as earthquakes. The major destruction during the 1989 San Francisco earthquake was in the Marina District, an area built on fill over marine sediments. The Turnagain Heights area of Anchorage, Alaska was hit by a 1964 earthquake that generated landslides on raised marine beaches. During the 1989 Loma Prieta earthquake the *USS Pampanito* pier and adjacent building built on piles driven to bedrock suffered no damage, but the floor of the building (partially built on landfill) collapsed and split open. It was declared unsafe and the submarine was closed to the public for two months. The museum store, artifact storage, and library all had to be moved.

Potential regions of concern: Any high-risk seismic area with structures built over marine sediments and/or fill such as the National Maritime Museum at San Francisco, or landslide hazardous areas. The late director of the National Center for Earthquake Engineering Research, Robert L. Ketter, predicted that a catastrophic quake will strike east of the Rocky Mountains by the year 2000.

7. Ice and snow. Unprotected small craft and/or structurally unsound sheds may collapse under heavy, wet snow. The yacht *America* suffered this unfortunate

fate. Ice can pull loose caulking from the seams of vessels or create pressure that opens seams, resulting in leaks or even sinking. Heavy ice may prevent the vessel from being moved to lifts for repair.

Potential regions of concern: Any area where ice may occur, but especially marginal areas like the Chesapeake Bay, where ice is so infrequent that when it occurs, few know how to deal with it.

8. **Ship and other maritime-related fires**. Waterfront museums located in larger cities are usually protected by city-operated fire boats and trained firemen familiar with vessel and shoreline fires. Many museums, however, depend on local volunteer fire departments, most of which do not have specific training in vessel fire suppression. Without waterborne apparatus, marina fires are especially difficult to fight due to their inaccessibility from land. For the same reason, structures built at the shoreline or over the water often suffer more damage on the water side than on the shore side. When fires are fought with saltwater, which is the case when fireboats and pumper trucks draw water directly from the local water source, the damage from salt can be even more serious than the fire. Saltwater can corrode electrical wires and equipment, and salt crystals can damage plaster and other surfaces. Special training and cooperation between museum staff and volunteer fire departments may be required to keep such damage to a minimum.

   Potential regions of concern: Any museum with floating vessels or with structures built next to or over the water that does not have waterborne fire fighting equipment is at risk.

9. **Collision.** Museums with static or working watercraft should have procedures for dealing with collisions. A collision can occur at the dock, at an offshore mooring, or at sea with another ship, rock, or even a whale. Collision at sea, where the distance to the nearest source of help may be the greatest, is the most dangerous type of collision. But any collision can be disastrous to an historic vessel. During the 1992 floods of the Mississippi River, the 277-foot sidewheel steam dredge *William Mitchell*, built in 1934 and berthed in Kansas City, broke free of her mooring, hit three bridges, sheared off a smokestack, and suffered extensive damage to her second deck. In April 1994 at Corpus Christi, Texas, a runaway barge damaged two of the Columbus ship replicas, punching a hole in *Pinta* and pushing her into *Santa Maria*, damaging her mast.

   Potential regions of concern: Any museum with working or static floating ships,

especially in congested harbors or rivers.

10. **Waterspouts and tornadoes**. These phenomena are relatively rare in marine environments, but they strike with little or no warning and with intense wind, rain, and lightning.

    Potential regions of concern: Everywhere.

III. B. HUMAN EMERGENCIES

In addition to the maritime-related natural disasters listed above, you should be prepared to deal with the following emergencies caused by human acts or errors:

1. Fire (accident or arson)*
2. Chemical spills and leaks (flammable and toxic substances)*
3. Gas leaks*
4. Airplane or helicopter crashes
5. Theft, violence, or vandalism*
6. Civil disobedience (riot, arson, etc.)*
7. Bomb explosion or threat*
8. Hostage-taking
9. Terrorism
10. Nuclear accidents* (At least two CAMM members are located within the ten-mile-radius evacuation zone of a nuclear power plant)
11. Hazards from construction or renovation (asbestos contamination, etc.)
12. Train or vehicle accidents involving hazardous materials
13. Rising water (dam, dike, or levee flooding)*
14. Falling water (water pipe breaks, roof leaks, etc.)*
15. Power outage*
16. Acts of war

* See Appendix 6 for specific preparedness and recovery procedures.

III. C. NATURAL THREATS AND DISASTERS

Acts of nature such as the following cannot always be anticipated or prevented:

1. Mold and mildew

2. Insect and rodent infestation*
3. Drought
4. Volcanic lava flows/volcanic ash/volcanic explosions
5. Sinkholes
6. Landslides, mudslides, and liquefaction
7. Avalanche
8. Lightning*
9. Saltwater intrusion*

* See Appendix 6 for specific preparedness and recovery procedures.

III. D. RATING PROBABILITY AND CRITICALITY

> *Assessing potential disasters cannot be underestimated as a beginning point for starting a disaster plan, yet risk management is not a topic with which most museum people are generally familiar.*
>
> Larry Francell, former director of the Wichita Falls Museum and Arts Center, site of devastating 1979 tornado.

Once you have reviewed all the possible disasters/emergencies that might affect your institution, a **vulnerability assessment chart** can be compiled (see samples 1 and 2 below) by prioritizing potential disasters on the basis of their probability and criticality. The suggested numerical rating schedule below will help you make this assessment. It does not matter if one institution assumes a higher or lower average than another in the same or similar situation. This is merely an exercise to get your institution thinking about possible disasters and its vulnerability to them. Although the process is meant to be an objective one, some subjectivity is inevitable.

Suggestion: You may want to contact your city or county emergency management office to see if they have already done an assessment for your area. If they have, you will still need to adapt it to your specific situation.

<u>Probability Rating</u>

5 = Virtually certain (chances are the event will eventually occur)

4 = Highly probable (chances of occurrence are much greater than not)
3 = Moderately probable (event likely to occur)

2 = Improbable (event is not likely to occur)

1 = Insufficient data (not enough information to determine probability)

Criticality Rating

5 = Fatal (a total loss of institution and collections, possible loss of life)

4 = Very serious (whether the institution could reopen would be subject to deliberation)

3 = Moderately serious (a loss would noticeably affect the institution's ability to operate)

2 = Relatively unimportant (loss could be covered by normal emergency planning using the institution's own resources)

1 = No real effect (impact of the loss would be so minor as to have no effect on the institution)

Sample 1

Vulnerability Assessment Chart

(for a non-waterfront museum located in North Carolina
along the Outer Banks and not built on landfill)

Hazard	Probability/Criticality	Average
Hundred Year Storm Event	5/5	5.0
Flooding	5/5	5.0
Hurricane	5/5	5.0
Earthquake	2/2	2.0
etc.		

Sample 2

Vulnerability Assessment Chart

(for a waterfront museum built on marine sediments located in California)

Hazard	Probability/Criticality	Average
Hundred Year Storm Event	5/5	5.0
Earthquake	5/5	5.0
Tsunami	4/5	4.5
Ship or Waterside Fire	3/4	3.5
Nor'easter	0/0	0.0

Once you have completed this exercise, you should concentrate on those hazards to which your institution is most vulnerable. Anything with an average of 2.0 or lower probably needs little or no immediate attention.

IV. PREPARING AN EMERGENCY AND DISASTER PLAN

IV. A. SOME GENERAL GUIDELINES

A good step-by-step guide for preparing a plan is *Emergency Management Guide for Business & Industry*, available at no charge from your local American Red Cross Office.

Here are some general guidelines to follow:

l **Begin by obtaining the authorization and commitment of your board or governing body.** This lets everyone know that the process is being taken seriously. Trustees may also be able to use their peer contacts to help you line up contractors, cold storage companies, and other such services. Since the board may have to approve the funding for preparation, supplies, and equipment, it makes sense to get trustees involved in the planning process.

l **Keep your plan simple.** A simple plan with clear priorities has a better chance of succeeding than a complex plan which is too difficult to execute or understand. Sections V and VI below, as well as the Sample Emergency Preparedness Plan Index found in Appendix 8, will help you in putting your plan together.

l **Don't reinvent the wheel.** Check with local institutions and industries who may already have developed disaster preparedness and recovery plans suitable for your area. Hospitals, universities, libraries, theme parks, and other museums may have plans they will share with you. Talking to them about their plans is a good way to begin setting up a working partnership for mutual assistance in case of disaster. Certainly other CAMM members will be willing to share their plans, and your local Emergency Management Office and FEMA regional office will lend their expertise (see Appendix 1). There are also several software packages compatible with IBM and Macintosh which may be of use.[2]

l **Consider your plan a basic reference.** Actual circumstances may dictate a response different from what the plan suggests. Even the best plan will not cover all contingencies. Use common sense and adjust rapidly as circumstances warrant.

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[2] Examples include The Maines and Associates' "Disaster Preparedness Plan Text Template for Museums, Archives and Libraries" (1-800-724-0073) and Recovery Management, Inc's "REXSEYS," a model business recovery plan (508-486-8866).

l **When writing your plan, bear in mind the following disaster-planning principles:**

3 Human life and safety are the highest priority and must come before the safety of collections.
3 Plan for the worst.
3 Plan for all possible circumstances.
3 Assume no outside help or resources will be available.

l **Don't overlook training.** The way your staff responds to a disaster is less dependent upon written plans than it is upon their attitudes and mental state. Training is paramount if they are to deal effectively with adversity and confusion. Annual training for staff should include:

3 Disaster preparedness drills for likely disasters.
3 Procedures for notifying emergency personnel, fire, and police.
3 Evacuation drills.
3 Medical emergency procedures, including updated CPR training.
3 Emergency utility cut-off drills.
3 Testing fire suppression and security systems.

l **Assign clear responsibility** for who will coordinate the preparation, annual training, testing, and updating of the plan. A disaster plan is not static, but must grow and change with the institution over time.

IV. B. PLAN COMPONENTS

A good disaster and emergency preparedness and recovery plan includes the following elements:

l **Introduction and statement of purpose:** Why the plan was written, who developed it, how it is kept current.

l **Authority:** Who directed the plan's preparation, who approved it (board of trustees, mayor, dean, etc.), and who will implement the plan (person in charge and alternates).

l **Scope of plan:** List in order of priority each type of emergency covered by the plan.

l **A facility access map** showing access routes, staff assembly area, emergency command center, etc.

l **Appendices,** including but not limited to building and site plans (including utility shutoffs, water hydrants, water main valves, gas main valves, storm drains, sewer lines, etc.), priority collections and locations, telephone rosters, emergency services and vendor lists, instructions for emergency operation of utilities and building systems, etc.

l **A ring binder** so that the plan can be updated easily.

l **Copies** for each staff person responsible for carrying out the plan. The Emergency Command Center should maintain several copies. You may find it useful to give a copy to your local fire department, local Emergency Management Office, etc. Copies with phone trees should be kept on site and off site by critical staff for 24-hour use.

IV. C. DISASTER AND RECOVERY TEAMS

Your first step in assigning responsibility for carrying out the plan is to designate a **Disaster Coordination Office** or **Emergency Command Center** at a safe location where staff and volunteers can report for assignments, and coordination of the recovery can be monitored. An ideal location would be a reinforced concrete building well above normal flood levels with auxiliary power. This may be either at the museum or off site.

Once you've decided where the Emergency Command Center will be located, follow these guidelines in assigning responsibility for carrying out emergency response procedures.

l **Prepare a "person in charge" list.** In an emergency, managerial or supervisory personnel may not be available to make decisions and take the necessary protective actions. For the purpose of determining who on the staff should take command, prepare a list of people to call until you reach someone. A suggested priority sequence is as follows:

1. Executive Director
2. Assistant Director
3. Safety Officer or Security Officer
4. Curator or Senior Curator*
5. Registrar*
6. Building Supervisor

* The curatorial and registration staff should assist the person in charge with any decisions that must be made pertaining to the handling and removal of collections and should supervise such handling and removal.

l **Designate a Disaster Team and a Recovery Team.** List staff assigned to each team by sequence of ✌person in charge.✍ A suggested sequence of team members for a larger museum might include the following:

Disaster Team:	**Recovery Team:**
Assistant Director	Curatorial staff
Building Supervisor	Registration staff
Senior Curator	Exhibition staff
Safety Officer	
Security Officer	

A separate recovery team consisting largely of maintenance personnel could begin recovery tasks that are not collection-related. Individuals who are not trained in handling collections can be assigned to teams with trained staff.

A suggested sequence of team members for a smaller museum might include the following:

Disaster Team:	**Recovery Team**:
Executive Director	Curator
Building/Security Supervisor	Educator
	Visitor Services staff

Both teams can be supplemented by other staff, volunteers, and local trustees.

The Disaster Team, consisting of pairs or small groups with appropriate safety gear and clothing, should enter the property, buildings, and/or ships as soon as permission is granted by law or fire officials. Their job is to ascertain and document the physical condition of the museum■s property by photography or video and determine if the recovery team(s) can be activated safely. They may also determine if outside assistance is needed from professional service companies and/or local and CAMM disaster network members.

The Recovery Team will document, inventory and begin clean-up and conservation procedures for which they are trained, as directed by the Disaster Coordination Office.

l **Instruct the teams to stay in touch with the Emergency Command Center**. The person in charge (usually the director) should be in the Command Center, receiving information and deciding on strategy. The Disaster and Recovery Teams should

therefore be in constant radio contact with him or her throughout the response and recovery process.

IV. D. STAFF, TRUSTEES AND VOLUNTEERS

A clear policy on whether and when staff are expected to appear on the scene of a museum disaster must be part of your written plan. In the case of a hurricane, enough lead time is usually available for staff to prepare their homes and protect their personal property as well as their institution. There should be no heroes: No one should be required or encouraged to remain on the scene of a potentially dangerous situation. The plan should also make it clear that after a disaster, staff's family and home come first—but their institution comes second.

You may decide to ask all staff to report to work at the normal time on the first morning after authorities have given the all-clear signal. Whatever you require, spell out your expectations carefully and indicate what the consequences will be if anyone fails to follow your policy. Staff should know this is serious business.

In order to avoid burn-out and morale problems due to stress, well-defined work schedules should be implemented. If disaster recovery will last several days, plan a meeting at the beginning and at the end of the day to keep everyone informed. After the disaster is over, don't forget to recognize all staff, volunteers, police, firefighters, and anyone else who assisted.

Never underestimate the value of trustees and volunteers when it comes to handling a disaster or emergency. Trustees, especially those who live locally, can be valuable resources when it comes to obtaining people, equipment and money in times of disaster. Volunteers should be trained along with paid staff (and trustees) and may assist with crowd control, answering phones, providing food and drink, babysitting (children of staff, volunteers, trustees, etc.), or even serving on disaster teams. Remember: It may very well be a volunteer who answers a bomb threat phone call, or who is leading a tour when an evacuation order is issued. They should receive the same training as staff.

FEMA provides two excellent publications: *Developing Volunteer Resources: Instructor Guide* and *Developing Volunteer Resources: Student Manual* which may assist you in recruiting, training, and managing volunteers.

IV. E. ON-SITE DISASTER SUPPLIES

Expect to provide your own resources for an extended period of time, especially in the event of a natural disaster. You'll want to set aside the necessary supplies and equipment for those disasters that are most likely to occur and keep them in a separate locked area. Some other suggestions:

l **Check and replenish supplies regularly.** Let your staff know that these supplies are for emergencies only. Plywood, tarps, etc. that are "borrowed" but never returned or replaced will do you no good in an emergency.

l **Design your first-aid kit with disaster needs in mind.** Make sure it contains whatever you think you will need in an emergency.

l **Protect your emergency supplies and equipment** by selecting the safest storage locations possible and by identifying them on locator maps in your emergency and disaster plan. Consider setting up a supply area that is outside of buildings or areas that you may not be allowed to re-enter in an emergency.

l **Keep track of keys to storage areas for disaster supplies and equipment.** Make sure your staff know where the keys are kept and that they are trained in operating the necessary equipment. Make sure keys to maintenance and janitorial rooms are available to any staff who may need them.

l **Have available multiple copies of your floor and deck plans to give to your disaster team.** The plan should clearly mark high priority collections so the team will know where to go first.

l **Provide food and rest facilities for staff, trustees, and volunteers.** People helping with the recovery effort will get thirsty, hungry, and tired. As part of your plan, designate a person to serve water, coffee, snacks, etc. and a place for cots and blankets to be set up. This could be at the emergency command center, child care center, or emergency supply depot. Plan for rest periods and set limits on work hours to minimize stress and fatigue.

IV. F. COLLECTIONS PRIORITIES

A collections priority list should be established as part of your recovery plan. Items should be classified as either irreplaceable, replaceable at high cost, or easily replaceable. A site or floor plan with photos and arrows showing the locations of the highest priority items will assist recovery teams in getting to them quickly. Indicate locations where such collections may be moved and any important do's or don'ts for handling special

items. Make these plans an easily visible part of your manual.

Establish a regularly scheduled date to review the plan to ensure that your priorities are appropriate and that telephone numbers are up to date, staff assignments are clear, etc. Museums located in hurricane-prone areas may want to use June 1, the first day of the hurricane season, for this purpose. Others may use the anniversary date of a previous disaster, which reinforces the reality of the threat.

IV. G. COMMUNICATIONS

Communications in the event of a disaster—particularly a regional disaster, such as a hurricane—will be difficult. Phone lines, if they're working at all, will probably be jammed. Even power back-up systems may be useless if lines are down. Therefore, you should have an alternate or back-up means of communication. Here are some suggestions:

l **UHF and VHF.** Walkie-talkie and paging systems use UHF; marine radios use VHF. VHF is especially important for museums with ships, which may already have such systems in place.

l **AREA or RACES.** You may be able to use the Amateur Radio Emergency Association (AREA) or Radio Amateur Civil Emergency Services (RACES). Contact your local chapter or district and work out a cooperative agreement.

Regardless of what method you use, your Emergency Command Center should be able to communicate with any unit of your operation. If your ship(s) have VHF but cannot communicate with your command center, the system is very limited. In some cases, using runners may be the only method of communication available to you. Some institutions use hand-held radios on a daily basis for efficient communications. In the event of an emergency, they can be used by essential personnel to stay in touch.

IV. H. FACILITIES

A thorough assessment of your building(s), ship(s), and grounds will also assist you in planning the best response to potential disasters. Familiarizing yourself with how your buildings are constructed, what types of materials are used, and where pipes, wires,

machinery, etc. are located will help you pinpoint areas particularly vulnerable to certain types of damage. A facilities report for each building, ship, pier, etc. should be completed and updated annually as part of your disaster manual. The Registrars' Committee of the American Association of Museums adopted a standard facility report form in 1988 for museum buildings that can be adapted for ships as well. See Appendix 10 for a sample form.

IV. I. EMERGENCY SERVICES

Calculate the average response time for staff, police, fire, and medical services. How might this affect your plan for handling a specific emergency? If the situation occurred at night or on a weekend or holiday, how might the response time differ? What would the response time be if the disaster were community-wide? See Appendix 10 for sample Location and Response Time of Emergency Personnel.

Seek counsel from your local fire department, police, and city or county Emergency Management Office. Give them an opportunity to review a draft of your plan. Getting to know these people can be very helpful in the event of an emergency at your facility. Some institutions have a standing invitation for members of the local fire and police department to visit the institution free as a way of becoming more familiar with your facility. Special tours for "emergency professionals" are also helpful.

At least one maritime institution hosts an annual "911 Weekend," where staff take part in an intense weekend of training in first aid, firefighting, rescue, and emergency medical procedures, including mock emergencies. Such a weekend event would be a great time for staff, volunteers, and trustees to test the institution's disaster preparedness and recovery plan. You can also invite local emergency personnel (fire, rescue, and police departments, Coast Guard, etc.) to familiarize them with your facility and to give them an opportunity to offer suggestions on how your plan might be improved.

IV. J. DOCUMENTING YOUR ASSETS

Proper documentation of collections and assets can facilitate the settlement of any insurance claims and accelerate the reconstruction, replacement, and restoration process. Here are some guidelines to follow:

1. If you know a disaster is imminent, save all important papers for documentation purposes by placing them in a safe location, preferably off site. If you keep a duplicate

set of these records in an off-site location and update them periodically, you'll have a good backup system in the event of an unexpected disaster as well.

2. Assess the current condition of collections and property and document them with collection catalogues, photographs, sketches, videos, architectural drawings, construction plans, and condition reports.

3. Assess the current value of property and collections by reviewing appraisals by qualified professionals, bills of purchase, inventory records, loan agreements for collections on loan to other institutions, and loan agreements for borrowed collections in your care.

4. Determine whether any of your buildings or ships are subject to the National Historic Preservation Act or to other regulations and how this might affect the cost and time involved in restoring them after they've been damaged.

5. Document sources of income such as admissions, grants, museum store proceeds, etc. with monthly receipt logs, documented daily attendance figures and admission fees, records of fundraising activities, rental revenue, copies of contracts, agreements with vendors and suppliers, etc.

6. Review your insurance coverage annually with your agent to determine:

- Whether you have adequate coverage.
- What is covered and what is not (e.g., collections, ships, all or only some buildings, landscaping, etc.).
- What types of emergencies or disasters are covered.
- What records are needed to file a claim. You should have copies of any essential records in an off-site location.
- What documents are required to determine pre-disaster condition and estimated cost of restoration.
- What their rules are for moving collections or for emergency recovery of damaged collections. Does their adjuster have to be informed or see the damage before any action can be taken? Can you get a waiver in writing if necessary?
- What the normal procedure is for settling a claim after a disaster occurs. Will there be on-site inspections? How soon will the adjusters appear on the scene?
- How long it will take to settle a claim. Don't make the mistake of accepting full payment on a claim too soon. There may be costs that extend into the future and which may be recoverable.
- Who makes the decision whether to restore or replace.
- How much time is allowed to file a claim.

3 Whether additional coverage is needed for loss of income, liability, exposure, workers compensation, and trustees' and officers' liability.

Keep in mind that FEMA and SBA (Small Business Administration) operate as insurers of last resort, and may pay for damages above and beyond those covered by private insurance. FEMA provides assistance in the form of grants to nonprofit organizations for stabilization, repair, rehabilitation, and collection conservation, but only if you have a photograph of the object before and after the damage occurred. SBA may give aid in the form of loans up to $500,000. Both FEMA and SBA only cover damages above those underwritten by private insurance. The National Trust for Historic Preservation provides funds of up to $5,000 through its President's Discretionary Fund for Disaster Relief. These funds are available to governments and nonprofit organizations for professional assistance in planning rehabilitation of historic structures and ships.

V. SAFEGUARDING LARGE FLOATING VESSELS

(by Dana Hewson, Vice President for Watercraft Preservation and Programs, Mystic Seaport Museum and Paul DeOrsay, then Director, Texas Seaport Maritime Museum and now Assistant Director, Independence Seaport Museum)

The following section deals with vessels that will be in the water during adverse weather conditions. In most situations, the size of the vessel and the seriousness of the anticipated weather will dictate which actions are most appropriate. Not all vessels are in the water on a year-round basis and are therefore not exposed to the same risks all the time.

Each large vessel in your collection should have a plan showing the location of water shutoffs, power shutoffs, fire extinguishers, lightning grounds, storm hawsers, additional mooring lines, emergency equipment, etc. Do not store your only copies of these on board! Have back-up copies on board, and keep the originals in a safe place onshore. Your institution's emergency preparedness and recovery plan should have a specific section dedicated to the procedures you will follow in taking care of your vessel(s).

V. A. ROUTINE SECURITY AND PREPAREDNESS

n Berth and Moorings

In berthing vessels, every attempt should be made to ensure that the vessel will be secure during normal conditions. Adverse but fairly routine conditions, such as thunderstorms, should be considered ✌normal.✍ Large vessels should be secured in preparation for a ten-year weather event, while small craft require attention in much less severe conditions. Major weather events, such as hurricanes, require additional securing measures, as discussed below.

Few museums have a great deal of choice in locating berths for large vessels, but the following describes the ideal:

l **Adequate depth and a soft, level bottom** in case the vessel someday rests upon it.

l **Structurally sound pier and mooring points,** located to permit many long leads. Investigate the strength of bollards, pilings, etc. Allow long enough leads to accommodate wind-driven tidal extremes. Use as many *different* bollards as possible. Be

skeptical of the strength of any piers and pilings that predate your own memory. Anchors, if they can be placed without obstructing navigation, are very useful and provide added security. ✌Deadmen✍ or buried land anchors can provide secure moorage from the shore. (The chain leading from the deadman can be buried to keep it out of the way.) At least one ship, USS *Texas*, is moored without lines at all; she is mechanically linked to special dolphins installed for the purpose, much as integrated tug/barge units are joined.

l **A three-sided ✌slip✍ configuration**, or a system of dolphins or anchors to permit holding the vessel off the pier. This can also provide protection from floating hazards like barges, ships, and drifting drydocks☝all of which have damaged historic vessels in the U.S.

l In the absence of three-sided ✌slip✍ configurations, **adequate camels and fenders**.

l **Shelter from heavy winds**, **seas and wave surges,** including those from passing ships. A big ship passing in a narrow waterway wreaks havoc just by her displacement. If possible, berth ships with their hulls oriented away from typical storm wind directions so they don■t get caught broadsides.

l **Adequate moorings** of synthetic fiber, wire rope, or chain, protected from chafe. Standard mooring gear should be designed to withstand a ten-year weather event (whether tide, wind, or sea) without additional gear. Most maritime museums rely on the elasticity of synthetic cordage to absorb shocks and to keep the ship stationary in her berth. Chain with adequate catenary (hanging freely between two points) serves the same function, but tends to permit enough motion to make public access and gangways a challenge. Wire rope, having neither weight nor elasticity, should be used with care. (*Elissa* uses wire as preventers, backing up her synthetic fiber lines. *Pampanito* shackles fiber shock absorbers into her wire moorings. This is probably the best approach for a semi-permanent mooring.)

V. B. FIRE PREVENTION

Prevention is by far the easiest way of dealing with the threat of fire. Standard precautions include the following:

1. Good housekeeping and safe work practices, particularly when using paints, thinners, oils, fuels, etc. Safe work practices are particularly important when dealing with electricity: At least one fire resulted from an extension cord placed in bilge water! Another resulted when shipyard fire doors were wired open for the convenience of

workers.

2. Good wiring. Wiring to marine electrical standards is costly, but well worth the expense. At least one museum ship had fire problems because of track lights and deck leaks!

3. Detectors and alarms. These are especially important if the public is allowed on board. Historically significant vessels should be fitted with bilge and fire alarms that transmit to a monitored central facility. The cost effectiveness of this measure will vary from ship to ship, but vessels wired for shore power should have alarms. Vessels without engine rooms or wiring are at less risk.

4. Extinguishers and fixed extinguishing systems (Halon, CO2, and sprinklers), **water, and training in how to use these systems.** Halon is now considered unacceptable for use in areas where people may be present.

V. C. CREW TRAINING

Having trained personnel is critical in any crisis. Museum staff are not always the best line handlers or marine fire fighters, and these may be the skills you most need in a crisis. One answer—not very practical—is to hire all your staff with these qualities in mind. A better option is to train the personnel you are likely to have on the scene in emergency response procedures. Knots and line handling are a good start, along with the use of fire extinguishers. ALL staff should know where emergency equipment and essential switches and valves are located. Drills may remind your staff of elementary school, but they are the best way to prepare people to respond effectively in an emergency.

In some situations, the permanent staff cannot hope to handle a serious emergency on their own. It is wise, therefore, to look for additional help elsewhere. *Elissa*'s hurricane plan uses volunteers who have trained on the ship, and who are called in via a phone network in an emergency. Other museums might look to schools, military facilities, or their neighbors for assistance in a crisis. Set up this cooperation ahead of time and notify them if a storm or other threat is imminent.

It's important to train at least TWO people in every task, especially supervisory roles. If only one person knows the emergency plan and where everything is, what will you do if this individual is 1,000 miles away when disaster strikes?

V. D. EMERGENCY EQUIPMENT

While it is impossible to predict most emergencies, adequate supplies and equipment can be assembled beforehand. Often necessity will be the mother of invention. Suggested supplies and equipment include:

- 3 Generator with fuel to run it
- 3 Pumps for firefighting and bilge
- 3 Dock lines (wire, chain, buoys)
- 3 Shackles, thimbles, cable clamps
- 3 Come-alongs, tackles, grip hoists
- 3 Chafing gear (including old rags, water hose, etc.)
- 3 Anchors
- 3 Fenders (tires, camels)
- 3 Work boat or float (with means to launch it if not kept in the water)
- 3 Torches (with protective gear,) bolt cutters, axes, pry-bars, sledge hammers, chain saws
- 3 Pipe plugs
- 3 Red Hand® (epoxy putty), sheet lead, tube caulking (Boat Life® works under water), steel plate, timbers
- 3 Lights (portable)
- 3 Tarps, both canvas and reinforced plastic
- 3 Odds and ends of lumber
- 3 PFD's (personal flotation devices), hard hats, gloves, adequate footwear
- 3 Hand-held VHF radios
- 3 Marine radios
- 3 Fire extinguishers
- 3 Oil spill protection booms, pads, and Speedy Dry®
- 3 Breathing equipment
- 3 Fire proof clothing

Outside assistance may be needed—salvage and marine construction companies, National Guard, Army Reserve Construction Battalions, USCG divers, shipyards, etc.

V. E. DEALING WITH DISASTERS AND EMERGENCIES

n **Fire**

Planning how to deal with a fire *before* it occurs ensures a prompt and effective response.

Here are some suggestions:

l **Familiarize local fire fighters with your ship** and the facilities, equipment, and personnel your museum can provide. Show them around the ship, point out important features like fixed extinguishing systems, compartmentation, ventilation shafts, etc. Be sure they know which staff will serve as advisors in the event of fire.

l **Outline evacuation procedures.** Sometimes the best way to avoid letting a waterfront fire spread to a museum ship is to move the vessel from her berth. This is hardly a small undertaking, given the number of ✌permanently moored✍ museum ships (*Elissa* is required to have fire warps rigged at all times, despite being permanently moored!). Here are some of the issues you will need to address:

- 3 Command structure (who has the authority to make decisions)
- 3 Crew (if self-propelled) or towing vessel
- 3 Casting off (in an emergency, this might require cutting torches, axes, etc.)
- 3 Destination (alternative berth)
- 3 Communications

n **Leaking/Sinking**

Needless to say, a well-maintained vessel is less likely to have this problem, but no ship is immune. Be especially diligent with operational vessels having through-hull fittings: Deteriorated hoses, galvanic corrosion, and freezing are classic sources of sudden, severe leaks. Also be alert to potential errors by inexperienced personnel (valves left open, etc.).

Vessels do, on occasion, ✌suddenly open up.✍ Ice can pull caulking, a stray piling can cause damage, an extreme low tide can ground the vessel on a rock or piling. Bilge alarms and automatic pumps can save the vessel in some of these circumstances.

To handle leaks:

l **Own or have access to effective pumps.** While leaks are serious, they are easier to address while the vessel is still afloat. Electric pumps are small and convenient, but electricity is not always available (the storm which led to the leak may have knocked out power). You may want to invest in portable gas or diesel pumps and generators, or at the least locate a rental shop which can provide them. Beware, however, of using such equipment in enclosed spaces: The exhaust is deadly, and ventilation is essential. Get a

night-time phone number for rental services. In some localities, the fire department can help with pumping.

l **Patch the leaks.** Once the flooding is under control by pumps, you must locate the leak and find a way to stop it. You might try plugs and/or shoring from the inside, or canvas ✌fothering✍ from the outside. Having a trusted diver in the local area can be a godsend (another night time phone number to keep on hand.) There are now exotic fiberglass and epoxy patching materials that will cure under water, and the good old sheet lead ✌tingle✍ works well for wooden hulls.

When a vessel is sinking:

l **Think about where she■ll go down.** There will be some situations in which you realize that the vessel is going to sink (e.g., you have her afloat only through the temporary aid of the fire department) and have time to choose where she goes down. Consider moving her to a place where her repair and refloating will be as convenient as possible. This may be her permanent berth, or one providing better access for salvage equipment, or perhaps a mud flat nearby. But beware of environmental regulations: Sinking and repairing your vessel in a wetland may be illegal! Yachts that ended up in a Massachusetts wetland during a hurricane had to be removed by helicopter, to avoid further damage to the ecosystem.

l **Do not attempt to keep the vessel afloat by placing buoyant material, such as styrofoam, inside the hold.** Decks are not engineered to support the weight of the hull, and you may do more damage than good (*Alice S. Wentworth* met her end this way, though not in museum hands).

l **Be aware of the danger of pollution,** particularly if there is any fuel or oil aboard the vessel. Remove the petroleum if at all possible, or try to cap off tanks and vents before the vessel goes under. With submarines, batteries are a serious concern, for both pollution and toxicity reasons.

l **Don■t try to salvage a ship without getting help.** What usually happens is that you arrive to find your vessel on the bottom and are faced with a salvage job and possibly a pollution problem. Be familiar with local, state, and federal regulations pertaining to such situations. You can start with the nearest USCG station. Never attempt to raise a historic vessel without knowing what you are doing. Sunken vessels may be weakened, and raising efforts can put too much stress on a hull, causing further damage. Professional assistance may be required.

If you have to scuttle a vessel intentionally:

l **Weigh the pros and cons carefully.** In the right circumstances—a hurricane, for example—scuttling can be a viable means of saving a vessel from catastrophic damage. But the individual responsible for making the decision should be certain that the risks merit the consequences. A vessel without engine or electrical systems, in a good berth, could be more secure from storm damage while on the bottom than while afloat. However, each vessel is a special case, and it is worthwhile to outline in advance the circumstances under which such action might be taken.

l **Consider the surrounding conditions.** A large vessel that sinks in shallow water may lose stability and roll on its side, putting additional strain on the hull. A heavy accumulation of ice and/or snow, coupled with high winds, can cause a vessel to heel over and let water in through normally above-water openings and poorly caulked planks. Swamping smaller vessels should get them out of the wind and seems a good plan for boats moored to anchors. However, swamping vessels moored to a dock requires careful planning for storm surges and wave action.

n **Wind**

It depends where you live, but most museum ships are likely to experience winds of fifty knots or more at least annually. Squalls, frontal passages, and winter storms routinely carry winds of this velocity, and your ship and moorings should be able to withstand them without extra measures. Strong moorings and a deck and rig kept shipshape are adequate preparation. Trouble may come from things like awnings, trash receptacles, gangways, or temporary rigging for maintenance. It is worth coming up with a plan to remove gangways and to rig temporary access from shore to ship, as large gangways can do tremendous damage to themselves, your ship, and the pier.

To avoid damage from wind:

l **Have chafing gear in place.** It is nearly impossible to rig chafing gear in a gale. Gusty winds, or gales of long duration, will get your vessel surging on her moorings as your shock absorbers (catenary in chain or synthetic line stretch) come into play. This is when chafe can have a serious impact, and any weaknesses in your mooring system will come to light as the vessel heaves against her lines. In a pinch, you might try some lard or vegetable shortening at chafe points; do not use petroleum products on fiber lines. If chafe is occurring, rig extra lines as backups. Ideally, your mooring system should have

built-in redundancy.
l **Secure vessels for all directions.** During a storm, winds can reverse themselves suddenly.

l **Remove masts and rigging on smaller vessels**. Get trailerable boats out of the water.

n **Hurricanes**

We habitually underestimate the damage potential of hurricanes. Because the strongest part of the storm is so localized, most of us will never experience the full force of a hurricane. However, there is a great danger in making inadequate preparations on the basis of this assumption. Here are some rules to live by:

l **Hurricanes are unpredictable.** They can change course and strength rapidly enough to leave you little time to revise your preparations. Act early, and prepare for the worst.

l **Hurricanes are more powerful than most of us can imagine.** A Category 1 storm has *twice* the wind force of a 50-knot gale; a Category 3 storm has *four times* the wind force. Preparations should concentrate first on your vessel's survival, then on minimizing damage.

l **Make your preparations and evacuate**. Do not imagine that by staying with your ship you will help anything.

l **Make your vessel as watertight as possible.** Seal all openings with air conditioning duct tape. Tape windows from the inside. Use porthole covers if present. Remove all movable equipment such as canvas, dinghies, radios, tillers, booms, etc. Secure hatches tightly.

l **Shut off fuel lines** at tank, and close all through-hull fittings.

Mariners tell of surviving hurricanes by moving their boats up tidal creeks as far as they could go and tying off to trees. If the water level rose, they would go still further. As the water receded, they would bring their boats back down in stages. These were desperate men trying to save their livelihoods. Such heroic actions are not expected today.

n **Seas**

Storm-driven waves carry tremendous amounts of energy and are best avoided. If your berth is vulnerable, make plans either to evacuate the vessel or to minimize damage

from waves. *Pampanito*, in San Francisco, has a very exposed berth, necessitating extensive mooring installations. *Pampanito* has been forced to make at least one dramatic escape.

If your berth is washed by relatively small waves, there are some effective energy-absorbing breakwaters made of floating tires, often used by marinas.

n **Tide/Storm Surge**

1. Low Water. This is somewhat less of a threat than a storm surge, but it is worth researching historic low water levels. Bodies of fresh water may fluctuate seasonally, canals and even lakes are sometimes drained for maintenance, and many bays and estuaries are subject to wind-driven loss of water depth. It is worth knowing the precise depth of your vessel's berth and what the bottom is like, in case you have to choose someday whether to leave or take the ground.

Be aware that what lies beneath your vessel—whether it's silt, current-driven debris, or (in urban settings) junked cars—may change over time. It is prudent, therefore to sound and sweep the berth when you have the opportunity.

2. High Water. Water levels high enough to threaten a moored vessel can result from river flooding (freshets, ice dams, etc.), lake level changes, or storm surges. Once again, it is worth checking historic records for frequency and magnitude of high water events. Remember that coincidence (e.g., spring tides plus a nor'easter) can create extraordinary water levels, resulting in extra hazards to your vessel. Bear in mind that high water usually denies you access to your ship and pier; preparations must be made in advance. Some specific concerns are enumerated below.

l **Straining, slipping, or breaking moorings.** As your vessel rises and the strain on her lines increases, the line may part or chocks, bitts, or bollards come adrift. She may even lift her lines off the dockside attachment points. Long leads on all lines, and either keeper pins or extra tall mooring points, will prevent slippage. *Elissa* has two steel mooring dolphins close alongside, tall enough to allow her mooring lines to slide up with a 15-foot storm surge (the height of the surge in the great Galveston hurricane of 1900).

l **Vessel shifting in her berth.** The worst possible result of high water is to have your vessel move; even a slight shift over the edge of the dock can cause severe damage. In the worst-case scenario, the ship might be well inland when the waters recede. It is essential that your moorings be adequate to keep the vessel in her berth despite high

water.

l **Electricity.** Remember your vessel's shore power connection. If you did not turn it off before the high water event, use caution when you return to the vessel.

Most high water events allow some time to prepare. If your berth is unsuitable for high water, consider finding a better temporary berth. (The Maine Maritime Museum routinely moves its vulnerable vessels to avoid spring ice flows in the Kennebec River.)

n **Tornadoes, Hail, and Squalls**

These weather events come with relatively little warning, but are often devastating in their intensity. The likelihood of their occurrence varies tremendously from region to region. It is best to maintain your ship to ensure her survival in winds of 100+ knots, and recognize that some damage is bound to occur to gear and rig. While high water or high winds alone can cause problems, they usually come together, increasing the strain on mooring systems.

After any heavy weather, the vessel(s) must be checked. In the case of severe storms involving a loss of communications, designated staff members should know ahead of time that they are expected to come in without being called.

If there is a secure area at or near the site, it's good practice to have a small crew stand by during the incident. This crew may be able to take some action during the storm and will be in the best position possible to take remedial action after it's over. Staff so designated should not be forced to undertake this assignment, and human safety should be everyone's highest priority.

n **Electrical Failure**

Failure of shoreside electricity often accompanies intense storms. In addition to being a problem in and of itself, it can complicate other storm-related problems.

The classic problem, of course, is loss of the automatic electric bilge pump without which your vessel will not float. If you have extra pumps on hand or know where to get them in a hurry, this won't cause as much difficulty. "Brownouts" can cause severe damage to large electric motors, which may in turn result in a fire or threaten your vessel's security.

Investigate what impact the loss of power or telephone lines will have on your alarm

system, ice bubbler, and preventive systems. Are battery and/or generator backups required? Consider either owning or knowing where to rent generators. (Note: After events like hurricanes, rental units are usually hard to find.)

n **Lightning**

Lightning can occur almost anytime, but it is most common during the summer. While lightning strikes on boats are rare, they can de-mast a vessel, hole the hull, set the vessel on fire, and burn or even kill humans on board.

It may be impossible to prevent lightning from striking, but you *can* reduce the chances of damage or injury by taking the following steps:

l **Have your vessels properly grounded.** This requires a straight, high-capacity electrical conductor from the highest point on the vessel to a submerged ground plate or an exposed metallic keel. Large metallic masses, such as engines and fuel tanks, should be included in the grounding system to eliminate the possibility of side flashes of lightning within the vessel. The wire used to bond the masts, engines, shrouds, etc. to the keel or ground plate should have a conductivity equal to or greater than #8 AWG copper wire. Tin-stranded copper wire resists metal fatigue better than solid, single conductors. Copper tubing or strips can also be used, as long as the thickness of the material is .032 inch or greater. All electrical connections should be made with corrosion-resistant hardware and should be mechanically strong. The use of solder should be avoided, as it may melt during a lightning strike. The ground should be firmly attached by a bolt that goes through the hull to the metallic keel or grounding plate; both must be exposed to the water. On some boats the metallic rudder, propeller and shaft can provide the ground if they form a relatively straight grounding path. A ✌lightning rod✍ should extend at least six inches above any other equipment attached to the masthead.

To ensure that a vessel is adequately protected against lightning, the entire vessel should be enclosed within the imaginary cone formed by a 60-degree angle from the highest grounded point on the vessel. If the grounded mast(s) is too low in relation to the length of the vessel, the extremities of the vessel are not protected. In such a case, the lightning rod can be extended until the entire vessel lies within the 60-degree ✌cone of protection.✍ If the vessel has a radio antenna at its highest point, it can be used for lightning protection only if it is equipped with a lightning arrester in the lead-in cable.

l **When thunder is heard, close the ship to visitors.** As a precaution, ships (especially

tall ships) should be closed to the public for at least 15 minutes after the last clap of thunder is heard. The Boy Scouts of America recommend a 30-minute waiting period.

n **Other Vessels and Floating Projectiles**

In many berthing situations, it will be necessary to protect a vessel from drifting objects. These may range in size from barges and dry docks to stumps and floating trees. The threat must be assessed for each situation and the appropriate protection provided. Perhaps the easiest form of protection is placing berths so that they take advantage of currents, winds, coves, exiting breakwaters, etc. Drifting ice and debris can be at least slowed down by booms across their path.

Much damage is caused in mooring fields when boats that have broken loose drift down on other moored vessels, causing damage and/or placing additional strain and chafe on the moorings that are still functioning. Aside from proper placement or surrounding dolphins, there isn't much you can do to protect your vessel(s) from this threat.

During storms, wind-blown debris is more of a threat to personal safety than to vessels. Good housekeeping goes a long way toward preventing the problem as far as loose debris is concerned. Once buildings begin to blow apart, there is little that can be done other than to use extreme caution and stay in protected areas until the threat has passed.

n **Ice and Snow** (see also Appendix 5)

When ice covers rivers, coves, and bays for extended periods of time, several problems can occur. Boats that require water access for periodic pumping and maintenance may be inaccessible for long periods of time. As ice thickens, it can exert pressure on the hull of the vessel. Caulking and seam compound can be pulled by the ice resulting in catastrophic leaks. Hulls can be chafed along the waterline by ice.

Techniques for protecting vessels against ice are fairly well known in northern climes, but for those museums located farther south, where cold winters are rare and experience with ice is lacking, it is worth considering the risks to your vessel.

1. Vessels frozen in their berths. Larger vessels are better able to withstand the rigors of being frozen in their berths. Smaller boats may require special equipment, such as ice bubblers, to prevent ice from forming around them.

2. Hull abrasion. The sharp edges of moving ice tend to abrade the hull at the waterline. If this is a recurring problem, you might want to consider fitting sheet metal or wood

sheathing around the hull. But because the sheathing can lead to other problems, you'll want to weigh the protection it affords against the danger of ice damage. Booms can also be used to prevent ice abrasion.

3. Masses of moving ice can create all sorts of problems. Rudders are vulnerable to being jammed hard over by pack ice, which can damage the rudder or, even worse, create leaks. Preventer chains or other types of stops (either permanent or rigged for the winter) can alleviate this.

4. Strain on moorings. A ship caught up in a mass of ice puts tremendous strain on her moorings. Anchors can drag, lines part, etc. Be sure your moorings are adequate to the task, or consider other solutions: a log boom placed around the vessel but moored independently, ice-breaking cluster pilings upstream of your berth, or the use of an ice-breaking vessel. Sometimes hard manual labor is the only way to get ice out from between your vessel and the pier.

Ordinarily snow, sleet, and freezing rain are more of a nuisance than a serious threat. But large amounts of any type of frozen precipitation can cause stability problems. Covers can collapse from the weight, and access to the vessels can become dangerous or impossible. Secondary problems can arise with loss of electricity and lack of access for emergencies services. Frozen plumbing can result in system damage, interior water damage, and in extreme cases, sinking.

VI. SAFEGUARDING SHIP MODELS

(by Dana Wegner, Curator of Ship Models, Department of the Navy)

This section offers practical suggestions about preparing for disasters from the perspective of protecting ship models. It also offers some ✌first aid✍ measures that can be taken while waiting for a full-scale conservation effort to be mounted.

VI. A. EMERGENCY SUPPLIES

Whether you■re anticipating a single disaster or the possibility that more than one catastrophe will strike simultaneously, there are a number of materials that should be kept on hand. Materials for protecting and stabilizing ship models should be retained in a ready-box, separate from supplies and equipment stowed for other purposes. Sufficient gear should be available in an emergency to avoid competing with facility managers and curators of other media. Check your supplies regularly to ensure that they have not disappeared and that their shelf life, especially for adhesive tapes, has not expired. For ship models, it is recommended that each museum stock the following:

l **Quilted furniture blankets**. Furniture or utility blankets can be obtained from a mover■s supply company. They are usually sold in bundles of twelve. You can rent them from van lines and truck rental firms, but buying your own ensures that they■re clean, dry, puffy (a technical term), and relatively dust-free. A minimum of one or two dozen is recommended☝more if the ship model collection is large. Do not use the thin, un-quilted pads called ✌skins.✍

l **Zipper-lock inert plastic polyethylene bags**. Have available at least two bags for each model. Zipper-lock vegetable bags, with small perforations that allow wet items to dry, have been introduced recently. But make sure they are inert, as some metal elements may be present.

l **Indelible ink markers** for marking zipper lock bags.

l **Fresh boat tape** (a.k.a. ✌duct tape✍ or ✌gaffer tape✍) about two inches wide (many rolls).

l **Fresh nylon filament reinforced tape** (a.k.a. ✌strapping tape✍) about one inch wide (many rolls).

l **Packages of 2-mil-thick polyethylene painter's drop cloths**, at least 9' x 12.'

l **Packages of 1-mil-thick polyethylene painter's drop cloths**, at least 9' x 12.'

l **Wet/dry vacuum cleaner** with regular attachments and small diameter suction tool. Wet/dry vacuums do not usually come equipped with a suitable small-diameter suction tool. Have an imaginative staff member construct one from plastic tubing and spare vacuum cleaner hose fittings. The nozzle should be about 1/2" wide. Sometimes small suction attachments are sold as accessories for dry vacuums and are known as ✌mini-vacuums,✍ used for cleaning computers, typewriters, and automobiles.

l An ample supply of a soft, reduced-lint, water-absorbent disposable swabbing material, such as high-quality paper towels.

l Cotton tying tape, undyed, about 5/16" wide.

l At least one 1200- or 1500-watt hand-held hair dryer.

l One portable electric fan per gallery or storage area.

l Extension cords, U.L. approved.

l Portable source of alternative lighting.

l Several soft, natural-hair brushes, 1" or 1-1/2" wide.

l Large sponges like those used to wash cars,

l Window-washing squeegee.

l Several pairs of long-nosed, cross-action tweezers.

l Cotton or nylon gloves (many pairs), medium or one-size-fits-all.

l Scissors or utility knives (several).

VI. B. PREPARING PERSONNEL FOR DISASTER

Museum personnel should be empowered to act as individuals in an emergency. That is, after receiving training in how to respond in an emergency, they should have permission to decide for themselves whether a ship model is in immediate peril. They should

understand that in cases of clear and immediate danger, when there is no time to obtain curatorial permission, they may open exhibit cases or remove objects from danger. Following a disaster, when there might be a shortage of professional workers or when untrained personnel might have to enter a restricted area, museum staff should be instructed to remove objects without supervision when they know that the circumstances are more threatening than their lack of skill in handling them.

Training for personnel in how to move models should include the following:

- How your exhibit cases are opened.
- How ship models are secured within the exhibit cases.
- How the models are secured to cradles or stands.
- How to carry a ship model in your hands.
- Moving a model alone.
- Moving a model with a team of people.
- Handling models in stands or cradles.
- Moving models with carts.
- Using nylon gloves to obtain a good grip.
- Where to move models within your facility.

VI. C. EVACUATION OF MODELS

Your disaster plan should cover both the evacuation of ship models to safe locations within your facility and the evacuation of models to an area outside your facility.

Ship models are relatively hardy objects. While damage to an artifact should be avoided, there are few ship models that have never been repaired or restored. The potential damage incurred by physically moving a model away from danger may be more acceptable than the risk of leaving the model in peril. Experience has shown that most ship models travel well even without exhibit cases or crating. Models may be carried by hand and on carts within buildings, but a closed truck is recommended when moving models outside more than a short distance, or to an alternate facility.

Selecting a Truck

Whatever the size of the truck employed, obtain the vehicle exclusively for moving your ship models. Do not share truck space with other goods of any sort, or with other artifacts, crated or uncrated. Ship models are both awkward and delicate, and they are most secure when not crowded or threatened by taller objects and things adrift.

Ordinary half-ton delivery vans usually have adequately soft suspension and may be used to haul small models or a few large models up to about 96 inches in length. Such vans can be rented or borrowed from local businesses or neighbors. Larger trucks should have air-ride suspension. Many types of household moving vans available from commercial rental firms have this type of suspension. Most ✌straight✍ trucks (as opposed to tractor-trailer rigs) with 16 to 28-foot box length do not have air-ride suspension, and it is recommended that ordinary one-ton, two-ton, and up to 28-foot straight trucks be avoided.

Surprisingly, large tractor-trailer rigs outfitted as household moving vans offer the best and most secure ride for ship models. Popularly known as ✌semis✍ and ✌eighteen wheelers,✍ this type of tractor and trailer combination was specifically developed to haul household goods over long distances. Insist upon air-ride suspension for trailers 35 feet and longer. While the entire trailer usually rides well, the softest ride area is located from the step of the drop deck to over the trailer wheels. Some larger trailers have climate control and intrusion alarms. If these amenities are not essential, it is not necessary to engage the special trailers some van lines prefer to dispatch for carrying exhibits, electronics, and artifacts. But insist that the van be free from water leaks, clean, and cleared of all extraneous materials except those necessary for your requirements. Transporting artifacts in trailers that hook to another vehicle using an ordinary trailer hitch, whether permanently installed or not, is not recommended.

n **Preparing Models**

Parts that appear loose should be removed and temporarily placed in **zipper lock bags** identified with **indelible ink markers**. Care should be taken to store the bags in a common place or to attach each bag firmly to the model's base or cradle. Model ships' boats suspended from davits should be gently triced up with **cotton tying tape** to prevent the boats from swinging into the ship. Use cotton tape to secure models to cradles or to help hold wobbly spindle-mounted models to bases. Models with sharp hulls not mounted in cradles or stands should be placed in temporary cradles made in advance. Universal temporary cradles can be constructed from two square pieces of 2" Ethafoam cut with a vee notch at the top and butt-glued with PVA glue to a plywood sheet. If needed, a supply of universal cradles should be added to your disaster supply ready box.

Spread out layers of quilted **furniture pads** on the van deck. Be sure the pads are clean and dry. About one or two inches of padding is good. Flat-hulled models without stands may be placed directly on the pads during transit. Models on cradles or stands may set on the padded van floor and then held upright by rolled furniture pads. Load

the models as if they are sailing into or out of the truck—that is, parallel to the direction of the road. The rolled pads will prevent models from rolling and pitching in the van. Allow plenty of space around each model and do not allow them to overlap.

Movable plexiglas or glass exhibit cases with models firmly mounted within can be set on a layer of furniture pads and covered over with one or two pads. Exhibit cases can then be lightly belted to the trailer walls, two to four inches above the floor, with special interlocking straps ("logistic tie-downs") provided by the trucker. Inspect the van to make sure there is no equipment—for example, ladders, plywood sheets, or tall stacks of pads—that might tumble over and damage the models in transit. Put a thermometer and hygrometer in the van to monitor temperature and humidity. The motion and vibration of the vehicle will render ordinary hygrothermographs useless.

Models may be off-loaded at another facility, or they may be left sealed within the truck for a few days if the climate is satisfactory or if the truck has environmental controls. Consider parking the truck inside a building. Some National Guard armories, factories, and warehouses can accommodate even the largest tractor-trailer rigs. The truck or trailer doors may be padlocked and additional security can be added by parking the vehicle against a building wall or another van so that the doors cannot be opened. For tractor/trailer rigs, do not uncouple and leave the trailer unattended unless the kingpin has been securely locked.

Check with your fine arts insurer in advance to find out whether your models are covered during emergency transit. Most drive-it-yourself truck rental firms offer no appropriate insurance. Commercial van lines offer standard coverage of pennies per pound, but sometimes increased amounts are available. Neighbors' and employees' vans, as well as volunteered commercial vehicles, may have no valid coverage at all.

Remember that when an impending disaster warning is broadcast, trucks may be scarce. Before disaster strikes, therefore, it might be helpful to introduce yourself and to discuss your potential needs with a local commercial van line or rental company.

VI. D. PROTECTING MODELS FROM DAMAGE

Water represents the greatest peril to ship models. Water damage can occur in a variety of circumstances, as described below.

n Water from Above

Water may enter a gallery or storage area from leaking or frozen water supply pipes,

overflowing toilets, showers and bathtubs, accidental or deliberate sprinkler head discharges, fire hoses, steam and condensate pipes, leaking soil pipes, leaking or frozen down spouts, gutters, internal drains, floor stripping and washing, and drinks spilled during exhibit openings. Water and gravity are a particularly dangerous combination, and water discharged on roofs or several floor levels above storage or exhibit areas may find its way down by running along pipes; through walls, ducts, and pipe chases; and even through tiny cracks in seemingly impervious concrete floors.

A number of staff members should be trained in how to turn off sources of water, or there should be signs instructing them how to do so. If the procedure is difficult or requires special devices, the staff should know whom to contact. Do not depend on your building maintenance staff or engineers alone. Regular and off-hours staff should know the location of all pipes passing through artifact areas. Even if they're out of sight, these pipes should be prominently labeled in plain language as to their purpose and contents. Consider color-coding the pipes when they pass through critical areas of your building.

Here are some other tips for protecting your models from water damage:

l **Models that are not on exhibit should be stored in a clean condition.** Dirt, soot, or dust suspended in water aggravates the conservator's problem of removing watermarks left on models. Water from above is frequently accompanied by debris like rust, scale, ceiling tile fragments, flotsam and jetsam collected in air ducts, and soggy particles of sheet rock and plaster.

l **Whenever possible, models in storage should be stowed in their display cases or in closed cabinets.** Old, surplus, individual display cases, ugly as they may be, should be re-employed to house single models. Large display cases can house several ship models. While open shelves may seem like an impressive way to store and display study collections of models, they do not offer adequate protection from water, pilferage, impact, dust, and soot. If closed shelving, cabinets, or dust-proof display cases are not available, some protection will be gained by lightly shrouding each model with a sheet of 1-mil polyethylene cut from a **painter's drop cloth**. The 1-mil thickness is generally light enough to avoid damaging masts, spars, and rigging.

l **When dealing with display cases that have separate tops and side panels, tops should be kept meticulously clean and, if possible, caulked with silicone sealant.** Water from above tends to gather on top panels and seep down the inside of the sides or drip from seams directly into the center of the display area. Sealant will help keep water from entering the case, and whatever water drips through will be less likely to stain if the seepage is clean. If the sealant touches the case interior, make sure it doesn't contain

acetic acid.

l **Display cases in storage areas should be covered with 2 mil painter's drop cloths**. Half models displayed on walls or stored in vertical racks can also be protected with 2 mil polyethylene. Smaller ✌rooms✍ within galleries should be roofed over, using conservationally acceptable waterproof construction materials like sheet metal, or heavy polyethylene sheeting canted to allow water to run off in a safe direction (45 mil polyethylene pond liner is available by the linear foot from some garden supply sources). Sheet rock, plaster, and ceiling tiles are not waterproof and offer no protection from water from above.

n **Water from Below**

Keep models a safe distance off the floor. Evacuate models to upper floors or another site if flooding is expected. Placing models aboard ships afloat is not recommended.

n **Driven Water**

Covering display cases, crates, and storage cabinets with 2 mil or thicker polyethylene, secured with **boat tape,** would seem to offer some protection from water driven by wind. Most likely, water will still enter all but the most secure display cases. Models not stored within closed containers do not stand a chance against driven water. When time is short and objects must be wrapped, your staff will appreciate the availability of **scissors or utility knives**.

n **Power Failure**

Dust-proof exhibit cases do a commendable job of protecting their contents from abrupt temperature and humidity fluctuations. But in time, humidity will invade the case interior and begin to act upon the artifacts. If humidity controls are disabled due to a power failure for a substantial period of time, generally a week or more, consideration should be given to evacuating ship models in display cases, crates, or cabinets to a more controlled environment. Ship models not stowed in closed containers should be evacuated within a few days. Generally speaking, the conservational risks must be weighed against the physical protection offered when storing any museum artifacts in unbuffered crates for extended periods.

n **Impact**

To protect artifacts from falling objects, the tops of display cases in galleries or storage

areas should be glazed with impact-resistant plexiglas, safety glass, wire reinforced glass, or glass covered over with impact-resistant plexiglas. Applying adhesive tape to large pieces of plate glass is probably better than doing nothing, but there's no guarantee that it will minimize impact damage. If you do tape, use **boat tape** or **nylon filament reinforced tape** applied copiously to the inside of exhibit cases. Masking tape or cellophane tape will not work.

Both glass and plastic display cases can be fortified by applying sheets of 1/4" or 3/8" plywood to the outside. Museums in areas where the risk of strong winds or civil disturbance is high, or that have unusually large glass curtain windows, might do well to cut plywood sheets to size for each case and store them in advance. Sheets can be secured with **nylon filament reinforced tape**. Anyhow, evacuation of models to a remote site is preferable.

n **Vibration**

Vibration may be caused by earthquakes, heavy construction, or explosions. Models mounted firmly in exhibit cases can usually survive vibration, but special care should be devoted to models stored on open shelves to ensure that they don't "walk off" the edge. Shelving should be secure from tipping or collapsing. Closed museum cabinets offer superior protection. Using adhesive tape to dampen the vibration of large pieces of glass does not work very well. Although it's a good idea, shock-mounting ordinary ship models would warrant some investigation beforehand.

VI. E. RECOVERY PROCEDURES

When your facility has been certified safe for re-entry, it should be photographed or videotaped for insurance claims. Parts found detached from models should be collected and temporarily stored in **zipper lock bags** and identified using **indelible ink markers**.

Your immediate goal after a disaster is to return gallery and storage areas containing ship models to their original air quality, temperature, and relative humidity levels as soon as possible. Your intermediate goal is to surround the models themselves with the appropriate level of temperature and relative humidity. Your long term goal is to return the models to their pre-disaster equilibrium and restore them if they are damaged. Here are some suggestions:

l **Smoke and Ash.** Smoke odor, by itself, will not damage models. However, removing the byproducts of fire, commonly called soot, can be a problem. Do not wipe ash or

soot-covered objects. A conservator can remove it when time permits.

l **Impact and Vibration Damage.** Heavy debris should be cleared from models by hand or with **long-nosed, cross-action tweezers**. Then place loose parts in **zipper lock bags** identified with **indelible ink markers** and store the bags in a secure place or attach them to the models. If possible, avoid moving models from the spot where they were damaged until a conservator is present. Small parts and splinters not noticeable during broad recovery efforts may be scattered or mixed with other debris. A model builder, curator, or conservator is best qualified to recognize model parts. If models must be moved without the supervision of a conservator, try to recover all the bits and keep track of the models from which they came.

l **Water Damage.** Be mindful of the post-disaster goals outlined above. Except to remove ship models or separated parts from immediate or continuing peril, *nothing* should be done until power, heating, and air conditioning is operational. Then, to reduce humidity, floors should be drained, mopped, and vacuumed with a **wet/dry vacuum cleaner**. If necessary, extra dehumidifiers can be brought in. Wet floor coverings that cannot be dried quickly should be removed and discarded. Exhibit case, crate, and cabinet tops should be cleared of standing water using a **window washing squeegee** and **large sponges**. Large squeegees mounted on broomsticks are also helpful in moving water on floors and carpets. When working in wet areas with electrical gear, be very careful to avoid shock.

When the environment in the gallery or storage area has been returned to normal, model display cases can be opened. Do not reduce humidity in the area to lower-than-normal levels. **Portable fans** may be used to circulate the air within the room, but they should not be trained directly on wet models. Residual water remaining in exhibit case rabbets can be sucked up using the wet vac.

Water standing on model decks and bases may be removed using the wet vac with a small diameter suction tool or by swabbing with **paper towels** cut into small patches held with **long-nosed cross-action tweezers**. Water admitted into the interior of models should be drained by turning the model over or by absorbing the moisture with paper toweling inserted with tweezers through existing deck openings. Lift up model stands and dry the area beneath, then place shims under them to allow the stand bottoms to dry. Depending upon normal lighting levels, **supplemental lighting** and **extension cords** may be necessary when working on models, especially those with substantial rigging.

After standing water is eliminated, ship models should be left to dry at a natural pace in

the normal pre-disaster climate of the gallery or storage area. Model rigging and sails may be dried using hand-held **hair dryers** at low or no-heat settings and minimal wattage, but drying should be done in steps to approximate the drying rate of the remainder of the model. Other than drying and stabilizing models, it is best to leave all other restoration to your conservator.

Damage, of course, will vary according to the severity of the model's exposure to water and the model's style of construction. In most cases, damage to the model's finish will be less of a restoration problem than structural damage. Matte-finish models tend to show water marks, while those with a gloss finish tend to shed water. Metal fittings may oxidize and stain surrounding material. Separation of paint from underlying material can be expected and is usually restorable. Plank-on-frame and plank-on-bulkhead style models may suffer severe structural damage because the planks are under tension and water may cause the wood to swell, adhesives to part, and metal fasteners to slide from attachment. A conservator experienced in ship model building or a model builder may be needed to rectify structural deformation of ship models. Bread-and-butter or lift- style models and lift-style half-hull models usually suffer less structural damage and, if carefully dried, often return to a close approximation of their pre-disaster dimensions. It may take weeks or months for wet ship models to return to their normal equilibrium.

If you have an opportunity to commission new ship models, encourage basic bread-and-butter construction whenever possible. Some museums may wish to explore the U.S. Navy's written specifications for ship models.[3] Aimed at encouraging durability and longevity while preserving fineness, the Navy's specs may steer the museum community toward acquiring ship models that are better suited to survive disasters.

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[3] The Navy's specifications for ship models are explained in Dana M. Wegner, "Museum Standards and Ship Models: The Influence of Professionalism," Nautical Research Journal 39, #1 (March 1994), pp. 44-49.

VII. SAFEGUARDING LIGHTHOUSE LENSES

(by Gregory Byrne, Objects Conservator, National Park Service)

The classical Fresnel lens is composed of multiple panel sections in which a central lens is mounted within a series of prisms secured to each other in one of two ways: (1) by a beveled cut and a small amount of litharge glazing putty to hold them in place, or (2) by insertion directly into the bronze framework with glazing putty. Retaining bars are often present as well. The prisms are positioned with wood shims, which help compensate for compressive forces as the brass and glass change shape with fluctuations in temperature.

Historically, maintenance practices were prevention-oriented, the primary goal being to keep the lens in operation. Today, prevention and preparedness are the best measures for limiting damage in the event of an emergency.

VII. A. THREATS TO CLASSICAL LENSES

Classical lenses deteriorate over time. The nature of the glass and the aging properties of the glazing putty must be understood if you are to prevent damage in an emergency.

l **Deterioration of glass.** The French makers of classical Fresnel optics used a crown glass: an optical glass composed of silica, sodium, and lime (calcium oxide). If the composition of a batch of glass was unbalanced, then sodium, the alkali component, might leach out and migrate to the surface in the presence of water or atmospheric condensation, causing the glass to turn cloudy. The surface might also feel wet, slippery, or sticky. Although this kind of deterioration does not require emergency action, its presence (or absence) should be documented. Exposure to flood water can start the reaction or make imminent deterioration obvious.

Although the yellow-green color of the French glass is often attributed to prolonged exposure to sunlight, its unique color was noted at the time of manufacture and is not the result of exposure to light.

l **Deterioration of litharge putty.** The historic glazing putty, a white lead and linseed oil paste with whiting (calcium carbonate), can oxidize with time and become inflexible. When this occurs, stress is transferred to the glass instead of being absorbed. Pressure-type flake chips often occur at the margin where the prism seats into the glass. Deteriorated putty can also loosen the glass so that it is ready to fall out if bumped, touched, or vibrated. In an emergency, this condition may result in catastrophic

damage.

VII. B. AGENTS OF DETERIORATION

Other external and environmental forces with negative effects on lenses are referred to as agents of deterioration. Although environmental forces can damage classical lenses, it is the **human factor** (including visitor contact, ill-advised maintenance, misguided emergency response practices, the lens removal process, and vandalism) that causes the most harm. These threats are summarized below:

l **Misguided emergency response.** Your goal in an emergency is to stabilize the situation. Misguided actions may add to the damage brought on by the disaster. For example, trying to clean off deposits left by fire can do more damage than leaving them there for the time being. Using adhesives to repair breaks or cleaning without assessing and documenting the condition of the lens assembly are other examples of actions that can either make recovery more difficult or cause further damage.

l **Lens Removal.** Moving a lens is a risky undertaking that requires more information and training than can be provided here. The first step is a thorough assessment of the lens's condition and a preservation plan. If its condition has already been compromised by environmental forces or deteriorated glazing putty, then removing it before it has been stabilized is likely to cause further damage. If your emergency plan calls for removing the lens in order to avoid catastrophic damage, then an adequate number of trained personnel, who have already practiced disassembling and packing at least one lens section, must be available. If the lens is on loan, you may have to obtain authorization from the lending institution. Disassembling the lens should be handled by an experienced team, using the proper tools and following handling guidelines and proper packing and transport procedures.

l **Vandalism.** Most intentional destruction is the result of treasure hunters or those seeking a souvenir. Whether the vandalism involves graffiti, gun shots, or senseless destruction, be careful what you say to the news media. Be specific and forthcoming about the time, the place, and any general information concerning the incident. Do *not* be specific about how access was gained, the ease or speed with which the damage was inflicted, the specific symbols used in the graffiti, the financial impact on the museum, or anything else that might inspire or enable future acts of vandalism.

l **Weather.** Well-maintained lighthouses are designed and built to withstand severe weather, but if the lantern room glazing is compromised, the combination of wind, rain,

and extreme temperatures (especially cold) will wreak havoc. Wind-driven particulates can erode the glass or blow out prisms. Condensation, in combination with freezing temperatures, can crumble the glazing putty. Other weather-related agents include flooding and storm surge.

l **Environmental Factors.** Additional hazards are site-specific and might include earthquakes, volcanic eruptions, landslides, or forest fires. These unpredictable threats require a planned response which may include removal of smaller lenses to prevent a catastrophic loss. Many lighthouses are in remote or isolated locations with restricted access. The less accessible the site, the more important it is to have emergency supplies and materials on hand.

VII. C. PREVENTION

Most damage to lenses can be moderated by three preventive actions: documented examination, stabilization, and a change in the nature and degree of access.

l **Examination and documentation.** Assessing and documenting the condition of the lens identifies existing damage and deterioration as well as pinpointing environmental stressors, inherent threats, and vulnerable areas. Your goal here is to identify these threats and provide stabilization treatment *before* an emergency situation arises. A documented examination also provides a baseline for future damage assessments and insurance claims. Here are some suggestions:

3 Record your observations and document with photographs the specific conditions that concern you. Use a grid system to specify their location and refer to the panel numbers where appropriate.

3 Inspect the prisms to see how securely they are mortared into the brass framework or superstructure. Using a probe and an artist's brush, determine if the glazing putty is flaking. Are there granular pieces of putty on the lens support surface? Use a flashlight to examine the glass putty-brass interface by looking into and through the prism at the point where it is secured into the framework. Do the prisms show numerous percussion flakes where the glass meets the brass? Percussion flakes indicate that stress is being transferred to the glass rather than being absorbed by the putty and positioning shims an indication that the glazing putty is in the process of deteriorating.

3 Check the condition of the prisms, annular rings (the spherical glass prisms), bullseye lenses (the spherical convex lenses found on the same plane as the light source), and/or barrel lenses (cylindrical glass lenses). Record any indication that the glass is deteriorating (see above), and look for unstable repairs and broken, chipped, or cracked

prisms. Incomplete cracks may indicate that the lens sections are not properly assembled.

To determine if unsupported annular rings are securely joined to each other, lightly tap the section in question with your finger. Tap *on the exterior* and listen to what it sounds like. If the assembly resonates clearly, the assembly is intact or stable. An insecure assembly will sound dull or fuzzy.

3 Examine the framework. Are the sections securely joined? Is the lens adequately secured to its pedestal or exhibit platform? If the lens is covered by an insurance policy, the insurance company will be more receptive to a claim for recently sustained damage if previously existing conditions were documented. Remember that in addition to the obvious damage to glass or brass, the glazing on a lens subjected to flood water, high winds, or fire may be compromised.

l **Stabilization.** Stabilization treatment is best carried out by a trained conservator. Emergency stabilization is covered in the ✌Emergency Response for Lighthouse Lenses✍ section below.

l **Access.** As noted above, the human factor is the other major cause of deterioration. Visitor-related damage can be minimized by controlling and limiting direct access to the lens. This is often accomplished by the use of a barrier. Staff training in inspection, maintenance, and handling procedures will also help prevent unnecessary damage.

VII. D. PREPAREDNESS

Preparing for an emergency that might threaten classical lighthouse lenses entails the following:

l **Identifying hazards and threats to the optic.** Identify the site-specific natural, industrial, inherent, and human-related hazards that threaten the lens. Be aware that the optic presents its own set of hazards as well, and will require a hazardous material emergency response if sufficient quantities of lead and mercury are present.

l **Designating authority and responsibility for emergency procedures.** Outside emergency response agencies will assume authority in matters of health and safety. When the issue is damage control, museum personnel should exercise custodial responsibility for the lens and the lighthouse. Local agencies should be given a tour of your site so that they can understand your concern about broken prisms, dislodged glass, smoke, or water damage. They need to know where the electrical panel is, where

the light switches are, and how the historic classical lens differs from just another piece of glass. The more information you give them, the better prepared they'll be to respond appropriately in an emergency.

l **Determining what outside support, personnel, equipment, supplies, and other resources may be needed.** General supplies and materials for emergency response are listed in this and other emergency preparedness and response publications[4] . Be sure to have specialized tools, dismantled crates (if need be), and all response supplies on site in an accessible location. Supplies and materials of special importance for classical lenses include:

- 3 fiber reinforced tape
- 3 masking tape (variety of widths)
- 3 polyethylene sheeting material
- 3 padding materials (Ethafoam)
- 3 graffiti removal supplies
- 3 solvents (acetone, paint remover)
- 3 photo equipment
- 3 disposable toweling
- 3 storage trays, boxes
- 3 waterproof labeling supplies

l **Preparing the lantern room.** The lantern room glazing protects the optic from wind and weather, while interior curtains help moderate solar heat gain. The glazing is the first line of defense against ice, snow, rain, wind, and wind-blown particulates, and it must be properly maintained.

Recent advances in technology reveal materials that hold great promise for preventive retrofit in the lantern room. Evaluate the circumstances to decide if bulletproof glazing is appropriate for the lens. The use of bullet-resistant exterior glazing in combination with Kevlar core reproduction interior curtains would be an effective (if expensive) method for protecting a classical lens from a high-powered rifle.

If minor alteration of the structure is acceptable, additional protection from wind and weather is afforded by exterior plywood sheathing. The three-quarter inch sheets must be custom fitted, and a means of attaching them should be determined before an emergency arises. The plywood can be secured to one-half inch threaded rods that have

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[4] Carl L. Nelson, *Protecting the Past from Natural Disasters*, National Trust for Historic Preservation, 1991.

been brazed or welded to the exterior mullions and framework. A metal washer, with a minimum diameter of two inches, placed beneath the securing nut is recommended. The placement of studs should not exceed twenty-eight inches if the sheathing is to withstand hurricane force winds.

VII. E. EMERGENCY RESPONSE FOR LIGHTHOUSE LENSES

When an emergency affects your lighthouse but does not endanger your personnel, the following procedures are recommended:

l **Water and floods.** Protect the lens from water leaks by covering it with plastic sheets. A little water may not be harmful, but uneven wetting can cause mineral migration in the putty (resulting in stains) as well as streaking in the surface finish. **Remove the plastic promptly once the danger has passed.**

Rising water (storm surge, etc.) may threaten lenses that are on display or in storage. If rising water is a problem, raise small optics or stored sections off the floor with blocks or skids. In cases where an entire floor or storeroom is flooding, designate another area for object removal. If it is not possible to safely move an exhibited lens prior to flooding, be sure that it is adequately secured to its exhibit platform and that the platform is secured to the floor so it cannot be toppled. If the rotational mechanism of the lens has been inundated by sea water, flush it with fresh water as the flood recedes. Remove other small objects from the room that might float into the lens and damage it.

l **Fire.** Not only fire, but thermal shock, smoke, and water used in fighting a fire can damage classical lenses. Discuss these concerns with your local fire department. If a fire rages long enough, the brass can distort, causing stress fractures in the glass. But it is more common for fire to leave a blackened sooty deposit on everything. Soot removal is *not* an emergency activity and can be carried out later. Polyester sheeting, such as Mylar®, has a very high melting point and can be used, time and location permitting, for protection from water and chemicals used in fighting fires.

l **Severe wind and weather.** These conditions could result in toppled lenses, blown-out prisms, and glass that is ready to fall at the slightest touch. After moving objects away from the windows, secure the exterior lantern room windows with fiberglass-reinforced strapping tape and (time permitting) prepared plywood. If the lantern room glazing is compromised and wind speeds comparable to a moderate hurricane are expected (96 - 110 mph), apply three-inch masking tape directly to optical panels that do not have

retaining bars or are not mortared into the brass. As soon as the emergency subsides, tape must be removed by pulling parallel to the surface, not perpendicular. It is a good idea to pad the surrounding area, anticipating that the wind will damage the lens.

l **Broken Glass.** Once the damage is done and the emergency situation has subsided, protect the lens from further damage by limiting access. Do not allow broken glass to be swept up or discarded. Cordon off the area and photograph the damage. If possible, place location-identifying signage in the photograph (i.e., section one, section two, etc.). Broken Fresnel lenses can be reassembled, and missing chips and pieces can be restored. If a preservation specialist or conservator is not able to respond, or if the glass must be moved before a conservator arrives, recover each piece of glass and store it on a labeled padded storage tray. Group pieces as they were found and recorded in the photograph. Handle the pieces as little as possible. This is not the time to try fitting pieces together to see where they go. Abraded surfaces will make it more difficult to repair the lens.

l **Bullet Entry.** A bullet hole in glass typically has pulverized glass at the point of entry with minute pieces of glass supporting it. Do not touch the entry site. An acceptable repair is only possible if the damage site is kept clean and the repair takes place relatively quickly. The work must be done on site by a trained conservator. The most important emergency response measure you can take is to keep the entry site clean and isolated. This can be accomplished by placing a sheet of plastic food wrap over the entry hole and adjacent area. Use a film material, such as clear polyethylene Glad Cling Wrap® or Saran Wrap®, that will cling lightly to the glass. Do not try to reposition the film once it has been placed, although you can add additional layers if the coverage is not quite right. Use the recovery techniques described for broken glass if you find pieces on the floor. Be sure to take photographs.

VII. F. RECOVERY PROCEDURES

If a team has been called in to disassemble the lens, make sure that the work area around the lens is adequately padded before disassembly begins. One-half-inch expanded closed-cell polyethylene foam is recommended for the floor and pedestal. The team should apply three-inch-wide masking tape to floating sections of the lens prior to disassembly. Examine the hardware to be sure the team has the proper tools and that they have taped or padded the handles. Most classical lenses are assembled with single-slot machine screws, while sections are often bolted together and to the pedestal.

l **Packing an entire lens section.** Disassembled lens sections can be packed horizontally. Make sure the prisms are secure, and always keep the outside surface facing up. Large lens sections usually require individual crates, with interior supports fabricated out of dense polyethylene (Ethafoam) foam blocks at weight-bearing and

stabilizing locations. Braces and blocks should only contact the brass and not the glass. Remember that hammer and nails are never used around a lighthouse lens.

The most successful packing method makes use of liquid urethane foam which becomes rigid in place inside the crate, in combination with semi-rigid packing materials. The lens section must first be isolated from the foam with polyethylene sheeting; then the foam is injected into a polyethylene bag. The bottom portion of the crate is foamed first. The lens section is then positioned, and the top portion of the crate is foamed in a similar manner.

l **Handling classical lenses.** There are specific rules that apply to the handling of classical lenses:

3 Before handling, examine the lens carefully (see examination section). Plan your work so that handling is minimized.

3 Wear either latex or vinyl medical examination gloves when handling lenses. Remove jewelry, such as rings, bracelets, long necklaces, and belts that might scratch or chip the lens. Wear an apron to ensure the prisms will not be scratched.

3 Do not apply pressure to annular rings that are not supported in the brass or bronze superstructure. Be especially careful not to apply pressure from the interior of the lens.

3 When moving classical lens sections, be sure there are enough people to uniformly support the sections. Simply lifting a two-hundred-pound lens section from each end can damage the prisms in the center. If you ✌hear the glass,✍ then it is not adequately supported or is unstable. Do not lift by any portion of the glass. [RALPH: What does he mean by this?]

3 Transport unsupported sections as little as possible. Bring the crates to the glass, not the glass to the crate.
3 Transport any detachable parts separately. If prisms are loose in the brass but not removable, slip tissue or padding between them to secure them. If unsupported annular rings or bullseye lenses are loose, perform stabilization treatment or remove completely. Identify their proper orientation and location, remove them, and pack separately.

l **Emergency Stabilization:** Emergency stabilization of a toppled, smashed, or otherwise severely damaged lighthouse lens consists of physically securing the object until a conservator or preservation specialist arrives. This is accomplished by first trying to prevent more glass from falling out and then redistributing damaging weight. Be

careful: glass is dangerous and heavy. If the optic is off its pedestal, support the weight of lens sections with additional bracing, and tape glass that is very loose (see also ✌Bullet Entry✍ and ✌Broken Glass✍ sections).

Although catastrophic damage to a large order lens is highly unlikely, the physical danger involved if it *does* occur is significant. Be careful: Lenses are heavy and broken glass is sharp. Both can cause serious injury. Secure the site (as described above) and recover what can be picked up safely. Look for loose glass and secure it with either fiber tape or masking tape. Catastrophic damage to a large order lens will require disassembly and removal. A professional assessment can then determine whether and how the restoration might take place.

VIII. SAFEGUARDING OTHER MARITIME COLLECTIONS

This section pertains specifically to maritime-related collections and offers suggestions on how to prepare for and recover from certain common disasters. The following individuals prepared these reports:

Small Craft: Peter Vermilya, Associate Curator for the Small Craft Collection, Mystic Seaport Museum. **Figureheads and Ship Carvings:** David Mathieson, Supervisor of Conservation, Mystic Seaport Museum. **Marine Engines:** George King, *Sabino* Engineer, Mystic Seaport Museum. The section on **Special Problems for Maritime Structures Built Over Water** is forthcoming from Michael Henry, Watson & Henry Associates. When this report is completed, it will be distributed with future updates for the manual. Additional reports or contributions that expand upon what is provided here are welcome.

VIII. A. SMALL CRAFT

Watercraft collections, when on exhibit or in storage on dry land, are subject to the same hazards as any other class of relatively large three-dimensional artifacts and should benefit from the same level of disaster preparation.

Certain factors, however, make museum watercraft collections worthy of special concern:

l Such collections are often located near the water on which the boats were once used, putting them at higher risk of flooding.

l With flooding comes the potential for mobility, as most boats were meant to float by design and construction.

l Their size, shape, and weight can make some boats difficult to handle. Because of this, small craft often require more elaborate and varied preparation than other, more homogeneous classes of artifact. This means that advance planning is mandatory.

n Preparedness

For small craft kept afloat, refer to Chapter V, ✌Large Floating Vessels.✍ In general, when time permits, remove small craft from the water and store as discussed below. If removal is not possible, consider sinking the craft or seeking the most protected berth

possible. Here are some other suggestions:

l **Design small craft exhibit and storage areas with disaster planning in mind.** If boats are to be removed, exits should be large enough for them to fit through without alteration, and security barriers and interpretive material should be easily movable. Boat supports with built-in mobility are best. Permanent wheels are excellent. Especially significant yet vulnerable boats could be kept on trailers.

l **Make sure that training is adequate.** Most damage to museum boats occurs when they are being handled. Untrained but well-meaning crews can often cause considerable damage to delicate, highly-finished small craft.

l **Determine in advance whether boats are to be moved.** The answer is often a function of the availability of safe storage space, trained personnel, the necessary materials and tools, and, above all, sufficient lead time. All of these factors must be budgeted for in advance.

l **Immobilize boats that are not going to be moved.** A loose boat under way, full of water, is like a loose cannon—a danger to itself and to other objects. If possible, the boat should be tied to its cradle and the cradle fastened to the floor.

l **Encourage flooding in place.** If boats are equipped with drain holes, the holes should be freed, although their size may limit their effectiveness. Small, light boats without wide side decks can be laid down on their sides and ballasted with bags of sand or lead shot. The ballast should be placed carefully on structural members. At the very least, boats should be turned over and secured in place.

VIII. B. FIGUREHEADS AND OTHER SHIP CARVINGS

The classic image of a ship carving is the figurehead. But numerous other carvings—billet heads, trail boards, name boards, stern boards, gun port covers, and mast skirts—are vulnerable to weather and water damage. Similarly, architectural elements rendered in wood are often exposed to severe climatic changes that dictate a more frequent schedule of maintenance and repair.

Carvings exposed to the weather will deteriorate more rapidly than those under a protective cover. Wood is dimensionally unstable, fluctuating according to the amount of moisture present. It is also susceptible to insects and biological deterioration. The paint may be affected by light and air pollutants. High levels of moisture and the presence of oxygen may cause the metal in screws, nails, and threaded rods used in previous restoration attempts to oxidize. All of these elements have their own unique characteristics and problems.

n Threats to Ship Carvings

When flooding occurs and carvings get wet, the immediate problems are:

l The wood absorbs the water, which causes it to expand and makes it more capable of supporting mold spore growth at higher temperatures.

l The dimensional change in the wood puts a greater strain on the paint layer, risking the adhesion of the paint.

l Adhesives that may have been used in prior restorations may be water soluble, causing these joints to fail.

l The metal fastenings in the carvings get wet, making them prone to corrosion.

l Fillers used in prior restorations (plaster, concrete, etc.) retain and trap moisture, causing corrosion and biodegradation of the wood and metal.

n Prevention

The first step in protecting your carving collection is prevention. Carvings should be displayed and stored in a stable environment. If you use pedestals, they should not be closed and airtight. Otherwise they will float in the event of a flood, throwing the carvings to the floor or into other objects.

Exhibition and storage areas for carvings should be above the known flood plain for the area. Condition assessments for carvings should be documented in both photographic and written form. Your disaster plan should have a section on ship carvings, including procedures for emergency preparations and steps to be taken immediately after a disaster has occurred.

n **Preparedness**

Here are some guidelines to follow when you know that a disaster is likely to occur:

l Evacuate all carvings from areas prone to damage from water or wind. Move them to a safe, dry area.

l Document accession numbers and both old and new locations.

l Move all collections records to a safe location.

l Alert your conservator that you may be in need of his/her services.

l Make sure that carvings that cannot be moved are well protected. Wrap them with Ethafoam or plastic sheeting. This will help protect them from possible wind and water-born pollutants. It will also protect them from drying out prematurely if you are not able to get back to the disaster site immediately after the danger has passed.

n **Recovery Procedures**

l If the carvings are wet, pat them dry with paper toweling, unprinted newspaper, or sheeting. Be sure to look for loose paint. It is important that the carvings not dry out too quickly. Lightly wrap them with plastic sheeting if this is a problem.

l If mold growth becomes a problem, wipe the surface with a 50 percent solution of ethanol or denatured alcohol and water. Keep air circulating with fans, and use air conditioners to cool the air.

l Contact your conservation resource for assistance and advice. For further information and assistance contact:

American Institute for Conservation of Historic and Artistic Works (see Appendix 3)
1717 K Street, NW - Suite 301

Washington, DC 20006
(202) 452-9545
FAX (202) 495-9328
National Institute for the Conservation of Cultural Property
3299 K Street, NW - Suite 403
Washington, DC 20007
(202) 625-1495
FAX (202) 625-1485

VIII. C. MARINE ENGINES

(by George King, *Sabino* Engineer, Mystic Seaport Museum)

The purpose of this section is to offer some procedures that can be followed after internal combustion and external combustion engines have been under water due to a flood or the sinking of a vessel.

n Before Disaster Strikes

The best plan is one of prevention. Although this may seem obvious, it bears consideration when planning how to display antique engines, especially in a marine environment. Here are some suggestions:

l **Consider the flood plane when planning an engine exhibit.** If you are constructing a new building, install drains and pumps where appropriate. Mount engines higher than if they were being installed for service. This will give an added margin of safety and allow visitors to get a better look at them.

The ideal building for an engine display has a permanently-mounted overhead crane. It also has doors large enough for a truck to be brought in to move the engines.

l **Consider the location of fuels and lubricants.** Place tanks above ground to minimize soil and water contamination in the event of flooding. Fuel, lubrication, cooling, and exhaust lines should be designed with engine removal in mind.

l **Mount engines for quick removal.** If engines must be placed in an area susceptible to flooding, plan their installation to facilitate quick removal. Automobile engines are attached to the car's frame by three or four rotor mounts. Marine engines typically have a series of bolt holes along both mounting flanges of the engine to affix it securely to the engine bed. A diesel marine engine may have as many as 18 bolt holes compared to four for the same engine in a truck.

When mounting a marine engine for static display, use only the bolt holes at each corner of the mounting flanges. The other holes can have false bolts placed loosely in them for aesthetic appeal. Even when large marine engines are to be run as exhibits, they will not need bolts in each of the holes. The advantage here is that it takes much less time to unscrew four bolts instead of eighteen if you need to move the engine quickly. If the engines are mounted on wood, use hanger bolts in lieu of lag screws to expedite removal.

Ideally, each engine has a portable beam upon which it can be placed for removal to

higher ground. Install ring bolts of the proper size for each engine within the display. This will expedite moving the engine for routine maintenance as well as in an emergency.

l **Have an emergency removal plan on file,** and make sure everyone knows where it can be found. A separate sheet should be prepared for each engine with information about mountings and system connections, a lifting diagram, a blocking plan, and anything else that will expedite its removal.

Keep the plan simple. Don't burden the emergency crew with unnecessary details, such as wrench sizes. They won't have time to read more than they need to know, and it's unlikely that they will have reviewed the plan before a crisis occurs. Many of the crew members may be volunteers with little technical knowledge, so tell them only what they need to know.

l **Have a predetermined site for temporary engine storage.** Engines under a plastic tarp on top of a neighboring hill is not the way to go. Consider making advance arrangements with local trucking companies for engine transport and storage. Factories, mills, and fabrication plants can often lend space until the waters recede.

l **Plan to remove engines on a priority basis.** When flood conditions are forecast, time is of the essence. If you have special or rare engines of exceptional value, plan to take care of them first.

l **Plan to shut down steam power boilers first**. It will take time for them to cool. Cold water and hot boilers don't mix.

l **Arrange to have the power to the building disconnected** after the engines and all other objects listed in the plan have been removed.

n **After the Flood**

Engines that have been under water need special treatment. Follow these guidelines:

l **If an engine has been submerged, keep it submerged until you can work on it.** If it has been under salt water, flush it with fresh water and submerge it in fresh water. This can be as simple as putting an outboard motor in a trash can or an inboard motor in a bath tub and filling it with a hose. But it can also be impossible.

If you have a six-cylinder Fairbanks diesel, it is unlikely that you could move it to avoid the flood, and obviously you can't move it to keep it wet. This engine will be one of your first candidates for stabilization after the flood.

l **Remove lubricants and fuels first**. These need to be handled in a physically and environmentally safe manner. Separate contaminated oil in an oily water separator if one is available. If not, it will cost a great deal more to have it taken off site for separation and proper disposal.

l **Remove access plates, open all drains, and remove lines for fuel, oil, and cooling systems.** NOTE: Operating diesel engines should not have their injector systems removed or flushed. Disconnect the system from the fuel source and treat the source for contaminated fuel. Remove external moisture from the injector system with compressed air and dry.

l **Flush each system (except as noted above) with fresh water.** Gasketed surfaces should not be separated.

l **Gasoline engines should have carburetors and fuel pumps removed, drained and cleaned.** Magnetos, coils, generators, and electric starters should be removed, flushed with fresh water, and hand dried. Do not use chemical solvents on wiring unless you are positive that it will not harm insulation varnishes and other insulating materials. Magnetos, coils, generators, and starters may be dried at low heat (100 degrees or less) in a conventional oven. If the coils are in wooden boxes, they will be susceptible to warping during this process. Remove the wood casing if possible.

l **Remove air, oil, and fuel filters.** Install new filters if replacements are available.

l **Remove spark plugs in gas engines and injectors in diesel engines.**

l **Disassemble the lower gear case of outboard motors.**

l **Blow engine and components clear of water with compressed air and dry everything you can reach by hand and with probes.** Turn the engine over slowly by hand for a few revolutions with fuel, lube oil, and electrical system removed. Flush all internal parts with kerosene.

l **Dry it again.** NOTE: Once the parts are cleaned in kerosene and dry, they will rust quickly. Don't clean them in this manner unless you have time to proceed to the next step.

l **Using high detergent engine oil, lubricate all accessible surfaces by hand and with probes.** Fill the oil cups on four-stroke engines with the proper lubricating oil (not necessarily heavy duty). Squirt oil into the spark plug injector holes. Repack the outboard engine gear case with the proper grease. Turn the engine over by hand.

l **Ensure that all contaminated fuel and oil has been removed from tanks and lines.** Replace filters as required.

l **Reassemble the engine and run it.** Ensure that the oil pressure is at the proper level. Bring the engine up to operating temperature.

l **Stop the engine.** Drain the oil and refill to the appropriate level.

l **Check for leaks.** Clean the outside of the engine and watch for early signs of rust. Treat any affected parts with your normal restoration procedures.

Non-running Engines

Engines that are static displays should be treated in the same manner as running engines with the obvious exception that they should not be run. They should be cleaned, dried, and lubricated as described above.

Static engines that do not turn over will need to be disassembled to drain, flush, lubricate, and preserve them. Replace the gaskets once seating surfaces have been separated.

Steam Engines and Boilers

Boilers are water-tight, steam-tight, and air-tight. If left intact, they need no special internal treatment. If flood water, especially salt water, has entered the boiler, flush it thoroughly with fresh water and add boiler treatment chemicals until the proper chemistry is reached. Then follow these steps:

l **Check fire boxes for damage to fire brick and insulation.** Replace as needed.

l **Remove pipe insulation.** Pipes should be flushed with fresh water, dried, and repainted.

Steam engines are less susceptible to damage from flooding than their internal combustion counterparts. The recommended procedure is to:

l **Remove the upper cylinder heads and valve chest covers, and flush with fresh water.** Wipe dry and cover all metal surfaces with Atlas® cylinder oil. Replace gaskets.

l **Flush rods, valve gear, and other working parts with fresh water.** Wipe dry and coat with a thin layer of machine oil.

l **Replace rod packings.**

l **Treat lubricating systems in the same manner as those on internal combustion engines.**

l **Drain, flush and treat with a spray lubricant any gauges that have filled with water**.

Steam pumps should be treated in a similar manner to engines. Contaminated systems need to be cleaned, flushed and refilled with clean liquids.

VIII. D. OTHER MUSEUM COLLECTIONS

Appendix 6 lists specific preparedness and recovery procedures for the following types of museum collections:

l Electrical equipment
l Fabrics (textiles)
l Furniture
l Leather
l Magnetic media
l Microfilm and microfiche
l Motion picture and microfilm rolls
l Paintings
l Paper and books
l Photographs
l Sound and video recordings

IX. EMERGENCY RESPONSE PROCEDURES

If you don't know what you're doing, it's almost better to do nothing than to do the wrong thing.

—Paulette Thomas, Virginia Historical Society

Repair in haste, repent at leisure.

—John Meffert, Executive Director, Preservation Society of Charleston, South Carolina

IX. A. SOME GENERAL GUIDELINES

This section deals with how to respond to a disaster or emergency. Make sure that your response measures are not person-specific. Several, if not all, staff should be trained in how to carry out important tasks, because you cannot predict who will be present for the recovery phase. If, for example, only one person knows how to hook up equipment to the emergency generator and he or she cannot get to the site, your entire recovery may be jeopardized.

Here are some general guidelines to follow when a disaster or emergency occurs:

l **Remain calm.** If you are calm and professional in the face of an emergency, your presence of mind will influence the behavior of other staff, volunteers, and visitors.

l **Use common sense.** Beware of the "do something now" mentality that comes naturally with disasters. It's far more important to do what's right. Counsel patience and a second opinion before irreversible action or demolition of collections or structures occurs. Let professionals—police, medics, and firefighters—do their job once they arrive. At the same time, be aware of the fact that they may not always be sensitive to the need for preservation. Be patient but persistent in working with them.

l **Assemble staff and volunteers.** Find out who is available. Contact volunteers if they are needed and if someone is there to supervise their efforts.

l **Assess damage and make sure that buildings, ships, etc. are safe to enter.** Assess any damage and the potential for continuing damage from mold, infestation, salt water, mud, rust, etc. A sample Damage Assessment Form, used by the National Park Service, can be found in Appendix 9. It is simple to use but does not provide data on collections or other assets located inside buildings, nor is it intended for use with ships. But it can be adapted.

l **Establish security.** Plan for 24-hour security to protect your institution from further damage or outside theft in the wake of a disaster. Many security systems are breached during disasters or go down when the power is off. Prepare a policy on firearms if this is part of your security coverage.
l **Determine whether utilities and mechanical systems are operable.** If not, get them reconnected and have mechanical systems working as soon as possible.

l **Weatherize and stabilize buildings, ships, and collections**, taking care of any immediate conservation needs. Can the environment be improved? Has all standing water been removed? Can circulation of air and ventilation be improved? Do you need utility specialists to get HVAC, water, telephone, computer, or other systems working?

l **Address immediate repair needs first.** Erect a temporary roof, re-float boats, and take care of the most pressing needs first. But beware of unscrupulous contractors who flock to disaster areas to make a quick dollar while performing shoddy work. Before any repairs are undertaken, determine the time involved and the cost of securing qualified contractors, performing architectural analysis for historic structures (essential for those with National Register or National Historic Landmark status), and obtaining original or authentic materials for repairs. Ensure that archival materials are saved and not tossed out in the confusion.

l **Prepare a full report on each disaster.** The command center as well as team leaders and other key personnel should keep notes on any actions that are taken and decisions that are made.

l **Monitor buildings and ships after the disaster is over.** Problems that were not immediately apparent—such as flaking paint, metal corrosion, mold, cracked wood, split book spines, etc.—may occur.

IX. B. ASSIGNING RESPONSIBILITY

The people who normally make decisions in your organization may not be available in a disaster situation. It is important, therefore, that you cross-train more than one individual in emergency response procedures.

l **Establish lines of authority and responsibility** to ensure leadership under any possible staffing scenario. How will you handle preparation or recovery of a disaster if it occurs during a weekend or holiday, or in the middle of the night?

l **Assign someone to keep copies of critical documents and papers**, such as insurance policies, bank account numbers, contracts, collection records, etc., off-site in a safe place. Keep in mind that computer disks cannot be used if the system is down. Both hard copy and disks are desirable.

l **Make a list of any staff who live on site or nearby.** They may be the only ones who can get to the facility for several days. Train them accordingly. Keep the list and training up to date, and include the list in your disaster manual. Have identification badges so employees can prove to authorities that they are staff members.

l **Prepare a suggested list of items that staff should bring from home** to assist in the recovery. Examples here might include a change of clothes, work gloves, rain slicker, flashlight, tool box, chain saw, snack food, water, thermos of coffee, etc. (See Appendix 4)

l **Maintain an updated telephone list** of staff, authorities, services, etc. Each disaster team member should have this list at work and home. It should include the names, addresses, and telephone numbers of contractors, conservators, and others whose services may be needed in an emergency (see Appendix 3).

l **Designate someone to watch children during recovery operations.** In the event of a natural disaster, schools and day care centers may be closed, and your staff may have to bring their children in with them.

l **Have relief workers available.** People get tired and should be relieved periodically.

IX. C. PERSONNEL EVACUATION

In the event of an emergency (such as a fire or impending storm) where the museum or ships must be evacuated, only the person in charge should have the authority to order such an evacuation. An announcement over the PA system, instructing people to walk immediately to the nearest exit, is usually sufficient. Mentioning that there is a fire or a bomb threat may cause unnecessary panic.

If time and conditions permit, museum staff should be instructed to do the following before they evacuate:

3 Lock up valuables.
3 Turn off all electrical equipment (computers, copiers, coffee pots, etc.) and shut down all hazardous operations.
3 Gather up personal belongings (car keys, purses, briefcases, etc.) but leave large or

heavy objects behind.
3 Close (but not lock) doors to offices and work areas to slow the possible spread of fire, smoke, and water.
3 Check rest rooms, exhibit halls, etc. to ensure that everyone is out✍if time allows.
3 Proceed to the prearranged assembly area through normal exits✍unless these routes are blocked, in which case emergency exits should be used. Everyone should be moved at least 100 yards away from structures and ships.
3 Await further instructions from the person in charge.

NOTE: If a handicapped person is trying to exit from an upper floor, he or she should not use the elevator because there is a danger of getting trapped. Handicapped persons should be directed to the nearest or safest stairwell and instructed to wait there for help from police or firefighters. Museum personnel should never attempt to carry a handicapped person down the stairs themselves.

IX. D. COLLECTIONS EVACUATION

Your disaster plan should specify the conditions under which collections will be evacuated, who will authorize the evacuation, how it will be carried out, and what items will be removed. In most cases, collections should only be evacuated✡

l after all personnel have been evacuated safely;
l if conditions in the building or on the ship present an immediate threat, such as fire or flooding, and if conditions outside or in another building are more favorable to the preservation of the collections;
l if evacuation can be carried out without hindering fire and police officials.

Only the person in charge should have the authority to order the removal of collections, and, if possible, the evacuation process should be supervised by curatorial and registration staff. The registrar should maintain a list of priority items in the collections and where they are located. Focus your attention on the most important collections first.

If conditions permit, collections may be stored outside temporarily, preferably off the ground. If outside conditions are poor due to rain, smoke, or soggy ground, temporary storage space may be found in staff and museum vehicles or other buildings. All temporary collections storage areas should have proper security.

If the museum facility cannot be secured or reused after the emergency, collections should be stored temporarily in another structure until permanent arrangements can be

made. A local cold storage warehouse or grocery store might agree to offer freezer space for storing wet books, archives, records, etc. All such arrangements should be made in advance and included in your emergency and disaster plan. A list of collections in temporary storage, along with accession numbers and locations, should be maintained, and adequate security should be assigned until permanent storage is available.

NOTE: Stabilization, repair, rehabilitation, and collection conservation funding is available from FEMA when a museum is affected by a natural disaster and the institution files a ✌Notice of Interest✍ form, together with photographs of objects taken before they were damaged by the event. These forms may be obtained from the Disaster Assistance Field Office or a District Field Office (see Appendix 1). FEMA will bring in a conservator to review the situation and work up a proposal of costs. A ✌Joint Damage Survey Report✍ is then submitted to FEMA, where it is reviewed and, if all goes well, funding is granted. FEMA■s Public Assistance Program handles these requests.

Emergency funding for temporary relocation, purchase of equipment, etc. may be available through the Institute of Museum Services and the National Endowment for the Humanities. (See Appendix 2)

IX. E. EMERGENCY MEDICAL PROCEDURES

Every museum staff member should know where first aid kits are located. Those who are trained in first aid and artificial resuscitation should be listed in the emergency phone directory.

In the event of a medical emergency, staff should be instructed to follow these procedures:

3 Call 911 immediately.
3 Contact the person in charge.
3 Unless it is a life-threatening situation, do not attempt to render any first aid unless you are trained to do so. Wait for a trained staff person and/or police, fire, or ambulance personnel to arrive.
3 Never leave an ill or injured person alone.
3 Do not attempt to move a person who has fallen and appears to be in pain. Cover him or her with a blanket.
3 Avoid unnecessary conversation with, or about, the injured person. You might increase the person's distress and thereby contribute to medical shock. Limit your communication to quiet reassurances.
3 Get the individual■s name and address as well as name and address of anyone who

witnessed the incident.
3 Never give aspirin, especially to children.
3 Do not discuss the possible cause of an accident or any conditions that may have contributed to it.
3 Do not verbally apologize or accept any responsibility for the accident.
3 Under no circumstances should an employee, docent, or volunteer discuss insurance information with members of the public.
3 When help arrives, assist the professional personnel as needed. Once the incident is over, remain on the scene to assist with the investigation.
3 Fill out an accident report form.

Remember: It is always better to err on the side of safety. If you are in doubt about calling an ambulance, call one. Accident victims are frequently embarrassed and refuse aid when it is needed. If they refuse assistance, encourage them to seek medical assistance in the presence of witnesses.

IX. F. EMERGENCY TELEPHONE PROCEDURES

During a regional disaster, the phone system in your area may not be functioning. Staff may be unable to reach your facility, or if they do, they may only get the answering machine. As a backup measure, set up a secondary long distance phone number at a location away from your immediate area. You might use the home number of a staff member who lives far away, or the number at a sister institution. Do not depend on cellular phones, because the fire department and police usually lock onto those channels and you may have problems getting through. Museums with UHF and VHF radios, such as walkie-talkies and ship-to-shore communications, may want to use them. Public telephones may operate when commercial lines do not.

For emergency calls, use the following procedures:

3 Call 911. Give your name.
3 Give the phone number from which you are calling.
3 Give the location of the emergency and describe how to get there.
3 Describe the nature of the emergency. If there are victims, indicate how many and what their condition is.
3 Do not hang up. Let the emergency dispatcher end the conversation.
3 If possible, have someone meet the emergency personnel at the entrance to direct them. If you are with victims, do not leave them alone. Get someone else to meet emergency personnel.
3 Post emergency numbers (fire department, police, ambulance, etc.) near all phones.

IX. G. EMERGENCY SANITATION PROCEDURES

In any disaster where sewer and/or water lines are unusable or buildings are unsafe to enter, it may take days or longer before adequate sanitation facilities are available. Under these circumstances it is especially important to handle human waste in a sanitary manner to avoid sepsis and the possible spread of disease. Here are some guidelines:

l **If the building is safe to enter** and the water and/or sewer lines are broken, but the toilets themselves are still usable, line the bowls with plastic bags to collect waste and use as normal without flushing. Following each use, a small amount of disinfectant must be added to the waste bag. The bag should then be tightly sealed and placed in a covered container. Then a new bag should be installed.

l **If the building is unsafe to enter,** use portable toilets, ship facilities, or other nearby facilities if available. Portable toilet vendors should be listed under ✌Emergency Services✍ in your disaster manual.

l **If none of the above is available,** build a temporary pit toilet in a location away from work areas. After each use, disinfect and cover lightly with soil.

IX. H. TEMPORARY MORGUE

In the event of a disaster involving fatalities, it may be some time before bodies can be collected and cared for by the proper authorities. Here are some suggestions for setting up a temporary morgue:

3 Leave bodies in place unless they must be removed to make way for rescue work or to ensure the health and safety of others.
3 Do not remove any personal effects. They should remain with the body at all times.
3 Use two or more identification tags for each body. One tag, attached to the body, should provide the following information:

- v Date and time found;
- v Exact location where found, including floor/room number;
- v Name and address of decedent, if known;
- v If identified, how and when;

- v Name and department of person making identification or filling out tag;
- v Whether the body is contaminated.

3 Place the body in a disaster pouch or in plastic sheeting and tie it securely to prevent unwrapping. Attach the second identification tag to the sheeting or pouch.
3 If personal effects are found with the body, place them in a separate container and tag it accordingly.
3 Move all properly tagged bodies with their personal effects to the location identified in your disaster plan. A temporary morgue should be cool, secure, and out of the way. You may want to select more than one location in case your chosen spot is incapacitated by the disaster. Once bodies are in place, lock and secure the area.
3 Keep animals and insects away from bodies.
3 Notify the police of the location and identity of bodies.
3 Secure and safeguard the temporary morgue until the police, the Coroner, or other authorities arrive.

IX. I. VESSELS SEEKING REFUGE AND VISITING YACHTS

You must decide before a storm approaches whether vessels seeking refuge are welcome and if so, what limitations (such as draft, length, where they can tie up, demonstration of adequate mooring lines, waiver of liability, etc.) will be placed on them. Put your guidelines in writing as part of your disaster manual and have your legal counsel review them.

Thirty-six to forty-eight hours before an expected storm or earlier if possible issue a warning to all visiting yachts. If you do not want yachts at your facility during a storm due to liability and your own fleet's need for dock space, close your docks to entering yachtsmen and request the departure of visiting yachts approximately forty-eight hours before the storm is due. (Some museums don't mind if visiting yachts stay where they are; their crews may be willing to assist with storm preparation and/or recovery.) Cancel all reservations until the danger of the storm has passed. Suggest other protected areas where yachts may tie up

If people refuse to leave and insist on staying aboard their vessels, ask them to read and sign a brief statement (approved by your legal counsel) stating that they have been advised to evacuate the vessel and go to the nearest emergency shelter, and that they have been informed that you will not risk the lives of your staff to come to their assistance. Make it clear that the institution will not be held responsible for any damage or injury to their vessel or to themselves, but that it holds them fully responsible for any damage or injury their vessel may cause to museum property. Obtain the full names of

all who are staying aboard and the names, addresses, and telephone numbers of their next of kin.

As owner of the dock(s), you generally have the right to require a vessel to move if it is tied up without permission or authorization. If the owner refuses to do so voluntarily, and if the vessel presents a real danger to the museum and its property, you may use reasonable force to move the vessel yourself. But make sure that *the vessel is moved to a safe place and is properly secured.* If you move the vessel to a place that is not safe, or if you negligently secure the vessel after relocating it, you may be liable for any damage sustained by the vessel, or for any damage it causes to third parties if it breaks loose.

n **The doctrine of private necessity.** In an emergency situation, such as the imminent arrival of a hurricane or storm, the doctrine of private necessity states that an individual may enter another's property if the intrusion is, or appears to be, necessary to save life or property of greater value than the damage that is likely to result from such an intrusion. It is not necessary to show that the necessity actually existed—provided the intruder's belief was reasonable.

Under the doctrine, the possessor (in this case, the museum) may not exclude anyone from its property and will be held liable for any damages that are caused by excluding the would-be intruder. The intruder may use a reasonable amount of force and inflict a reasonable amount of property damage if this is the only way that he or she may gain entry. And the possessor may not use force to resist such conduct.

What does this mean in the context of an impending hurricane or storm?

l Although the doctrine of private necessity may permit the entry of a yacht seeking refuge, it will not excuse the owner from liability for any damage his or her vessel causes to the museum=s property.

l The general rule is that a dock owner may not bar a vessel from mooring and may not un-moor a vessel that has been secured to his dock under emergency storm conditions—if the value of the property that is being protected (i.e., the vessel) is greater than that of the property that is being threatened (i.e., the dock). However, the museum generally has the right to determine the exact location where the vessel seeking refuge may dock. Private necessity may bar the museum from turning away a vessel, but it should not bar you from exercising good judgment in making the best possible use of your docks in order to protect your property.

l You may insist upon specific locations for vessels seeking refuge, as long as it doesn=t

subject the vessels to a greater risk of harm. Generally speaking, you have the right to use reasonable force when necessary to control a vessel seeking refuge, but you must move the vessel to a reasonably safe place.

l If you negligently direct the securing of a vessel, you will be liable for any damage caused by your negligence.

l You are under no obligation to provide lines for use in securing vessels in an emergency. You may provide such lines without risking liability, provided that you lend them free of charge. Your only duty to the owner of the vessels is to inform them of any defects in the lines of which you are aware. You have no obligation to inspect the lines before lending them out.

l If you allow a vessel to tie up to a structurally weak or defective dock and damage results to the vessel, you may be held liable for negligence and for not furnishing the vessel with a reasonably safe berth. If the damage to the dock and/or vessel is due solely to the weather, you will probably be exonerated. Similarly, if an attached or neighboring vessel strikes the dock, causing it to collapse, the owner may be held liable for any damage to the dock and/or other moored vessels.

l If, during a storm, a vessel is tossed up on your pilings, the owner will generally be responsible for removing the vessel unless the accident can be attributed to negligence on your part.

l It is unlikely that you will be held liable for any personal injuries sustained by individuals who are at your museum during a severe storm under the doctrine of private necessity. They are not on your property by invitation.

IX. J. PUBLIC RELATIONS IN AN EMERGENCY

Communications with authorities, staff, the media, and the public are very important in an emergency. Donors may want to know the status of their gifts, and parents may be frantic to inquire about the health of their children. All communications with the public should be channeled through a single individual so that conflicting information is not released. Your disaster plan should name the person who will handle newspaper, radio, and TV reporters, and who will deal with all requests for information. If you want the public to be aware of what is going on at the museum in the wake of a disaster, this person can contact the media and provide them with approved press releases.
In museums where walkie-talkies or public address systems are used, code names can be established for certain emergency situations so that staff can be notified without causing

undue panic among visitors. Make sure that code names don't arouse visitors' suspicion. Avoid names like "Code Red" or "Code Blue," which are an immediate tip-off that something is wrong. Remember that the media routinely monitor police and emergency radio channels and are apt to appear on the scene when you least expect them.

In the event of an emergency, urge all staff to follow these rules:

3 Don't speak with the press unless you are the designated spokesperson. If approached by the press, politely refer them to the emergency public relations person.
3 Don't make idle remarks that could be picked up by a crowd or the press. Such remarks could be embarrassing, inaccurate, and/or cause a public relations problem.
3 Don't start rumors or gossip about the emergency situation. Never speculate.
3 Information that might be damaging to the museum or an individual should be kept confidential.
3 Do not release the names of dead or injured individuals until family members have been notified.
3 Never hesitate to say "I don't know."
3 Do not offer exclusive interviews or show favoritism.

As soon as it is safe to do so, it's a good idea to reopen the museum and keep the staff working. By continuing your educational and membership programs during a period of hardship, you can make a significant impact on community morale and raise the public's consciousness of the museum's importance. Once the museum is back on its feet, staff volunteer efforts within the community can also increase good will.

n **Dealing with the press.** How your museum responds to a crisis within the first 24 hours can have a lasting impact on its public image and relationship with the press. Here are some suggestions for what your public affairs staff can do to stay in control of the situation and at the same time ensure that the press is kept up to date:

3 Do not admit press, photographers, or camera crews to the museum, its ships, or its grounds before you reopen to the public unless their presence has been authorized and they are accompanied by a staff member.

3 Issue a press release informing the media where the incident occurred and reassuring them that the museum (a) is aware of what happened, (b) is cooperating with the authorities, (c) has initiated its emergency response plan and has dispatched a team of trained personnel to the site, and (d) will continue to provide all appropriate information to the media.

3 Have the museum's CEO or another senior executive contact key local officials (mayor, governor, etc.), members of the Board of Directors or Trustees, and (if appropriate) law enforcement officials in writing, covering the same points listed above.

3 Set up a "press center" for journalists working on the story.

3 Establish a system for handling the flood of telephone calls that are likely to come in. Make sure that some lines are kept open for urgent calls. If necessary, set up emergency lines for use by the press.

n **What the press will want to know.** Everyone who is likely to come in contact with the press should be prepared for what type of information they will be seeking. This usually falls into the following categories:

l **What happened.** What caused the accident or incident? Was anyone killed or injured? Were collections lost or damaged?

l **How the museum is responding.** What is being done? What individuals or agencies are involved in the response effort?

l **What happens next.** When will the museum re-open? How much will repairs cost? Where will the money come from? What type of insurance coverage does the museum have?

l **What the director has to say.** Where is the director and what is he/she doing about the situation? Has she or he said anything that can be quoted?

Remember one thing: the press is going to write about the incident whether you want it to or not. You can sit back and let it happen, or you can take advantage of this opportunity to influence what the media will say. If you can convey the impression that the museum acted promptly, professionally, and with concern for the welfare of individuals as well as collections, you might be able to avoid expensive litigation and loss of funding.

* **THE GOOD NEWS:** Despite the damage they may incur, disasters often provide opportunities to repair, replace, and rehabilitate your buildings, ships, and collections to standards higher than those that existed before. When gas explosions blew out most of the windows in the New Bedford Whaling Museum, for example, they were replaced

with UV-filtered glass. Emergencies also provide unique fundraising and promotional campaign opportunities. So don't overlook the potential for gain in the wake of a disaster.

Appendix 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
REGIONAL OFFICES

Federal Emergency Management Agency
National Office
State and Local Programs and Support Directorate
Office of Disaster Assistance Programs
Washington, DC 20472
202-646-3615

Regional Offices:

Region I: **Connecticut, Maine, Massachusetts, Rhode Island, Vermont**
FEMA - Region I
J.W. McCormack Post Office & Courthouse Building
Room 442
Boston, MA 02109
617-223-9540

Region II: **New Jersey, New York, Puerto Rico, Virgin Islands**
FEMA - Region II
26 Federal Plaza Room 1338
New York, NY 10278
212-238-8309

Region III: **Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia**
FEMA - Region III
Liberty Square Building Second Floor
105 S. Seventh Street
Philadelphia, PA 19106
215-931-5500

Region IV: **Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee**
FEMA - Region IV
1371 Peachtree Street, NE
Suite 700

Atlanta, GA 30309
404-853-4200

Region V: **Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin**
FEMA - Region V
175 W. Jackson Boulevard
Fourth Floor
Chicago, IL 60604-2698
312-408-5500

Region VI: **Arkansas, Louisiana, New Mexico, Oklahoma, Texas**
FEMA - Region VI
Federal Regional Center
Room 206
800 N. Loop 288
Denton, TX 76201-9399

Region VII: **Iowa, Kansas, Missouri, Nebraska**
FEMA - Region VII
911 Walnut Street
Room 200
Kansas City, MO 64106
816-283-7061

Region VIII: **Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming**
FEMA - Region VIII
Denver Federal Center
Building 710
Box 25267
Denver, CO 80225-0267
303-235-4811

Region IX: **American Samoa, Arizona, California, Guam, Hawaii, Nevada, Trust Territory of the Pacific Islands, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia**
FEMA - Region IX
Disaster Assistance Programs
Building 105
Presidio of San Francisco, CA 94129
415-923-7100

Region X: **Alaska, Idaho, Oregon, Washington**
FEMA - Region X
Federal Regional Center
130 228th Street, SW
Bothell, WA 98021-9796

Appendix 2

PRESERVATION, CONSERVATION, EMERGENCY PLANNING, AND RECOVERY ORGANIZATIONS

Advisory Council on Historic Preservation
1100 Pennsylvania Avenue, NW
Suite 803
Washington, DC 20506
202-786-0505

American Association for State and Local History
172 Second Avenue, North
Suite 202
Nashville, TN 37201
615-225-2971

American Association of Museums
1225 I Street, NW
Suite 200
Washington, DC 2005
202-289-1818

American Institute for Conservation of Historic and Artistic Works
1717 K Street NW, Suite 301
Washington, DC 20006
202-452-9545
(offers a free brochure on ✌Guidelines for Selecting a Conservator✍; see also Foundation of the American Institute for Conservation)

American Institute of Architects
Community Assistance Initiative
1735 New York Ave., NW
Washington, DC 20006
202-626-7452
(provides teams of architects for damage assessment and rehabilitation)

American Red Cross
17th and D Streets, NW

Washington, D.C. 20006
202-737-8300
24-HOUR DISASTER LINE: 703-838-8316

American Society of Appraisers
P. O. Box 17265
Washington, D.C. 20041
800-272-8258

AMIGOES Bibliographic Council Inc.
Dallas, TX
214-750-6130
(provides assistance with books, paper, micrographics recovery)

Area Radio Relay League, Inc. (ARRL)
Newington, CT 06111
(national volunteer group of licensed radio amateurs who provide volunteer communication services)

Art and Archaeological Technical Abstracts
4503 Glencoe Ave.
Marina del Rey, CA 90292-6357
310-822-2299

Art Conservation and Technical Services (ACTS)
410 Lyman Avenue
Baltimore, MD 21212
410-433-0038

Association for Preservation Technology International (APT)
904 Princess Anne St.
P. O. Box 8178
Fredricksburg, VA 22404
703-373-1621

Balboa Art Conservation Center
P. O. Box 3755
San Diego, Ca 92103
619-236-9702

Baltimore Area Conservation Group

19 Clovelly St. #1206
Pikesville, MD 21208
410-770-6070

Bay Area Regional Earthquake Preparedness Project
101 Eighth St., Suite 152
Oakland, CA 94607
415-893-0818

Booklab, Inc.
Cross Park Dr.
Suite #2-E
Austin, TX 78754
512-837-0479
(provide emergency advice after a disaster)

Canadian Association of Professional Conservators (CAPC)
c/o Robert Waller
Canadian Museum of Nature
O. Box 3443, Station D
Ottawa, Ontario K1P 6P4, Canada
613-952-6439

Canadian Conservation Institute (CCI)
1030 Innes Rd.
Ottawa, Ontario K1A 0C8, Canada
613-998-3721

Center for Conservation and Technical Studies
Fogg Art Museum
32 Quincy Street
Cambridge, MA 02138
617-495-2392

Center for Preservation and Rehabilitation Technology
College of Architecture and Urban Studies
Virginia Polytechnic Institute and State University
201 Cowgill Hall
Blacksburg, VA 24061-0205
703-231-5324

Central United States Earthquake Consortium
P. O. Box 367
Marion, IL 62959
618-997-5659

Chicago Area Conservation Group
Chicago Historical Society
Clark St. at North Ave.
Chicago, IL 60614-6099
312-642-5035

Conservation Analytical Laboratory
Smithsonian Institution
Museum Support Center
Washington, D.C. 20560
202-238-3712

Conservation Association of the Pacific Northwest
P. O. Box 2756
Olympia, WA 98507
206-352-2627

Conservation Center for Art and Historic Artifacts
264 S. 23rd St.
Philadelphia, PA 19103
215-545-0613
(provide preservation planning, disaster help and advice)

Conservation Information Network
Contact: Getty Conservation Institute Library; Art and Archaeology Technical Abstracts; Smithsonian Institution Conservation Analytical Laboratory; or the Canadian Conservation Institute. See also Appendix 11.

Conservation Services
Bishop Museum
P. O. Box 19000-A
Honolulu, HI 96817
808-848-4112

Cumberland Conservation Center
Nashville, TN
615-269-3868

Federal Emergency Management Agency (FEMA)
500 C St., SW
Washington, DC 20472
202-646-2802
(for free publications, write FEMA, P. O. Box 70274, Washington, D.C. 20024)

Foundation of the American Institute for Conservation (FAIC)
1717 K Street NW, Suite 301
Washington, DC 20006
202-452-9545
(FAIC will provide lists of conservators' names according to specialty and geographic region as part of their conservation services referral system)

Furniture Conservation Laboratory
Society for the Preservation of New England Antiquities
185 Lyman St.
Waltham, MA 02154
617-891-1985

Getty Conservation Institute
4503 Glencoe Ave.
Marina del Ray, CA 90292-6537
213-822-2299

Historic Naval Ships Association of North America
C/O US Naval Academy Museum
118 Maryland Ave.
Annapolis, MD 21402-5034
410-267-2108

Image Permanence Institute
P. O. Box 9887
Rochester, NY 14623-0887
716-475-5199

Institute of Metal Repair
1558 S. Redwood
Escondido, CA 92025
619-747-5978

Institute of Museum Services
1100 Pennsylvania Ave., NW
Room 510
Washington, DC 20506
202-786-0539

Institute of Paper Conservation
Leigh Lodge
Leigh, Worcester WR6 5LB, England
0886-832323
Institute of Paper Science & Technology
575 14th St., NW
Atlanta, GA 30318
404-853-9500

Intermuseum Conservation Center
Allen Art Building
Oberlin, OH 44074
216-775-7331

International Centre for the Study of the Preservation and the Restoration of Cultural Material (ICCROM)
Via di San Michele 13
00153 Rome, Italy
58-79-01

International Council of Museums (ICOM)
Ad Hoc Committee for Hazard Reduction
1 Rue Miollis
75732 Paris
Cedex 15 France

International Institute for Conservation of Historic

and Artistic Works
6 Buckingham Street
London, England WC2N 6BA
01-1441-839-5975

International Institute for Conservation - Canadian Group
P. O. Box 9195 Terminal
Ottawa, Ontario K1G 3T9
Canada
613-998-3721

International Society of Appraisers
500 N. Michigan Ave., Suite 1400
Chicago, IL 60611
800-472-0105

International Tsunami Information Center (ITIC)
Box 50027
Honolulu, HI 96850-4993

Leather Conservation Centre
34 Guildhall Rd.
Northampton NN1 1EW, England
0164-232723

Library of Congress
National Preservation Program
LMG-07
Washington, DC 20540
202-707-1840 or 202-707-5213

Midwest Regional Conservation Guild
Cumberland Art Conservation
3343 Acklen Ave.
Nashville, TN 37212
615-269-3868

National Center for Earthquake Engineering

SUNY-Buffalo
Red Jacket Quad
Buffalo, NY 14261
716-636-3377

National Center for Film & Video Preservation
American Film Institute
2021 N. Western Ave.
Los Angeles, CA 90027
213-856-7637

National Coordinating Council on Emergency Management
7297 Lee Highway, Unit N
Falls Church, VA 22042
703-533-7672

National Endowment for the Arts
Museum Program
1100 Pennsylvania Ave., NW
Washington, DC 20506
202-682-5442

National Endowment for the Humanities
Office of Preservation
1100 Pennsylvania Ave., NW
Washington, DC 20506
202-786-0570

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02260
617-770-3000

National Guard Association
1 Massachusetts Ave. N.W.
Washington, D.C. 20001-1431
202-789-0031

National Hazard Research and Application Information Center
Institute of Behavioral Sciences No. 6
Campus Box 482
University of Colorado

Boulder, CO 80309-0482

National Hurricane Center
1320 South Dixie Highway, Room 631
Coral Gables, FL 33146
305-666-4612

National Hurricane Hot Line
Up-to-the-minute hurricane status reports for the east, west, and Gulf coasts, as well as the Caribbean, can be obtained 24 hours a day by dialing 1-900-933-2628 from a touch-tone phone. The cost is $0.98 cents a minute and the average call is about three minutes.

National Institute for the Conservation of Cultural Property
Collections Care Information Service
3299 K Street, NW
Washington, DC 20007
202-625-1495

National Maritime Alliance
229 Washington St.
Bath, ME 04530
207-443-6222

National Park Service
P. O. Box 37127
Washington, DC 20013-7127
202-343-8142 Curatorial Services Division
202-343-9573 Preservation Assistance Division
(provide expertise, statistics, documentation, and some technical assistance through Associate Director for Cultural Resources)

National Park Service
Division of Conservation
Harpers Ferry Center
Harpers Ferry, WV 25425
304-535-6139

National Preservation Institute
National Building Museum
Judiciary Square, NW

Washington, DC 20001
202-393-0038

National Trust for Historic Preservation
1785 Massachusetts Ave., NW
Washington, DC 20036
202-673-4146
(serves as clearinghouse for private disaster preparedness strategies; works with public agencies to improve disaster preparedness)

National Voluntary Organizations Active in Disaster (NVOAD)
(in additional to the national organization, many state VOADs work closely with state and local governments)

National Weather Service
1325 East West Highway
Silver Spring, MD 20910
301-713-0622

Naval Reserve Association
1619 King St.
Alexandria, VA 22314
703-548-5800

New England Conservation Association
Old Sturbridge Village
1 Old Sturbridge Village Rd.
Sturbridge, MA 01566
508-347-3362

New York Conservation Association
P. O. Box 20098
New York, NY 10011-0001

Northeast Document Conservation Center (NEDCC)
100 Brickstone Square
Andover, MA 01810
508-470-1010
(provides preservation planning; disaster help and advice; surveys and consultation; conservation of books, art on paper, maps, photographs)

Nuclear Regulatory Commission
11555 Rockville Pike
Washington, D.C. 20555
800-368-5642

Pacific Regional Conservation Center
c/o Laura Word
Bishop Museum
P. O. Box 19000-A
1525 Bernice Street
Honolulu, HI 96817
808-848-4112

Rocky Mountain Regional Conservation Center
University of Denver
2420 South University Boulevard
Denver, CO 80208
303-733-2712

Smithsonian Institution
Office of Risk Management
955 L'Enfant Plaza
Suite 7700
Washington, DC 20560
202-357-3338

Smithsonian Institution Conservation Analytical Laboratory
4210 Silverhill
Suitland, MD 20746
301-238-3712

Society for the Preservation of New England Antiquities Conservation Center
185 Lyman St.
Waltham, MA 02154
617-891-1985
(architectural, furniture, and upholstery conservation)

Southeastern Library Network (SOLINET)
Atlanta, GA
404-892-0943
(provides assistance with books, paper, micrographics recovery)

Textile Conservation Center
Museum of American Textile History
800 Massachusetts Ave.
North Andover, MA 01845
508-686-0191

Textile Conservation Group, Inc.
c/o Department of Anthropology
American Museum of Natural History
Central Park W. at 79th St.
New York, NY 10024
212-769-5893

Textile Conservation Laboratory
Cathedral Church of St. John the Divine
1047 Amsterdam Ave.
New York, NY 10025
211-316-7523

Textile Conservation Workshop
Main St.
South Salem, NY 10590
914-763-5805

United Nations Disaster Relief Organization
Room S2935
New York, NY 10017
212-963-5704

U. S. Coast Guard Auxiliary
2100 2nd St. SW
Washington, D.C. 20593
202-267-0982

U.S. Army Corps of Engineers
20 Massachusetts Ave., NW, Suite 6218

Washington, D.C. 20314
202-272-0251 or 202-272-0010
(provides construction expertise and assistance)

United States Geological Survey
905 National Center
Reston, VA 22092
703-648-6711

Upper Midwest Conservation Association
2400 Third Ave. South
Minneapolis, MN 55404
612-870-3120

Virginia Conservation Association
P. O. Box 4314
Richmond, VA 23220
804-358-2006

Washington Conservation Guild
P. O. Box 23364
Washington, D.C. 20026
202-387-2979

Western Association for Art Conservation
215 2nd Ave., South Mezz.
Seattle, WA 98104
206-587-3725

Western New York Conservation Guild
The Strong Museum
1 Manhattan Square
Rochester, NY 14607
716-263-2700

Williamstown Regional Art Conservation Laboratory, Inc.
225 South St.
Williamstown, MA 01267
413-458-5741

Appendix 3

RECOVERY SUPPLIERS AND SERVICES

Keep a list of companies who provide services, equipment, and supplies that may be needed in the event of a disaster. Below is a list of the types of services and equipment you may need. Provide an address and phone number for each. Once a year, call all vendors/services to confirm that they are still in business and that they can provide the service or equipment you need. If possible, make arrangements for them to provide you with priority service in case of an emergency. In a regional emergency, such services and supplies are in high demand, and costs can escalate to unreasonable levels.

ARCHITECT:
Address:
Phone:

CARPENTER(S):
Address:
Phone:

CHEMIST:
Address:
Phone:

COLD STORAGE FACILITY:
Address:
Phone:

COMPUTER RESTORATION:
Address:
Phone:

CONSERVATION CENTER:
Address:
Phone:

CONTRACTOR(S):
Address:
Phone:

CRANE RENTAL:
Address:
Phone:

DATA RECOVERY SERVICE:
Address:
Phone:

DEHUMIDIFIERS RENTAL:
Address:
Phone:

DRY ICE:
Address:
Phone:

DUMPSTER RENTAL AND TRASH REMOVAL SERVICE:
Address:
Phone:

ELECTRICIAN:
Address:
Phone:

EXTERMINATOR:
Address:
Phone:

FREEZER SERVICES:
Address:
Phone:

FREEZER TRUCK:
Address:
Phone:

FUMIGATION:
Address:
Phone:

GLAZIER:
Address:
Phone:

HEATING, VENTILATION AND AIR CONDITIONING:
Address:
Phone:

INSURANCE COMPANY:
Broker:
Phone:
Adjuster:
Phone:

JANITORIAL:
Address:
Phone:

LAWYER:
Address:
Phone:

LOCKSMITH:
Address:
Phone:

LUMBER YARD(S):
Address:
Phone:

MILK CRATE SUPPLIER(plastic):
Address:
Phone:

MOVERS:
U-Haul Center address:
Phone:
Ryder Truck Rental address:

Phone:

MYCOLOGIST:
Address:
Phone:

PALLETS:
Address:
Phone:

PEST CONTROL:
Address:
Phone:

PHOTOGRAPHER:
Address:
Phone:

PLUMBER:
Address:
Phone:

PORTABLE TOILETS:
Address:
Phone:

RIGGER:
Address:
Phone:

SECURITY/GUARD SERVICE:
Address:
Phone:

STORAGE:
Address:
Phone:

TELECOMMUNICATIONS:
AT&T: 800-222-0400
Other:

TOOL RENTAL:
Address:
Phone:

TRAVEL LIFT OPERATOR:
Address:
Phone:

UTILITIES:
Address:
Phone:
VACUUM FREEZE DRYING:
Address:
Phone:

DISASTER ASSISTANCE FIRMS

This is only a partial list; in no way does inclusion here indicate that the firm has been recommended, nor does exclusion indicate that the firm is not recommended. You can find local service firms in the Yellow Pages and through the Conservation Information Network in Appendix 11. Remember to discuss what cleanup materials will be used, as some products may not be safe to use around certain collections or objects. Ozone, for example, is often used to deodorize; but it should not be used around textiles or organic materials.

Aeroscopic Engineers, Inc.
6745 Denny Ave.
North Hollywood, CA 91606
(deodorizing and cleaning services)

Airdex Corporation
2100 West Loop South Suite 820
Houston, TX 77027
(portable equipment)

American Freeze-Dry, Inc.
411 White Horse Pike
Audubon, NJ 08106
609-546-0777
(deals primarily with library books and office files; can provide freezing, vacuum freeze-drying, milk crates, pick-up and delivery, cleaning of materials, and smoke odor removal☝will not dry out buildings)

Blackmon-Mooring-Steamatic Catastrophic, Inc. (BMS CAT)
303 Arthur St.
Fort Worth, TX 76107
817-332-2770
FAX: 817-332-6728
24-HOUR HOT LINE: 800-433-2940 or 800-940-2267
Canada: 800-263-5961
(Full restoration service including cleaning, vacuum freeze-drying, and hazardous materials. They also have museum-related experience: smoke and water damage to the Ghost Town Museum, Colorado Springs, Colorado [restoration and corrosion control to wax mannequins, antique fire engines, carriages]; flooding at the Chicago Historical Society [mud and water removal, moisture control, disinfecting and corrosion control to tools and metal boxes]; mold, mildew, and rodent damage to archival collection at Strong Museum, Rochester, New York; and flooding of the Wyoming State Library [221 boxes of water-damaged books were frozen and shipped refrigerated to BMS CAT's headquarters for treatment in drying chambers])

Disaster Recovery Services
414 Blue Smoke Court West
Fort worth, TX 76105
800-856-3333
(full restoration, including freeze-drying)

Document Reprocessors
5611 Water Street
Middlesex, NY 14507
or
55 Sutter Street, Suite 120
San Francisco, CA 94103
800-437-9464
(freeze-drying with mobile salvage teams)

Enviro-Air Control Corp.
1523 North Post Oak Road
Houston, TX 77055
713-681-3449
(leases refrigerated dehumidification equipment to dry out buildings, as well as auxiliary equipment such as heaters and blowers)

Kodak
check for your regional office
800-445-6325
(disaster recovery program for microforms)

Mid-West Freeze-Dry, Ltd.
7326 N. Central park
Skokie, IL 60076
708-679-4756
(vacuum freeze-drying)

Moisture Control Services
79 Monroe Rd.
Amesbury, MA 01913
508-338-4900
(disaster recovery services, building dehumidification, drying services, microfilm drying services)

Moisture Control Services
216 Boston St.
Woburn, MA 01801
(portable equipment)

Moisture Removal Technologies
54 Eleventh Street
Atlanta, GA 30309
404-892-8455
(drying and dehumidification services)

Munter Moisture Control Services
regional offices in Norcross, GA; Cocoa, FL; Houston, TX; Jefferson, LA

800-422-6379
(uses desiccant dehumidification process, best for drying buildings)

Museum Services
434 South First St.
San Jose, CA 95113
(vacuum drying services)

Randomex, Inc.
Dara Recovery Division
1100 East Willow St.
Signal Hill, CA 90806
800-Ran-Domox, 310-595-4138
(disaster recovery of computer media)

Re-Oda Chemical Engineering
100 Industrial Parkway
P. O. Box 424
Chagrin Falls, OH 44022
216-247-4131
(smoke damage recovery)

Restoration Technologies, Inc.
1183 N. Elsworth Ave.
Villa Park, IL 60181
800-421-9290
(disaster recovery of electronic equipment)

SERVPRO
PO Box 1978
Gallatin, TN 37066
plus 850 local offices
800-737-8776
(fire and water damage recovery)

Solex Environmental Systems

P. O. Box 460242
Houston, TX 77056
800-848-0484, 713-963-8600
(recovery services, dehumidification of buildings)

There are many other companies that specialize in environmental clean-up, fire and water damage, smoke and odor counteracting services, computer and other electrical equipment repair and restoration services, data recovery, network recovery, records management, crisis management, disaster public relations, psychological services, mobile administrative offices, mobile cargo storage space, mobile computer rooms, recovery trailers, modular buildings, etc. Check your local Yellow Pages and try to find experienced, dependable professionals near you.

Appendix 4

SUGGESTED LIST OF ITEMS FOR INCLUSION IN EMERGENCY/DISASTER SUPPLY AND EQUIPMENT CACHE

Which items you include on your list will depend on your site and the nature of your collections. Items such as tools, ladders, etc. that are part of your normal maintenance equipment can be brought to the emergency cache site during the preparedness (preferable) or recovery phase of an emergency. The number and size of certain items will vary from one institution to the next.

For Debris Removal and Cleanup:

- o water hoses and nozzles
- o mops and wringers
- o wash tubs
- o scrub brushes
- o brooms
- o dust pans
- o cellulose sponges
- o natural sponges
- o window and floor washing squeegees
- o clear household ammonia
- o Ivory liquid or other low-sudsing detergents
- o ammonia
- o scouring powders
- o Murphy's oil soap
- o bleach
- o Fantastic or other general use cleaner
- o antiseptic soaps
- o fungicides
- o disinfectants
- o white paper towels
- o buckets
- o wheelbarrow(s)
- o rubber gloves
- o cloth rags (assorted)
- o large heavy-duty plastic trash bags and throw-away containers (use a color that is different from that of the bags you use for collection protection so there is no confusion)

o book truck
o dollies
o hand carts
o scoops and shovels
o dumpsters and trash containers for controlled demolition and removal of debris
o dry/wet vacuum cleaner with accessories
o portable work tables
o knives

For Demolition, Repairs, and Rescue:

o hammers (claw and machinist)
o wrenches (pipe, channel lock, and vice grips in various sizes)
o pliers (adjustable, lineman's, and needle nose in various sizes)
o screwdrivers (straight blade and Phillips head in various sizes)
o tools for tamper-resistant screws and bolts
o wood saws (including bow saw)
o chain saws with appropriate file and wrench
o metal saws with extra blades
o utility knives with extra blades
o wire cutters
o tin snips
o pipe cutter
o bolt cutter
o chisel
o hand drill with variety of bits
o chain hoist and tow chains
o 3-ton hydraulic jacks
o pry-bars
o sledge hammer
o axes (including a fireman's ax)
o rope
o block and tackle
o suction handles
o plunger
o plumber's snake
o pit cover hook
o hydrant and post indicator valve wrenches
o folding rule and tape measure
o shovels

o rakes
o hoes
o caulking gun and caulk
o step ladder
o extension latter
o hard hats
o safety glasses
o heavy work gloves
o barrier tape plastic rolls (for cordoning off dangerous areas)

For Construction:

o hand tools (assortment)
o nails, screws, and other fasteners (assortment)
o pre-cut plywood for windows
o extra lumber and plywood for temporary roof repairs, bracing, etc.
o sheet plastic, 10' X 100' rolls
o heavy duty tarps (assorted sizes, some with eyelets)
o rope and twine
o bungee cords (assorted lengths)
o tapes of various kinds (masking, nylon filament reinforced [a.k.a. strapping tape], boat tape [a.k.a. duct or gaffer's tape], electrician's, etc.)
o glues (waterbase white glues and super glues)
o binding wire
o cordage rolls
o staple gun and staples
o clamps

Emergency Equipment and Supplies:

o flashlights and lanterns with fresh batteries
o extra batteries
o oil lamps and oil
o waterproof matches
o personal flotation devices
o reflective caution tape
o portable gasoline fueled water pumps (trash pump type probably most useful)
o portable gasoline fueled, 110 volt, AC generator
o portable air conditioner(s)
o electrical extension cords with ground fault interrupters (U.L. approved)

o portable lights (string lights and incandescent work lights)
o unleaded gas in approved containers
o oil in approved containers
o Hubell twist lock adapter for waterfront type electrical outlets
o wet/dry vacuum cleaner
o sump pump
o sand bags and sand
o padlocks
o keys for all access to museum buildings, ships, vehicles, etc.
o fire extinguishers (CO-2 or ABC type recommended)
o walkie-talkie radios with fresh and extra batteries
o battery operated FM-AM radio with fresh and extra batteries
o portable public address system and/or bullhorn
o Geiger counter and dosimeters
o gas masks with extra canisters
o air breathers with extra oxygen tanks
o resuscitation equipment
o spill control pillows
o photographic equipment with extra film and flash, etc. (may want to consider a Polaroid for instant results)
o video camera and tapes with fresh extra batteries

Personal Equipment and Supplies (some may be designated as ✌to be provided by the employee✍):

o rubber boots and waders
o rubber lab aprons
o rubber gloves
o protective masks
o sleeping bags and blankets
o rain gear
o orange caution vests
o changes of clothes
o potable water
o water tablets
o food and food preparation equipment
o sanitation facilities (portable toilet, toilet paper, etc.)
o first aid kits and medical supplies
o cots
o blankets and/or sleeping bags

o body pouches
o antiseptic soaps

Conservation Supplies and Equipment:

o box fans (at least one for each gallery or storage area)
o space heaters
o hair dyers (1200 or 1500 watt)
o portable dehumidifiers
o portable humidifiers
o extension cords (U.L. approved)
o hygrometers and humidity testing papers
o hygrothermographs
o freezer paper and wax paper
o polyester (Mylar) and polyethylene film
o plastic (polyethylene) garbage bags (use color different from bags you will use for garbage so there is no confusion)
o polyethylene painter's drop cloths (both 1 and 2 mil thickness and at least 9' by 12')
o thymol (for use by trained professional only)
o ethanol
o acetone
o industrial denatured alcohol
o white blotters (soft, reduced-lint, water absorbent disposable swabbing material such as high-quality paper towels)
o toothpicks
o toothbrushes
o cotton swabs
o thick glass or smooth masonite in various sizes
o weights (such as shot bags)
o Japanese tissue
o towels and clean rags
o monofilament fish line and/or light clothesline (for hanging items to dry)
o clothes pins
o scissors
o sharp utility knives with extra blades
o tweezers (cross-action)
o water displacement compound (WD-40)
o waxes and dressings
o zip-lock polyethylene plastic bags (assortment, including vegetable bags that

have small perforations to allow wet items stored inside to dry or, conversely, wet items stored in water to stay wet)
o plastic milk crates (these are preferable to cardboard boxes as they will not fall apart when placed in water or when wet objects are placed in them)
o boxes for packing and moving artifacts, records, and equipment (record transfer boxes are easiest to carry and store as they come flat for storage and can be re-flattened; but they are not water-resistant)
o furniture or utility blankets (clean and quilted, available from mover's supply and usually sold in bundles of twelve; do not use the thin, unquilted pads called ✌skins✍)
o buckets for storing items wet (clean 5 gallon spackle buckets are ideal)
o pallets
o tissue paper, clean newsprint, plastic bubble pack, foam noodles, and other packing materials
o indelible marking pens and soft sharpened pencils with sharpener
o labels (adhesive) and tags of all sorts (string and wire attachable, etc.)
o tape and packing supplies (including fiber reinforced tape, boat tape [a.k.a. duct tape or gaffer■s tape], and cotton tying tape [undyed and about 5/16"])
o disinfectants
o insecticides and rodenticides
o portable work tables
o blank forms for recording data
o clip boards
o cotton or nylon gloves
o brushes (natural hair, 1" or 1 1/2" wide)
o sponges (cellulose and natural)

Miscellaneous Equipment:

o essential office equipment such as manual typewriter, pocket calculator, pencil sharpener, stapler, ruler, scissors, etc.
o stationery, postage stamps, blank forms, and other paper supplies to carry out minimal administration operations

Appendix 6

PREPAREDNESS AND RECOVERY PROCEDURES BY OBJECT TYPE

This section outlines disaster preparedness and recovery procedures for the following types of objects (in alphabetical order):

- Electronic equipment
- Fabrics
- Furniture
- Leather
- Magnetic media
- Microfilm and microfiche
- Motion pictures
- Paintings
- Paper and books
- Photographs
- Sound and video recordings

ELECTRONIC EQUIPMENT

n Preparedness procedures

l Computers, printers, copiers, communication modems, and cash registers should always be covered with dust covers when not in use to protect them from falling water and smoke.

n When a fire or flood occurs

All of the electronic equipment listed above, as well as telephone switches, numeric control machines, etc. can be damaged by fire, smoke, or flooding. Immediate countermeasures are imperative to stop corrosion.

l **Smoke**. The major contaminant that threatens electronic equipment is hydrogen chloride (HCl), a form of hydrochloric acid generated when PVCs have been heated or consumed by fire. Spread by smoke, HCl is extremely corrosive to electrical equipment. A quick and simple method of testing for HCl is using a Saltesmo test strip. Generally, if the surface of the equipment is covered with less than 400 micrograms of sodium chloride equivalent per square inch, the equipment is restorable. The rule of thumb is that restoration should not exceed 25 percent of the replacement cost. The normal restoration cost is around 10 percent.

l **Water**. Electronic equipment that has been sprayed, splashed, or dripped on, or equipment which has been submerged in water, can be restored. It is critical to know if the equipment was powered at the time of exposure. If it was, greater damage may have occurred. This is the reason why such equipment should generally be unplugged when not in use.

n Recovery procedures

l If any electronic equipment is still powered, turn it off immediately. There is a continuing danger to the equipment from electrical shorts, and voltage potential within the circuitry tends to plate contaminants onto printed circuit boards and back planes.

l Do not turn on power to any potentially water- or smoke-damaged electronic equipment before checking it for damage.

l Open cabinet doors, remove side panels and covers, and pull out chassis drawers to

allow water to run out of the equipment.

l Remove standing water with wet vacs. Use low-pressure air (50 psi) to blow trapped water out of equipment. Absorbent cotton pads (diapers and cotton swabs) can be used to blot up water. Use appropriate caution around header pins and back plane wire wrap connectors to avoid bending. If hand-held heat guns (hair dryers) are used, set on the lowest setting, use caution, and keep the dryer well away from components and wires. Overheating of electronic parts can cause permanent damage.

l Vacuum and mop up water under any raised machinery or computer room floors.

l Set up portable fans to circulate air through the equipment for general drying. Equipment that contains open relays and transformers will require a special bake-out before an application of power.

l Portable equipment should be moved to a humidity-controlled area while awaiting restoration.

l A professional electronic restoration service should be brought in ASAP to mitigate the loss.

FABRICS

n **Preparedness procedures**

l Store fabrics in protective material that is dust and water repellent.

l Keep fabrics rolled rather than folded.

n **Recovery procedures**

l Handle wet fabrics as little as possible, with plenty of support. Wet textiles promote rapid mold growth, which may leave irreversible stains. Colors may bleed, and fibers may weaken internally. Large fabrics, such as carpets and sails, can be particularly difficult to handle when wet because they are so heavy. This also puts additional strain on the fabric.

l Have a trained conservator treat irreplaceable fabrics that have been exposed to saltwater. Keep them cool (50 to 60 degrees F.), and have them treated within 48 hours. If it will take longer, freeze them.

l Take quick action on carpets to guard against mold. Modern carpets that are not part of the collections can be cleaned, deodorized, sanitized, and dried. Carpets that are impregnated with mud may be beyond cleaning.

l Use caution when having clothes treated by local commercial dry cleaning firms. These treatments are often far too harsh for collection items.

l Sails, while made for use at sea and in salt air, should be soaked in clean, fresh water to remove salt and dirt and then dried. Older, non-synthetic sails should be handled carefully to prevent unnecessary tears. This can be especially difficult with heavy, wet sails weighing hundreds of pounds.

FURNITURE (and other wooden objects)

n **Preparedness procedures**

l If furniture is threatened by a possible disaster, such as a hurricane, cover it with plastic and keep it on blocks off the floor. Make sure that weight-bearing members are supported. When not on exhibit, such objects should be covered at all times.

n **Recovery procedures**

Wet wooden objects may suffer from dimensional changes and warping of wood, loss of adhesion in glues used in construction, damage to varnish or polychroming, and corrosion of metal fittings and staining of adjacent material. To deal with these problems it is generally best to:

l Avoid rapid drying, which will only compound the damage and often results in checks or cracks in the wood. When more than one piece has been affected, it is usually most efficient to set aside a room where a very high relative humidity can be maintained for several weeks. It may be necessary to line the walls and ceiling of the room with polyethylene plastic sheeting and to provide moisture using humidifiers and/or vaporizers. For individual pieces, a plastic tent that maintains a constant environment may be the best temporary solution. The plastic should not be allowed to touch the surface of the object.

l Watch out for mold growth. This threat can be reduced by increased air circulation, lower temperature, and the presence of light. However, fungicidal fogging may be necessary. Contact your furniture consultant.

l Remove excess water by blotting with absorbent paper, but be careful not to rub or apply excessive pressure. Do not blot fragile surfaces.

l Dry veneers under weights to avoid separation and crumbling.

l Use sponges with de-ionized water to carefully remove mud and grime, but do not wipe or scour water-softened finishes. A light spray of de-ionized water and a soft bristle brush may be effective.

l Remove all metal hardware where possible and place it in a bag with a tag identifying the piece it came from.

l When moving wet objects, always lift from weight-bearing members such as chair rails, table aprons, etc., as glues may have been weakened by water. Never lift by handles, spouts, arms, legs, or projecting parts. Never drag. Use a cart, if possible, and protect the object with blankets or padding. Use padding underneath if the object is to be placed on the floor.
l Know where you plan to put the object and where you are going before you lift it. Do not move it unnecessarily.

l Put objects where there is no chance of their being accidentally knocked into and where they will not be in the way of emergency crews.

l To improve air circulation, it may be necessary to raise a piece off the floor with blocks. Remember to support the piece on its weight-bearing members.

l Open lids and doors and remove drawers. This will allow for greater air circulation, cut down on potential mold growth, and promote even drying. However, you should only do this if the relative humidity is high; otherwise, pieces such as drawers may change dimensions and not fit back into place.

l If a piece is particularly ornate or important, call your furniture conservator immediately.

l Have a furniture/textile conservator treat upholstered furniture, which is harder to dry. He or she will probably have to remove the outside covering and padding. You may use towels to absorb moisture, but avoid the temptation to apply pressure, which can tear fabric. Allow water to wick from wet fabric to dry towels.

LEATHER

n **Preparedness procedures**

l Store leather items in waterproof and dust-protective acid-free boxes.

n **Recovery procedures**

l Recovery of leather from water damage is particularly difficult, because it stiffens and darkens when exposed to water and stains easily. For small quantities, try shaping and slow air drying, using blotting paper.

l Pack large quantities of leather items in wax paper and freeze. Consult a conservator.

l Never freeze leather adorned with glass beads or leather that has been painted. Pack it in cold water and ship it to a conservator ASAP.

MAGNETIC MEDIA

n **Preparedness procedures**

l Keep all disks, tapes, etc. in protective storage containers. Critical data on magnetic media can be lost if dirty disks are used or copied. Media that have been exposed to contaminants should be examined by a professional before use. Particulate contamination on the surface of hard disk media can damage the drive and result in loss of data. Water can dissolve the adhesive between the substrate and the magnetic oxide coating, resulting in loss of data. Tapes must be dry and clean before any attempt is made to copy them.

n **Recovery procedures**

l Remove standing water. Open the cartridge access door and shake out the water. Use clean low-pressure air to force the water out. Remove rings on reel tape.

l For minor water damage, inventory the items and move them to a dry environment ASAP for drying, cleaning, and copying.

l Freeze wet tapes or floppy media that are critical and that have not been backed up. Freeze drying is the most efficient means of restoration, but you may want to contact the supplier for their recommended drying method.

l Do not touch the diskette surface with bare hands.

l Do not attempt to dry magnetic media with heat.

l Special tape and diskette cleaning machines are available from professional services. Once the information has been retrieved, it should be copied onto new tape.

l Small hard disk assemblies may be removed by trained personnel, but you should never attempt to open a hard drive. Call for professional assistance. Once the information has been retrieved, it should be copied onto new storage media. Damaged hard disks should never be placed back into expensive equipment.

l If you take action within 72 to 96 hours, you can expect a 95 to 100 percent success rate.

MICROFILM AND MICROFICHE

n **Preparedness procedures**

l Keep all microfilm and microfiche in protective storage containers to keep falling water and smoke from damaging them.

n **Recovery procedures**

l If film is wet, do not let it dry. The gelatin coating will stick to the next layer and the document information will be torn from the film. Speed is essential. Water-damaged film can never be restored to archival quality.

l Do not remove microfilm from boxes; hold cartons together with rubber bands.

l For short term storage, use five gallon buckets to store the film preferably in distilled water. Make sure the water completely covers the film. Zip-lock bags or Saran wrap can also be used to package the film and prevent drying.

l For storage beyond a few days, special gelatin-hardening chemicals must be added to the water by a competent conservator.

l Arrange for a microfilm processor to rewash and dry.

MOTION PICTURES

n **Preparedness procedures**

(See procedures for microfilm and microfiche above.)

n **Recovery procedures**

l For non-replaceable and other high priority items, rewash and dry with in seventy-two hours.

l For non-high priority items, fill film can or boxes with cold water and pack in plastic pails or garbage bag-lined boxes.

l Arrange for a film and/or microfilm processor to rewash and dry.

PAINTINGS

n **Recovery procedures**

Oil paintings:

l Immediately remove free water by draining.

l Only carry one painting at a time.

l Always have two or more people lift any painting that one person finds even slightly difficult to manage alone.

l Always carry framed painting by the frame, with one hand on each side. Never hold a frame by the ornate decorations at the corners or centers of the sides. If the frame is gold leafed, be very careful; gold leaf is very fragile, and the pressure of you hands may knock it off. Never hold an unframed painting with your knuckles pressing into the reverse of the canvas. Walk smoothly when carrying a painting so that you do not jar or vibrate the canvas. Know where you plan to put the painting before you lift it. Do not move it unnecessarily.

l Put paintings where there is no chance of their being accidentally knocked into and where they will not get in the way of emergency crews.

l Carry paintings horizontally; never rest a wet painting vertically. (If paintings are not wet, however, this is the preferred method of temporary storage.)

l Pack paintings face up without touching the paint layer.

l Never touch the surface of the painting with your fingers.

l Blotting paper may be placed under the painting to help absorb moisture. Change as needed.

l If any paper sticks to the surface of painting, DO NOT REMOVE. Let the conservator do it.

l Let paintings air dry.

l A trained painting conservator should normally be consulted before removing a painting from its frame to promote drying. Wet composition artist's board, cardboard, and canvas may be very weak when soaked, and it can easily tear or break.

l DO NOT FREEZE paintings, as this may cause paint flaking.
l For glass framed paintings or prints that appear to be stuck to the glass, do not try to separate. Dry with the glass side down.

l If paintings are subjected to saltwater soaking, contact a painting conservator IMMEDIATELY, and do not allow painting to dry. Drying may cause salt crystallization and flaking of paint.

Watercolors:

l Immediately remove from free water by lifting horizontally.

l Do not blot.

l Interleave and pack flat.

l Air or freeze dry.

l Consult a conservator.

PAPER AND BOOKS

We suggest reading *Procedures for Salvage of Water Damaged Library Materials* by Peter Waters (1993), available from the Library of Congress. Some basic procedures are outlined below. For a major disaster, it is highly recommended that you bring in a paper conservator for consultation.

n **Preparedness procedures**

l Keep all non-replaceable and other high priority books and paper archival items in acid-free binders or boxes to protect them from dust, falling water, smoke, etc.

l Do not store books or paper items under pipes, bathrooms, kitchens, drip pans, near windows, or on lower levels that are likely to flood.

n **Recovery procedures**

l Remove free water, as paper will continue to wick up moisture.

l Use fans to circulate the air around the wet items. Do not aim the air flow directly at the materials that are being dried.

l Do not open or close wet books.

l Do not separate single sheets. This is especially important for coated and glossy papers or open pages of books and pamphlets made from coated paper (e.g. magazines, art books, paperback covers, etc.).

l Do not remove book covers.

l Do not press wet books.

l Do not wipe off mud and dirt.

l Do not disturb wet file boxes, prints, or drawings.

l If items are to be conserved by freezing (which is generally the best method for items that cannot be air dried within two days, for large collections, for coated papers, for soluble inks and watercolors on paper, for vellum and leather bindings, and for photo prints and film):

3 Remove loose debris and mud carefully by rinsing and allow to flatten before packing.
3 Clean with a natural rubber sponge as needed.
3 Number and inventory each container, preferably milk cartons or boxes. One to 1 1/2-cubic-foot boxes are the easiest to handle. Cardboard boxes will soak up water and weaken.
3 Pack file folders and books spine down so bindings will not sag.
3 Avoid packing unequal sized books side-by-side.
3 Avoid packing books too loosely or too tightly.
3 Interleave between folders, manuscripts, documents, and small drawings.
3 Separate books with freezer paper or wax paper.
3 Use bread trays, flat boxes, or poly-covered plywood for large maps and drawings, and pack them in map drawers, . Wet documents can be temporarily stored five or six high if absorbent paper is placed between each sheet.
3 Keep everything wet until frozen.
3 Remove framed prints and drawings from frames and pack flat.
3 Freeze priority items as soon as possible, but at least within 48 hours.

l Non priority items or those that are merely damp (i.e., not in direct contact with water) may be air dried. The disadvantages of this method are that it is labor-intensive and may invite mold, distortion, and staining.

3 Stand damp books on their tails with the pages fanned open. Periodically re-fan the pages to assure that they dry evenly.
3 Treat wet books similarly, but interleave them with absorbent paper, such as un-printed newsprint, and change it frequently. Remember, however, that warping, cockling, blocking, and ink bleeding are more prevalent with this method.
3 Freeze dry coated papers in books or pamphlets. Do not allow coated paper material to dry before freezing or the pages will stick together.

l If active mold forms, do not attempt to remove it; you may only spread or smear it. Active mold looks fuzzy or slimy. Dormant mold is powdery and dry.

l If in doubt, FREEZE. This will give you time to sort out what to do without further damaging the collection. For large collections, freezing is the best method. Air drying is best for small collections, as long as the temperature and humidity are relatively low and conducive to drying.

l Blast freezing should be considered for archival bound volumes to reduce the possibility of spine damage.

PHOTOGRAPHS

n **Preparedness procedures** (see ✌Paper and Books✍ above)

l Store nitrate film properly and identify it clearly.

n **Recovery procedures**

Prints, negatives, and transparencies:

l Keep non-replaceable and other high priority items wet, and contact professional conservator for advice. If the freeze method is chosen (this is usually not the preferred method), do it within 48 hours. Salvage priority items in the following order: (1) color photographs, (2) prints, (3) negatives and transparencies.

l Do not touch emulsions while handling.

l Rinse photographs gently in shallow baths of clear, cool water; never rub or scrub. Keep immersion time to a minimum, and then air dry in a cool, dry environment.

l Treat slides like photographs, but remove them from their mounts if they■ve been penetrated by silt.

l Pack non-priority items in garbage bag-lined containers and keep them in cold water (preferably 60 degrees F. or lower). Air dry as time permits. If frozen, thaw and air dry.

l Only vacuum freeze-dry items that were kept wet and then frozen within 48 hours, with the images interleaved with wax paper. In this process, most of the moisture passes through a liquid state before it vaporizes. Some further damage, therefore, might occur☝such as running or feathering-out of water-soluble inks and dyes, and blocking or sliding of photographic gelatin layers. Freeze drying is preferred.

Wet collodian (ambrotypes, tintypes, pannotypes) and daguerreotypes:

l Dry immediately.

l Handle with care.

l Pack horizontally in padded containers to protect glass.

l Air dry face up.

l Never freeze wet collodian types. If you are uncertain about the type of photograph, don't freeze it.

Nitrates with solution emulsions:

l Immediately freeze non-replaceable and other high priority items.

l Do not blot.

l Air dry non-priority items.

SOUND AND VIDEO RECORDINGS

n **Preparedness procedures**

(Same as for ✌Books and Papers✍ above.)

n **Recovery procedures**

l Dry non-replaceable and other high priority items within 48 hours. Freezing is untested.

l Pack vertically in plastic or cardboard boxes.

l Hold disks by the edges and avoid shocks, such as dropping.

l Air dry.

Appendix 7

SAMPLE EMERGENCY PREPAREDNESS PLAN INDEX

(not meant to be all-inclusive)

Accident/illness procedures and report forms

Alarm call procedures for fire, burglary, and other emergencies

Alarm malfunction procedures

Annual review and update

Artificial resuscitation procedures and updated list of trained staff

Bomb threat procedures; how to handle suspicious objects

Chain of command

Chemical spill procedures and location of cleanup equipment

Command Center location, phone number, person in charge

Communications systems:

- Command Center
- Internal communications
- Public relations

Conservation services with complete list of names, addresses and phone numbers

Conservation suppliers with complete list of names, addresses and phone numbers

Conservators with complete list of names, addresses and phone numbers

Disaster procedures:

- Earthquake
- Fire
- Flooding

Hurricane
Ice and snow
Nor'easter
Tsunami
etc.

Disaster kits or suitcase

Disaster Recovery Coordinator

Disturbed visitor procedures

Earthquake procedures

Electrical outage procedures

Electric shut-off switches

Elevations of all structures and floor or deck plans

Emergency assembly area location

Emergency Command Center location and phone number

Emergency shut-off valve locator map

Emergency telephone numbers with response times

Emergency supply depot

Emergency procedures:

Earthquake
Fire
Flooding
Hurricane
Ice and snow
Nor'easter
Tsunami
etc.

Emergency Response Teams

Energy emergency procedures

Evacuation assembly area

Evacuation procedures from museum

Evacuation procedures from region with map showing quickest exit routes

Explosion procedures

Fire procedures, location of fire extinguishes

Fire pull boxes

First aid kits

First aid, staff and training

Flooding procedures

Floor and deck plans; location of water, gas, electric cut off valves; ventilating, heating, and AV systems; fire and security systems; hazardous material storage; transformers with PBCs; location of high priority collections, etc.

Gas shut-offs

Ground floor elevations of building

Hazardous materials storage

Insurance carrier and notification procedures

Maps (evacuation routes, etc.)

Media spokesperson

Medical emergencies and procedures

NOAA weather stations with kHz identifiers

Phone numbers

Photographic documentation of damage

Power outage procedures

Power shut-offs

Propane gas shut-offs

Post disaster review

Priorities

Public relations

Pump location(s)

Review and drills

Resource directories

Safety Officer

Security Officer

Security procedures and philosophy

Shut-offs:

- Electric
- Gas
- Sewer
- Water

Smoke damage

Staff emergency assignments with alternate designations

Staff phone numbers

Staff trained in first aid and artificial resuscitation

Supplies and equipment, list and locations

Suspicious objects

Telephone numbers

Telephone procedures for staff

Transformers

Training and drills

Ventilation system locations

Volunteers

Weather television station

[Note: many subjects should have multiple listings for speedy reference e.g. power outage procedures and electrical outage procedures]

Refer to Appendix 6 for a summary of preparedness procedures for each major disaster category.

Appendix 8

SAMPLE DISASTER PREPAREDNESS PLAN
TELEPHONE DIRECTORY

Emergency 911

Amateur Radio Emergency Services (AREA)

Area Radio Relay League, Inc. (ARRL)

Civil Defense

Conservators (furniture, textiles, painting, photographs, objects, paper, etc.)

Craftsmen (plaster, carpenter, roofer, boatwright, etc.)

Emergency Operating Center for your city and/or county

Emergency Volunteers

Fire department (including bomb disposal and hazardous waste disposal units)

Hardware stores

Hospital(s)

Insurance Agent(s)

National Guard

National Hurricane Center and Hurricane Hot Line

Police (local and state) and FBI

Public Works, Engineer, Water and Sewage Service for your city and/or county

Radio Amateur Civil Emergency Services (RACES)

Security system

Services:

- Architect
- Computers
- Electrical
- Emergency power
- Exterminator
- Gas
- Heat and AC
- Lawyer
- Locksmith
- Plumbing
- Portable toilets
- Telephone
- Tree removal
- Truck rental
- Trucking/moving
- etc.

Staff (both home and office numbers)

- Disaster Recovery Coordinator
- Emergency Response Team members
- Safety officer
- Security officer

State department for environmental protection, natural resources, cultural resources, state historic preservation officer, etc.

U.S. Coast Guard

NOAA, national and local weather offices, and radio stations with kHz identifier

Weather television station

Appendix 9

SAMPLE FORMS

Standard Facility Report Form

Damage Assessment Form

Appendix 10

CAMM DISASTER NETWORK

It is the intent here to ask every CAMM member to fill out a CAMM Emergency Network form listing personnel, supplies, and equipment they are willing to provide in exchange for being a part of the network. We need to address possible problems, such as distances, costs, etc.

INSTITUTION	STAFF
List each CAMM member who will participate	List all staff designated by their institution who will assist (pending supervisory approval). An asterisk (*) denotes staff members designated to locate volunteers in their institution.

INSTITUTION	EQUIPMENT AVAILABLE FOR LOAN
	Items may include pumps, generators, vehicles, wet vacuums, buckets, mops, brooms, tarps, dehumidifiers, etc.

CAMM Disaster Assistance Questionnaire

	YES	NO
1. Are you able to lend equipment? (List equipment from attached list. You may circle items on the list if you wish)	o	o
2. Are you able to lend vehicles? (List types and whether a driver is available (e.g. flat bed, truck, van, station wagon, crane truck, forklift, etc.)	o	o
3. Can you arrange for short-term storage space?	o	o
Approximate size: _		
Climate control?	o	o
Adequate security?	o	o
4. Will you send volunteers?	o	o

(List numbers of potential volunteers and areas of assistance specialty e.g. conservation, ship repair, security, construction, etc.).

5. Whom should be contacted when in need of assistance that your institution has indicated it may be able to provide?

Name:
Title:
Phone Number:
FAX #:
e-mail address:

Alternate:
Title:
Phone Number:

FAX #:
e-mail address:

Name of CAMM institution:
Address:

Appendix 11

CAMM EMERGENCY/DISASTER REFERENCE LIBRARY

The Blunt White Library of Mystic Seaport Museum, Inc. has agreed to receive, index, catalog, and make available to CAMM all the reports, publications, videos, etc. which have been accumulated during the preparation of this manual. Following is a brief index to this collection for your convenience and use.

Appendix 12
CONSERVATION INFORMATION NETWORK BIBLIOGRAPHY

There are many disaster planning and conservation bibliographies already compiled and easily accessible. One of the more complete is a bibliography compiled by Toby Murry, which appeared in Sally A. Buchanan's "Disaster Planning, Preparedness and Recovery for Libraries and Archives," a 1988 RAMP study, with guidelines, published by The United Nations Educational, Scientific and Cultural Organization (UNESCO). A copy is available in the CAMM Emergency/Disaster Reference Library at the Blunt White Library of Mystic Seaport Museum.

The most complete and up-to-date information, however, is the international Conservation Information Network (CIN). This network is a collaborative venture designed to improve the collection and distribution of information essential to the conservation and restoration of both movable and immovable cultural property. Network subscribers gain access to :

- An up-to-date bibliography of technical conservation and conservation-related literature via the Bibliographic Conservation Information Network (BCIN). Approximately 120,000 citations are currently in the database.

- Detailed information on commercial products used in conservation via the Materials Conservation Information Network (MCIN). There are currently six major product categories: adhesives, consolidants, coatings, pesticides, backing and support materials, and solvents.

- Field and lab reports on the practical application of commercial products used in conservation.

- Names, addresses, and product lines of suppliers and manufacturers of conservation products, available in a standard format from a single source via the manufacturers' conservation information network (ACIN).

- An electronic mail service that enables colleagues from various parts of the globe to consult with one another quickly, easily, and inexpensively.

- A 24-hour hotline.

Access to on-line use of these services can obtained for a one-time registration fee of $50.00 and an annual renewable fee of $35.00. The cost of searching the Network is

significantly lower than the rate charged by commercial database vendors. An IBM, IBM-compatible, or Macintosh computer with a 300/1200/2400 baud modem is all that is needed to send and receive information using the network. The Smithsonian Institution Conservation Analytical Laboratory (see Appendix 3) is a subscriber.