AASLH
TECHNICAL LEAFLET BUNDLE
A PUBLICATION OF THE AMERICAN ASSOCIATION FOR STATE AND LOCAL HISTORY

Risk Management

BNDL004

Our collections, our buildings, and our equipment make it possible for us to do what we do, but these things are subject to the insidious hunger of creepy-crawlies, opportunistic or uninformed people, and the overwhelming destructive power of nature. The impact of Katrina and the issues in the Heritage Preservation *Health Index* report released in December 2005 underscore the importance of addressing this reality. This bundle of technical leaflets will help you identify the risks that your organization's assets and collections face every day and put together a plan for successful management.

TL 147 –An Insurance Primer for the Local Historical Organization (1983)
TL 171 – A Holistic Approach to Museum Pest Management (1990)
TL 183 - Disaster Planning for Cultural Institutions (1993)
TL 206 – Protecting Cultural Heritage Properties from Fire (1999)
TL 220 - Closing the Barn Door: Dealing with Security Issues (2002)

This bundle may help institutions achieve the standards as set forth under the Mission, Vision and Governance, Stewardship of Collections, Stewardship of Historic Structures and Landscapes, and the Management section of the AASLH StEPS Program.

A A S L H

Technical Leaflet

Technical Information Service

American Association for State and Local History

An Insurance Primer for the Local Historical Organization

Arthur Flitner

Editor's note: This AASLH Technical Leaflet was originally produced by the Ohio Historical Society's Local History Office as Local History Notebook, *Volume 2, Number 4, September-October, 1986. The AASLH thanks the Ohio Historical Society for permission to reprint and distribute this publication.*

The preservation of collections is such an important objective of most local historians that the use of insurance to help achieve that objective is probably apparent in every case. Less apparent, perhaps, is the historical organization's exposure to various other hazards, any of which may be a potential threat to the organization's existence. Yet many historical organizations may feel that they lack the expertise to identify their exposures to loss and select the appropriate insurance coverages. Accordingly, this leaflet is an attempt to provide local historians with some practical guidelines on insurance and introduce them to the overall process called "risk management."

Arthur Flitner is Associate Editor of The Fire, Casualty and Surety Bulletins, *a technical insurance publication of The National Underwriter Company, Cincinnati. He is a graduate of Ohio University and Eastern Michigan University and is a Chartered Property Casualty Underwriter. He has taught insurance at the University of Cincinnati and is coauthor of the book,* Commercial General Liability, *which won the 1984 Research Excellence Award of the Society of Chartered Property Casualty Underwriters.*

"Risk management" is a broader concept than insurance. It can be described as a five step process: (1) identification of exposures to loss, (2) consideration of the various techniques of protecting against the consequences of those losses, (3) selection of the most appropriate risk management techniques, (4) implementation of those techniques, and (5) monitoring the results of the chosen techniques to make sure that they remain efficient.

The various risk management techniques and an example of each are as follows:

Exposure avoidance: By deciding not to enter a float in the Founder's Day Parade, you avoid the possibility of becoming liable for injury to others arising out of the operation of the float.

Loss prevention: To prevent burglars from entering your building, you install iron bars on all windows and doors.

Loss reduction: To reduce the damage that will be done by a fire once it starts in your building, you install a fire detection system.

Segregation of exposure units: By dividing your collection between two locations, you eliminate the possibility that a single fire will destroy your entire collection.

Contractual transfer: You lease one of your historic buildings to another organization under an agreement that requires that organization to assume responsibility for any damage to the building.

Retention of exposure: You decide not to buy insurance for your collection. You put the resulting savings into a reserve fund to pay for losses that might occur.

Insurance: You pay $1,000 to XYZ Insurance Company in return for its promise to pay for specified liability claims made against you during the coming year.

As you can see, insurance is only one of various risk management techniques. However, apart from total avoidance of an activity, it is the most certain way of escaping the consequences of loss. For organizations with limited resources, that kind of certainty may be essential to their survival. For example, an automatic sprinkler system greatly reduces the possibility that a fire could consume your entire building. But would your increased odds of surviving a fire be an adequate substitute for the certainty of having fire insurance just in case a substantial loss did occur?

As a practical matter, insurance will, in many cases, be the most feasible risk management technique, particularly for local historical organizations. The study of risk management becomes a study of insurance as far as the needs of local historians go. Nevertheless, it would be a mistake to ignore the broader aspects of risk managment in handling the loss exposures of a historical organization.

The different steps in risk management process – especially identifying loss exposures and monitoring the effectiveness of a risk management program – are essential even if insurance is the only technique used. And, there are obvious benefits to using one or more of the noninsurance techniques in combination with insurance. A fire detection system and burglar alarm, for example, will not only reduce insurance rates in many cases but will reduce the chance that irreplaceable property will be destroyed or lost.

Consequently, the approach taken here emphasizes exposures to loss and corresponding insurance coverages. Noninsurance alternatives are mentioned incidentally.

Property Exposures and Coverages

Property exposures arise out of the fact that the historical organization owns or is otherwise responsible for loss to buildings, collections, and other personal property. "Personal property" is essentially property that is movable because it is not affixed to the realty; both the historical society's collection and its other movable belongings, such as office equipment, are personal property.

The distinction between real property (i.e., buildings and other attached structures) and personal property is important because each class is ordinarily insured under separate provisions, for separate amounts of insurance, and sometimes even under separate policies. In fact, collections are usually insured separately from other personal property, as are money and securities.

Buildings

If the organization owns one or more buildings, it will obviously want to insure them against fire, windstorm, vandalism, and a host of other perils. The most thorough way of doing so is to request "all-risks" building coverage. "All-risks" does not mean that loss by any risk whatsoever is covered; it means that damage to the building by any fortuitous cause *other than those the policy excludes* will be covered. Most all-risks policies do not cover loss resulting from earthquake, flood, war, and certain perils. This does not mean that it is impossible to get coverage for the excluded perils. For example, flood insurance and earthquake insurance can be arranged under separate policies for an additional charge.

Still, the all-risks building policy is a good place to start. Look the policy over for its exclusions and limitations, and, if there are any excluded perils that you want to insure, ask your agent, broker, or insurance company if separate coverage can be arranged.

Be sure that the description of your property in the policy matches your actual holdings. If, for example, you have a carriage house behind your main museum building, the carriage house should either be described in the policy declarations sheet or the policy should have a clause that automatically extends the coverage on the main building to other structures on the premises. Similarly, if you acquire a new building during the policy period, it should be reported promptly to the insurance company.

An important point in arranging property coverage is the basis of valuation in the event of loss. Ordinarily, buildings are insured for either their "actual cash value" or their "replacement cost." If a building is insured for actual cash value, the policy holder will be able to collect no more than what the building would cost to replace *minus depreciation*. In the case of a very old historic building that has not been well preserved, actual cash value could be far below the cost to reproduce the building. Replacement cost coverage, on the other hand, pays the actual cost of replacing the building without any deduction for depreciation.

Even replacement cost coverage will not pay for the sentimental or historical value of the building though. If, because of its historical significance or physical uniqueness, a building is "irreplaceable," the risk management process referred to earlier may come into play. A historical society may decide, for example, that it would rather settle for an actual cash value (ACV) policy and put the resulting premium savings (an ACV policy is less expensive than a replacement cost policy) into a fire detection system or other means of loss control.

In extreme cases, the decision might even be made to buy no building insurance at all. The savings might be put into both loss control and a fund for repairing the building should a loss occur. The latter decision is probably ill-advised for the small, privately funded institution and is, of course, unacceptable if the property is subject to a mortgage agreement.

Collections

Collections are subject to all of the perils that buildings are, such as fire, theft, and windstorm. In addition, collections are commonly transported to other locations, whether for exhibitions, loans, or repairs. Consequently, collections may be damaged either while at or away from their regular location, by any number of perils, including the risks of transportation, such as breakage due to shifting of load or collision or overturn of the vehicle transporting them.

In many cases, the objects within a collection will be truly irreplaceable, and the value of insurance will be in question. As with historic buildings, some historical organizations may forego insurance, either wholly or in part, and spend the resulting savings on improved security and fire prevention measures. On the other hand, insurance on "irreplaceable" objects may be seen as a means of ensuring that if a loss should occur, the organization can recover an amount of money that will enable it to purchase other objects to replenish the collection.

If the decision is made to insure the collection, an all-risks form of protection is recommended. Moreover, coverage should be on a worldwide basis if there is any possibility that objects will be loaned or otherwise removed from their regular location.

An additional consideration is whether to insure the collection on a "schedule" or "blanket" basis. Schedule coverage only covers the particular objects that are specifically listed and described in the policy declarations. Blanket coverage provides an overall amount of insurance that would apply to the entire collection, without any requirement of scheduling.

Because schedule coverage is frequently used for insuring very valuable works of art, as well as certain valuable articles under homeowner policies, some insurance underwriters might feel that schedule coverage is more appropriate for collections than blanket coverage. Actually, schedule coverage should be avoided if at all possible. It is far more convenient to have a single blanket limit of insurance covering all objects in the collection than to have to list all objects in the collection, notify the insurer of all acquisitions during the policy period, and periodically update the values assigned to the various objects.

If a historical organization decides to insure only portions of its collections, the coverage can still be written on a blanket basis. However, the items on which no coverage is desired should be listed in an exclusionary endorsement to the policy. That approach is more likely to avoid the "coinsurance penalty" that may result if the *entire* collection is

insured for an amount that is less than a stipulated percentage (often eighty) of the entire collection's value.

Historical organizations may also need to buy insurance on collections that they borrow. The actual requirements will ordinarily be spelled out in the loan agreement, and any such requirements should be carefully checked against the coverage that you may already have for borrowed collections or that you may acquire for that purpose. If, for example, the loan agreement requires you to provide all-risks coverage on the borrowed objects from the time they leave the lender's walls or shelves until returned there, your insurance should provide precisely that scope of coverage.

While most all-risks policies on collections cover theft of the collection by outsiders, they ordinarily exclude dishonest acts of employees or volunteers. To cover the excluded exposure you need what is called fidelity coverage. Naturally, many historical organizations may have complete confidence that they would never become victims of an "inside job." Still, the possibility should at least be considered and a *conscious* decision made to insure or not to insure.

Other Personal Property

Most historical societies have personal property that is not part of the collection, such as office equipment, supplies, and perhaps sales merchandise if the society has a gift shop. Coverage can be arranged on either the all-risks basis discussed earlier or for "specified perils." A specified perils policy actually names the perils that are covered – fire, lightning, windstorm, hail, and vandalism – instead of excluding those that are not covered.

The best recommendation in many cases is again all-risks coverage, particularly if it does not exclude theft. Specified perils policies usually do not cover theft, requiring the policyholder to buy theft coverage under yet another form or policy if theft coverage is desired. Again, theft by an employee or volunteer ordinarily must be covered under separate fidelity coverage.

Most personal property policies flatly exclude loss of money or securities. While securities are probably not a widespread exposure among historical societies, money on the premises and in transit to bank premises may be. This is particularly likely if your organization charges admission, operates a gift shop, or holds fund-raisers. If insurance coverage is desired, it is written under a separate money form that covers virtually any type of accidental loss of money, subject to only a few exclusions.

The need for money coverage can be greatly lessened in many cases by using loss reduction techniques. For example, any time the amount of money on the premises exceeds a certain amount, an employee or volunteer can take it directly to a bank for deposit. That way, the exposure for any one loss will never exceed the maximum amount of money allowed on the premises, which could be as little as the amount of the deductible that would apply to money coverage if purchased.

Naturally, the above measure would not diminish the possibility that your organization could suffer money losses on many different occasions. That possibility demonstrates the need for monitoring loss experience to see whether the chosen risk management technique remains appropriate.

Finally, personal property policies do not cover damage to automobiles. Ordinarily any automobiles owned by the organization are insured through the same policy that covers automobile liability. However, antique autos that are part of the collections might be insured under the collections policy, depending on the underwriter's preference.

Loss of Income

If you have the types of insurance discussed so far and your insured building or collection is seriously damaged by a fire or other insured peril, your insurance company will pay for the direct loss to that property (i.e., either its actual cash value or its replacement cost, depending on which option you had chosen). But you could still suffer an additional loss in the form of lost income that you would otherwise have made had the fire not occurred. For exam-

ple, while the building was being repaired or rebuilt you would not be able to receive any admissions, and if you had a museum shop, you would not be able to make any sales. If loss of that income would threaten your organization's existence, you should consider the possibility of buying loss-of-income coverage, which can make up the income lost during the time that it would reasonably take to restore the property. In practice, loss-of-income coverage is seldom purchased by historical societies, but the loss of exposure should at least be reviewed.

Liability Exposures and Coverages

Liability exposures result from the possibility that persons or organizations injured on the historical organization's premises or by its activities may have the right to recover damages from the organization. The right to recover will more likely than not be due to the organization's negligence, but could also be based on contractual or statutory grounds. Because of the potential severity of liability losses—judgments in excess of $100,000 are commonplace—few risk management alternatives to liability insurance exist for organizations the size of historical societies. In fact, some liability coverages, such as automobile and workers compensation, are actually required by law.

General Liability

General liability insurance covers your legal responsibility to pay damages to others because of bodily injury or property damage resulting from your activities, premises, or products. A notable exception is that general liability insurance does not cover the use of automobiles, which are insured separately.

There are a number of other exclusions from coverage that need to be closely compared to your actual exposures. For example, some policies flatly exclude liability arising out of products or completed work. If your association has a gift shop, snack bar, or participates in projects to restore historic buildings, those exclusions would need to be eliminated in order to have the full scope of coverage needed for such activities. Similarly, liability for watercraft is excluded. If, for example, your association sponsors a canoe trip for its members, you could be without liability coverage for the event if additional coverage were not arranged.

A coverage supplement to the general liability policy that is worth considering is called the "broad form endorsement." This gives you a number of additional coverages, such as blanket contractual liability coverage, nonowned watercraft coverage, coverage for libel, slander, and other "personal injury" offenses, host liquor liability coverage, limited worldwide coverage, and others. Some general liability policies have these features built into them. But even the broad form endorsement is no assurance that your policy covers all of your exposures. A comparison of the policy's exclusions against your actual liability exposures is the only way to be sure of having the coverage you need.

There is no definitive answer to the question of how much liability insurance a historical society needs. Few would probably go with less than a $500,000 limit per occurrence. In some cases, the insurance company that provides the first one-half to one million dollars of coverage will not be willing to provide additional limits. Then, if higher coverage is needed, you will need to buy an "umbrella" or excess policy that provides an additional layer of coverage, ordinarily in increments of $1 million. If you buy an umbrella, you should make sure that the umbrella provides coverage that is as broad or broader than the primary policy. Also make sure that the inception and termination dates of the umbrella are the same as those of the primary policies.

In short, don't downplay the importance of high limits. The cost of increasing your limits is comparatively low. For example, if you increase your limit from $500,000 to $1 million, your cost for the additional $500,000 will only be a fraction of what the first $500,000 cost.

Beginning in 1986, many insurance companies started offering general liability policies that pay on a "claims-made" basis, instead of the "occurrence"

that was standard in the past. If at all possible, avoid buying a claims-made general liability policy. The differences between the two bases of coverage are outside the scope of this leaflet, but you should know that arranging claims-made coverage requires a high level of expertise and is, therefore, full of potential pitfalls and gaps in coverage. In comparison, arranging the traditional occurrence type policy is essentially foolproof.

Automobile Liability

If your association owns automobiles that are actually driven on the road, auto liability insurance (or other acceptable proof of financial responsibility) is required in many states. The required limits under the laws of some states are very low and should not be used as a guide to how much coverage you need. Whatever limits you have selected for general liability coverage are a better guide. If you buy an umbrella liability, it will ordinarily provide the same limits of excess coverage over both your general liability and auto liability policies.

If your organization does not own any autos, it should nevertheless carry "hired and nonowned autos coverage." This protects the historical society in the event it rents an auto and injures a member of the public or if someone, such as a volunteer, runs an errand for the organization in his or her car and injures another person. Ordinarily, the driver's auto policy will protect the association as well, but there is always the possibility that the driver's coverage will be inadequate. Hired and nonowned auto coverage is usually inexpensive and is available as either a separate policy or as an endorsement to the general liability policy.

Workers Compensation

In most states, workers compensation insurance is mandatory for all employments. By carrying the required workers compensation coverage for its employees, an employer is made immune to suits by its employees for their on-the-job injuries. If the employer fails to carry workers compensation when required, it can become subject to fines, imprisonment, or both. Moreover, the employee is permitted to sue, and the employer loses the right to assert certain key defenses against the suit.

Those who are strictly volunteers (i.e., they receive no pay for their work) are not subject to workers compensation since they are not employees. If volunteers are injured through the negligence of the historical organization, they will be able to recover damages like any other member of the public, and such damages will ordinarily be payable under the organization's liability insurance.

There is also the possibility of injuries to volunteers in the course of their duties when the organization will not have been negligent, and therefore, has no actual legal liability to pay damages. In such cases, the insurance company has no obligation to pay damages either, yet the organization may feel a *moral* obligation to its volunteers even though there is no *legal* obligation. One way to provide for such cases is to carry medical payments coverage, which pays for injuries arising out of the policyholder's premises or activities regardless of whether the policyholder is legally liable. The limit of coverage is usually far less than that for liability insurance, but it does enable the policyholder to offer *something* when there is no legal liability to pay damages.

Trustees Liability

What might be called trustees liability insurance in the context of historical associations is actually an offshoot of directors and officers liability insurance. "D&O" coverage, as it's called, protects the directors and officers of a corporation against their liability for financial loss to the corporation resulting from their "wrongful acts," apart from dishonest or illegal acts. This kind of insurance is not to be confused with general liability insurance, which only protects against bodily injury or property damage to others, but not financial loss resulting from mismanagement. Directors and officers as well as trustees are ordinarily covered by the general liability policy, but only for bodily injury and property damage liability.

Because suits against directors and officers of corporations have become commonplace in the world of business, the coverage has become quite expensive if it is available at all. Unfortunately, the underwriters who price this coverage have failed to distinguish between the high likelihood of loss in the corporate setting and the low likelihood of loss in the historical society community. Consequently, the high pricing and limited availability of D&O coverage are almost universal.

The chances of a D&O type suit against the trustees of a local museum or historical organization are almost nonexistent. In a corporation, the stockholders (and others) have the standing to sue the directors and officers for their mismanagement. In a historical society it is questionable whether anyone has the standing to sue the trustees for mismanagement, apart from the attorney general of the state where the society is located. Another possibility, again a remote one, is a suit by a benefactor who feels that his or her contributions have been mismanaged.

While there is perhaps an arguable purpose for trustees of a historical society to have D&O coverage, it needs to be weighed against the cost. If the cost is so prohibitive as to hinder the organization's objectives, the wisdom of buying the coverage falls into doubt. Of course, some individuals, having heard the horror tales of corporate D&O suits, may decline to serve as trustees of the organization unless the coverage is in place. Obviously, the desired solution is to be able to obtain the coverage for a reasonable cost.

Conclusion

The foregoing remarks are only intended as an overview of the loss exposures faced by the local history organization and a survey of the corresponding insurance coverages and allied risk management alternatives. Although the objective is to increase the reader's undertaking of the subject and his or her fluency in the language of insurance, the "little knowledge" so gained can be a dangerous thing without proper professional guidance.

Where can this professional guidance be obtained? First, there are many knowledgeable independent insurance agents or brokers. Some may possess proven experience insuring museums or historical organizations in your area, and communication with other such organizations may reveal the identity of such agents. Other agents may have had no experience insuring your kind of organization yet have the level of technical expertise that would enable them to do a thorough job. One step in the process would be to give the agent a tour of your facilities and carefully describe the different aspects of your operations. If the agent you select has passed the rigorous examinations and ethics requirements designation, that is a good indication that you are dealing with a truly professional insurance person.

Another approach is to develop expertise in insurance and risk management within your organization. A lawyer or a business person with insurance background might be among your membership already and willing to consult with the trustees or even serve as one of them. This would not do away with the need for an insurance agent or broker, but it could provide greater assurance that proper arrangements are being made. Similarly, existing trustees, staff, or volunteers can increase their knowledge of risk management and insurance through formal or informal study. For formal study, many colleges and universities offer basic insurance courses. Moreover, numerous insurance and risk management degree programs are available through the Insurance Institute of America, 720 Providence Road, Malvern, Pennsylvania 19355.

Suggested Reading

Insurance and Risk Management for Museums and Historical Societies. Hamilton, New York: Gallery Association of New York, 1985.

Pfeffer, Irving and Ernest B. Uhr. "The Truth about Art Museum Insurance," *Museum News* 52:6 (March 1974): 23-31.

Technical Leaflet 147

Technical Leaflets are published by the American Association for State and Local History. The leaflets, which are detachable from the magazine, should be catalogued as part of *History News*.

Reprints are available for $2.00 each with a minimum order of $4.00. For information on bulk rates, write to the Marketing Manager, American Association for State and Local History, 172 Second Avenue North, Suite 102, Nashville, Tennessee 37201, (615) 255-2971.

A A S L H

Technical Leaflet

Technical Information Service | American Association for State and Local History

A Holistic Approach to Museum Pest Management

by Sherry Butcher-Younghans and Gretchen E. Anderson

All museums are faced with the dilemma of how to protect their collections from destructive pests, such as moths, beetles, and silverfish. Today, chemical substances often are used to eliminate insects that plague museums. However, it is now known that many of these chemicals are unsafe for humans and can seriously damage artifacts. This leaflet reviews common pest control methods used in museums and suggests benign alternatives to chemical eradication.

Traditionally museums have relied on Para-dichlorobenzene (PDB), Naphthalene flakes, and Vapona to eliminate the most typical insects. These common household substances have been easy to procure and, with the exception of Naphthalene, which is a repellant and not an insecticide, they have largely been successful in eliminating the enemies that thrive on organic materials in collections.

Another method used by smaller museums is to contract with larger museums to have infested materials fumigated. These large museums, that are equipped with fumigation systems, often provide a service that "debugs" artifacts by using toxic chemicals, such as ethylene oxide or vikane. Still other museums opt for another method of pest control—they simply hope that an infestation does not occur in their collections; and until an infestation is noticed, pest control measures largely are ignored.

Unfortunately, all of these typical pest control methods are problematic. It is known that some pesticides that have been used faithfully and relied upon by museums are extremely toxic to humans—even with limited usage—and they can seriously damage the very objects they are meant to protect. For example, the ubiquitous moth crystals, or Naphthalene, have been linked to serious eye irritations and cataracts, as well as nausea, abdominal pain, bladder and kidney failure. Naphthalene is under investigation currently by the Environmental Protection Agency as a human carcinogen.[1] Naphthalene also is known to damage artifacts by softening resins and corroding metals.[2]

PDB is even more dangerous. When used properly, it will kill museum insects. However, it also will soften some plastics and damage feathers, leather, dyes, and bronze. Chlorine gas is formed as a by-product of PDB and, in certain circumstances, may bleach specimens.[3] Humans who come in contact with PDB may develop dermatitis, liver and kidney damage, loss of appetite, nausea, vomiting, jaundice, and liver cirrhosis.[4] Further, it has been determined recently by the EPA to be a human carcinogen.[5]

Vapona, most commonly known as "No-Pest Strips," is no longer available over the counter. However, it still is used by pest control companies as a fumigant. This pesticide is toxic to humans if exposure is prolonged and is dangerous if it is

Sherry Butcher-Younghans is on the staff of the department of anthropology and Gretchen E. Anderson is objects conservator at The Science Museum of Minnesota in Saint Paul.

inhaled or absorbed through the skin (in the same manner as Naphthalene and PDB). When exposed to organic materials, Vapona can soften glue, resins, finishes, and plastics. It also can corrode metals and damage other surfaces.[6]

A chemical frequently used in museum fumigation is ethylene oxide. Unfortunately, it is known to cause central nervous system damage and skin, eye, and respiratory infections when used in high concentrations. Lower concentrations can cause reproductive effects, such as chromosomal damage, spontaneous abortions, leukemia, and other cancers.[7] Damage also may be caused in artifact materials when ethylene oxide is absorbed into fatty tissues; it is known to induce premature aging of protein materials and cause the deterioration of adhesives.[8]

Vikane, or sulfuryl fluoride, is used also as a fumigant in museums, although it is more commonly used by licensed exterminators. It is effective in killing a variety of insects, including clothes moths, carpet beetles, silverfish, and roaches at all stages of life except possibly eggs. Vikane can either be inhaled or ingested and can be toxic when exposure is extreme. It can cause conjunctivitis, rhinitis, nausea, vomiting and abdominal pain.[9] Vikane reacts negatively with metals, cellulose, and proteins.[10]

Even polyethylene bags commonly used to protect artifacts during fumigation may be hazardous because plastics are known to absorb and retain the fumigants or chemicals. Eventually the bags, or the artifact itself (if it was fumigated uncovered), will release the chemical into the air in the work environment. During this "gassing off" period, which can take weeks or even months, museum staff are at risk.[11]

Some of the problems relating to chemical use in museum pest control have been outlined, but what methods are available to museum staff that both will eliminate insects and be harmless to humans? Research on this question has been conducted for many years and continues to be investigated. At present the most widely approved method is the use of freezing artifact materials to rid them of pest infestations.

Freezing as a Safe Alternative to Chemicals in Museum Pest Control

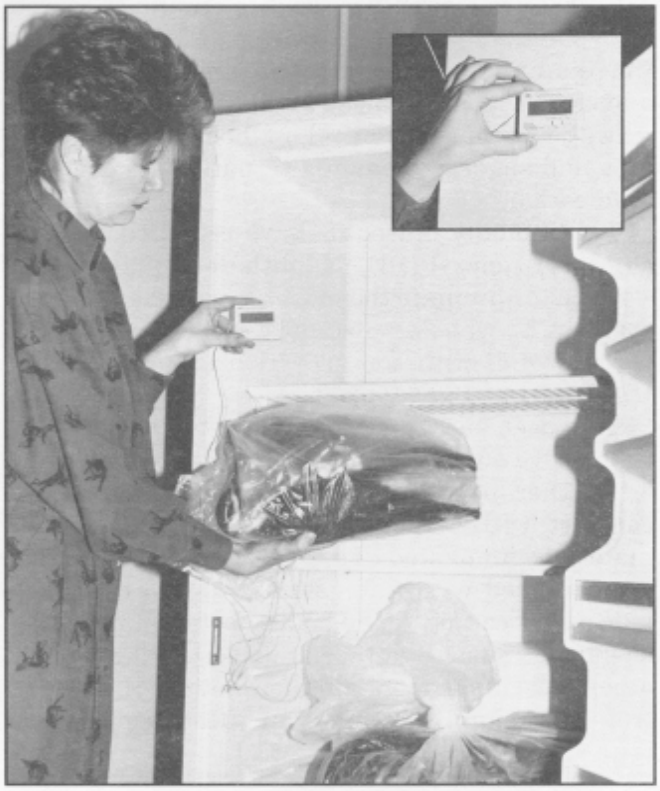
Freezing, as a pest elimination method, is advantageous because it can be used on most objects that are infested with pests, and it has a 100% kill rate when done properly. The freezing method is simple, inexpensive, readily accessible, and non-hazardous to humans. It only requires the acquisition of a common household freezer, either chest style or upright.

Freezing artifacts should be used to eliminate pests whenever possible. There are only a few cases where freezing organic materials may not be optimal. (These are outlined below.) The process of freezing insects has been known by entomologists for many years.[12] What was unknown was how the combined process of freezing and thawing affected organic materials. Since these questions were asked, ten years of research have been conducted, and the results of this research have been published.

The leading researcher in this area is Mary-Lou Florian, a conservation scientist from the British Columbia Provincial Museum. Florian has reviewed and critiqued the existing literature, in addition to conducting her own research on the effects of freezing on artifact materials. Because of her work and the wide acceptance of this method by museum conservators, many museums have implemented this freezing technique to eradicate insects.

How Does Freezing Work?

Freezing to eradicate insects works on most artifact materials susceptible to infestation. The basic principle in the freezing and thawing cycle is that living cells are composed of 90% water. During the freezing process, this water crystallizes and turns



Photographs by Tim Ready.

Placing bagged objects into freezer and situating thermo-couple probe. **Inset:** *A thermo-couple is attached to the door for reading interior temperatures.*

into ice. This expansion, resulting from the phase change of liquid into solid, causes the cell walls to rupture, consequently killing the living organism. The freezing procedure is effective because it will kill all stages of insect life present on an artifact. In most cases freezing will not harm the organic artifact material that is infested because dry artifacts do not contain enough water to sustain cell damage when frozen.[13]

It is important to freeze infested materials as quickly as possible (from room temperature to -20° C within eight hours) and maintain the temperature for forty hours. After this time has elapsed, the materials can be removed from the freezer and slowly thawed at room temperature. The freeze/thaw cycle must be adhered to closely to ensure that insects do not develop a freeze resistance or "anti-freeze" that allows them to survive the freezing process. When freeze/thaw cycles are repeated, they destroy the insects' ability to produce "anti-freeze."[14]

Steps in the Freezing Procedure

The freezing process is simple and effective in eradicating insects with the added advantage that it kills the spores of mold and mildew.

1. Isolate infested objects that qualify for the freezing procedure. (Not all museum objects can be frozen; refer below to listing of which ones qualify for the freezing procedure.)

2. Place the object in a clear polyethylene bag and remove as much air as possible. This reduces the amount of moisture present in the air that surrounds the object, thus helping to eliminate condensation on the object and the inside of the bag. Seal the bag with a twist tie or tape. Use caution in placing the object in the bag making sure not to puncture the bag or to damage the artifact. (Place one object per bag.)

3. Keep the object at room temperature (above 18° C) until the freezing procedure is started. If the object has been in a cool environment just prior to freezing, it is necessary to allow it to warm to room temperature before starting the cycle. This ensures that the insects will sustain fatal cell damage.

4. Place the bagged object in the freezer, making certain that the air can flow around it.

5. Use an indoor-outdoor thermometer (thermocouple) to monitor the temperature of the object and the surrounding air. This can be done by placing the probe end of the thermometer in or near the bag inside the freezer and placing the display component outside the freezer door. The temperature should drop to -0° C within four hours and to -20° C within eight hours. These temperatures are optimum for eradicating pests without putting undue stress on the objects.

6. Maintain a temperature of -20° C for a minimum of forty hours.

7. After the appropriate time has elapsed, remove the bagged object from the freezer and let it slowly come to room temperature. If possible, place it in a refrigerator to slow down the thawing process. The faster the freeze and the slower the thaw guarantees the death of the insects.

8. After the object has thawed to room temperature, repeat the freeze-thaw cycle. This is necessary to ensure the 100% kill rate when the freezing procedure is done accurately.

9. After the second freeze/thaw cycle has been completed, remove the object from the bag and examine it. Clean off insect remains and frass (debris left behind by insects) by gently vacuuming, brushing, or removing by hand.

10. Keep records of all freezing procedures, including the length of time the object remained in the freezer, the temperatures that were attained, and the reasons for freezing (suspected or active infestation). This will provide documentation for the history of the artifact's infestation and will supply the museum with pest control information.

What Artifact Materials Can Be Frozen?

Most artifacts susceptible to insect infestations are organic materials. These include wool, hair, hide, horn, feathers, baleen (i.e. substances composed of protein), wood, textiles, plastics, and plant materials (fibers, seeds, botanical specimens). Most of these objects can be frozen safely because any water condensing from the air around them will be absorbed into their structure. This will not, in most cases, cause permanent changes in the material.

Extreme caution should be exercised when freezing objects that are made up of a combination of materials. Different materials that are combined in one artifact have different strengths under extreme cold, and some become more brittle or fragile than others. Also, different materials expand and contract at different rates. This has the potential of causing serious problems. For example, caution needs to be taken when considering freezing painted,

wooden objects, where the wood contracts at a different rate than the painted surface.

During the freezing process, temperatures should never go below the specified range of -20° to -30° C. When temperatures go below this range, the shear strength of certain glues is altered; in some cases the glue becomes weaker and in others stronger.[15]

Other materials that should not be frozen are inorganic, non-absorbent materials, such as metals, minerals, ceramic, and glass. Freezing is not recommended with these materials because condensation of water droplets from the air may form on the surface of the non-absorbent materials causing corrosion and surface deterioration. Condensation may also cause cracks that already are present to expand. Fortunately, artifacts made of inorganic materials are **NOT** susceptible to any kind of insect infestation.

Please note: Freezing of objects does not take care of every situation. Some objects are too large to be frozen; others cannot be frozen because of their fragile nature or structural make-up. It may be necessary to use chemical intervention in some cases. If this is necessary:

1. Be informed of state and Occupational Safety and Health Administration standards for the use of chemicals in museums. Be aware of health hazards and of damage that chemicals may cause to collections.

2. Do not fumigate indiscriminately—deal with the specific problem, keeping the use of chemicals to a minimum.

The Freezer and Other Necessary Equipment

The type of freezer chosen for pest eradication is dependent upon what is available and applicable to your collections. Either an upright or a chest freezer works well for most museum collections. Each type freezer has advantages and disadvantages.

An upright freezer takes up less floor space than a chest style. It has adjustable shelves for easy access, and it provides excellent air flow around the objects. The drawback to this type freezer is that larger objects can be difficult to work with because of the interior spatial arrangement. However, if shelves can be removed to accommodate larger objects, some problems can be eliminated.

A chest freezer can accommodate larger items with less stress to the objects. However, it is harder to load objects into the freezer so that the air circulation remains good. One way to eliminate this problem is to use self-supporting shelves that are available at hardware stores. These shelves can be set up in the interior of the freezer to accommodate objects of different sizes. By using these, the air will circulate more freely around the objects, allowing for a fast and even freeze.

Conclusion

Freezing, and all other methods of pest control (toxic and non-toxic), must be viewed as part of an overall collections management program. By instituting an integrated pest management program where all incoming objects are monitored carefully, good housekeeping methods are practiced, and periodic checks are made, it is possible to minimize insects in the museum environment. When insect elimination is necessary, freezing should be used in those cases where it is possible. If other methods are required, due to artifact composition or size, the most prudent steps must be taken to protect the handler and the object.

The Enemy

Minimize Pests by Using Prevention

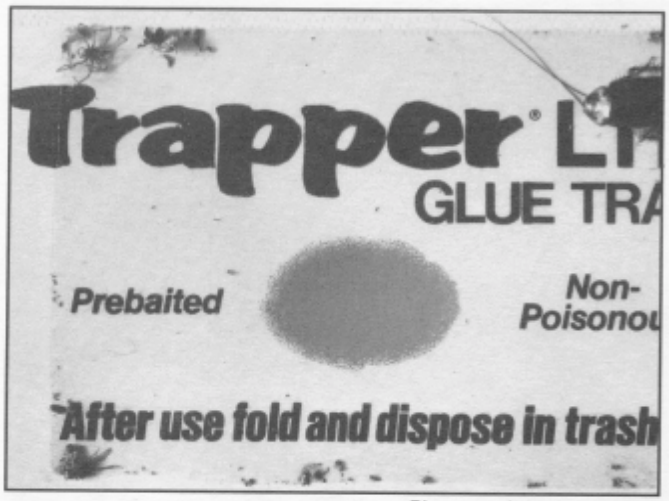
An important first step in controlling pests in the museum environment is to develop and implement a serious pest control policy. Fundamental features of a workable policy should include *prevention* coupled with safe elimination of pests in the case of an infestation.

Prevention

Preventing a pest infestation from occurring in your museum can be achieved by good housekeeping and frequent monitoring of collections. If done painstakingly, these critical safeguards will assist in preventing the nuisances of pest infestation.

Good housekeeping must be done regularly and thoroughly. By keeping exhibit and collections areas clean, fewer materials will be available on which insects may feed, therefore making it easier to keep pests in check. Also, clean and uncluttered shelves allow any pests present to be spotted immediately. The following are suggestions that should be included in a pest control policy:

• Always keep food away from artifacts. Have a central location for staff food consumption, preferably at a distance from the collections. Because insects can be carried in on plants and similar materials, these too should be kept away from artifact areas.



Photograph by Tim Ready.

Glue trap with a variety of insects stuck fast. These traps are placed in areas to monitor pest activity, enabling pests to be identified for elimination purposes.

• Since dust and lint can harbor insects and provide them with a food supply, an active cleaning policy should be maintained to remove these attractive materials.

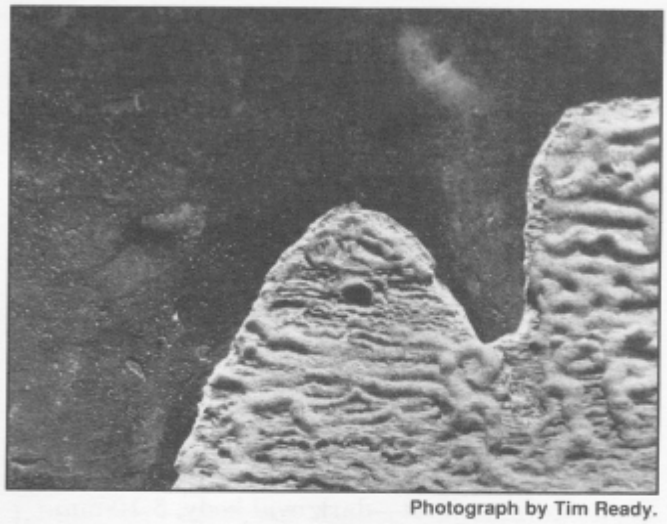
• Keep areas uncluttered so that any insect activity present will not be missed. Line shelves in storage areas with light colored paper, such as acid-free or blotter paper or ethefoam, to allow easy detection of pests.

• Frequent monitoring of both exhibit and collection areas will keep you aware of any infestation that may be viable. Collection checks should be conducted every several months, and sensitive artifacts (i.e. textiles, fur, feathers), should be checked even more frequently. Accurate records and detailed reports should be kept during each check.

• An easy way to identify pests that may be in collections is by setting out sticky traps (glue boards) around storage areas. These traps capture insects and hold them in place. From these traps insects can be identified and the appropriate steps taken to eliminate them.

• Make certain that all windows and doors are sealed tightly. Any windows that will be opened need to have screens. Keeping filters in place for intake vents prevents insects from being pulled into the museum interior. Filters should be changed when needed.

• By controlling the humidity and temperature in the museum environment, certain pests can be reduced, such as the silverfish.[16]



Photograph by Tim Ready.

Channels made in a Mexican mask by wood-boring insect (possibly powderpost beetle). Insect damage caused the mask to split.

Common Museum Pests

The following list is a selection of the most common insects found in the museum environment:[17]

Clothes Moths

Casemaking Clothes Moth

Identification: adult—light brown with three spots on front wing, 7-9 mm; larva—white, 7-8 mm.
Damaging stage: larva; adults do not feed.
Detection: adults flying, larva, silken tubes (casings), feeding damage.
Life cycle: usually two generations per year; prefers dry conditions.

Webbing Clothes Moth

Identification: adult—white to yellow, bronze head, 8-10 mm; larva—whitish, fleshy, 8-10 mm.
Damaging stage: larva; adults do not feed.
Detection: feeding holes, hair and fur cut from pelts, matted fibers, debris, and insect frass.
Life cycle: 1-2 years, variable as to conditions; are nocturnal.
Food source: hair, fur, wool, feathers, hide, uncleaned bone, insect collections; will damage plant materials and synthetic fibers while looking for a food source, like stained textiles.

Dermestid

Black, Varied, and Furniture Carpet Beetle

Identification: black adult—oval, black, 3-5 mm;

larva—dark brown, tapered, short body hair with longer hair at tail, 8 mm.
Varied and furniture adult—oval, black with orange or yellow patterns, 1.8-3.0 mm; larva—black, hairy, 2-4 mm.
Damaging stage: larva.
Detection: feeding damage (holes, loose hair), cast larval skins; adults congregate at windows and light fixtures.
Life cycle: 1-2 generations per year.
Food source: animal fibers (wool, hair, silk), feather, felt, leather, hide, dead insects, and seeds.

Hide Beetle

Identification: adult—dark oval body, 5-10 mm.
Damaging stage: larva, adult.
Detection: feeding damage, cast larval skins; adults at windows, near lights.
Life cycle: 1-2 generations per year; larva like the dark; larva will bore into wood to pupate.
Food source: hide, skins, smoked meat, dead insects, animal hair, and feathers.

Larder Beetle

Identification: adult—oval, black above, white below, 6-7.5 mm; larva—brown to black with lighter median lines, hairy, tapered with two horns near tail end, 10-13 mm.
Damaging stage: larva and adult; larva will bore into wood or cardboard to pupate.
Detection: adults crawling or flying; cast larval skins.
Life cycle: 30-45 days, like humid environment, diurnal or nocturnal.
Food source: dead flesh, hide, horn, feathers, and mummies (used to clean bones in museums).

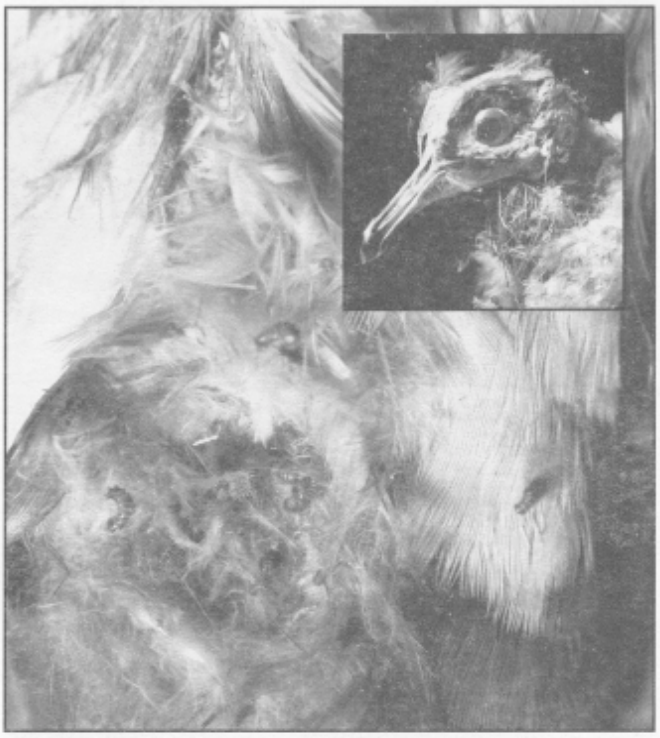
Odd Beetle

Identification: adults—oval, yellowish-white, 2-3 mm; larva—C-shaped, brown, bristly hair, 3 mm.
Damaging stage: larva
Detection: feeding damage; adults flying; cast larval skins.
Life cycle: 1 generation per year; like the dark.
Food source: insect collections and fibers (cotton, silk, wool, etc.).

Wood Boring Beetles

Powderpost Beetle

Identification: adults—red to black, 2-5 mm; larva—white with brown head, C-shaped, 3-5 mm.
Damaging stage: larva.

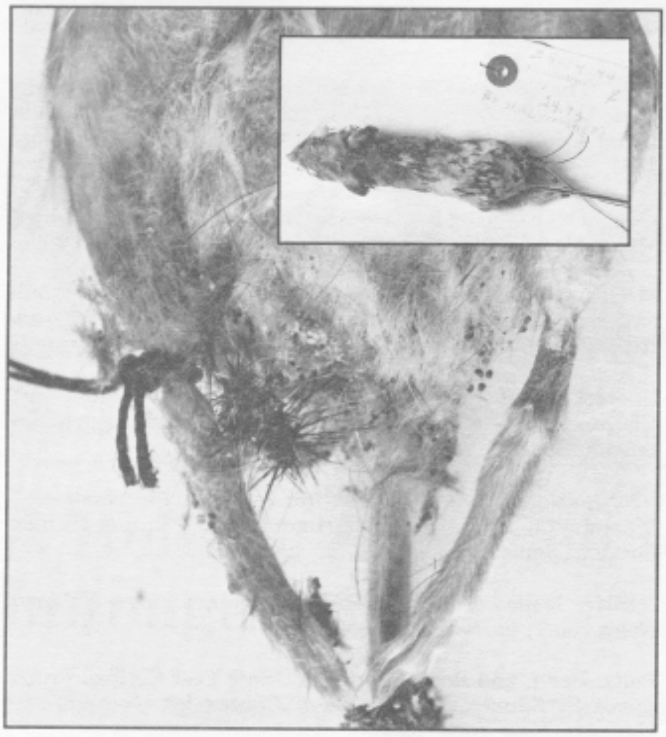


Photographs by Tim Ready.

Pigeon mount with dermestid and moth infestation. Odd beetle larvae are visible in the feathers.

Photograph by Tim Ready.

Right: *Ermine-skin tubes from a Blackfeet bonnet after severe moth infestation.* **Left:** *Tubes from the reconstructed bonnet.*



Photographs by Tim Ready.

White-footed mouse study skin from collection storage with evidence of moth infestation.

Detection: exit holes of adult, fine powdery dust beneath holes; tunnels in broken wood.
Life cycle: varies, mostly live inside wood so are rarely seen.
Food source: hardwoods, bamboo, and basketry.

Bamboo Powderpost Beetle

Identification: adult—dark brown, 2.5-3.5 mm; larva—white with brown heads, 3.5 mm.
Damaging stage: larva and adult.
Detection: exit holes.
Life cycle: 50-75 days.
Food source: bamboo.

Silverfish and Firebrat

Silverfish and Firebrat

Identification: silver gray with darker marks; up to 12.5 mm long.
Damaging stage: nymph and adult.
Detection: feeding damage, sightings.
Life cycle: 1-3 generations per year; like humid conditions. Firebrats prefer warmer environments (90-110° C ideal).
Food source: paper, starchy food, paste, textiles (rayon), cotton, linen, and book bindings; will eat protein based foods.

Cockroach

German Cockroach

Identification: Adult—tan with dark strip on prothorax; up to 12.5 mm long.
Damaging stage: nymph and adult.
Detection: feeding damage, egg casings, and excrement.
Life cycle: 2-3 generations per year.
Food source: starchy materials, sugary or fermented foods, leather, parchment; omnivorous.

Endnotes

1. Peltz, Perri, and Rossol, Monona. "Safe Pest Control Procedures for Museum Collections." Center for Occupational Hazards, 1983, 4-5.

2. McGiffin, Robert F., Jr. "A Current Status Report on Fumigation in Museums and Historical Agencies." Technical Report 4. Nashville, TN: American Association for State and Local History, 1985, 6.

3. Peltz and Rossol, 4-5.

4. Peltz and Rossol, 4-5.

5. Personal communication from Angela Babin, director of Center for Occupational Hazards (August 1989).

6. McGiffin, 6.

7. *Art Hazard News*, vol. 7, no. 6 (July/August 1984): 1.

8. Peltz and Rossol, 4.

9. Peltz and Rossol, 5.

10. "Vikane Holds Potential as a Museum Fumigant." *The Getty Conservation Institute Newsletter.* vol. 3, no. 1 (Winter 1988): 6.

11. Florian, Mary-Lou. "The Effect on Artifact Materials of the Fumigant Ethylene Oxide and Freezing Used in Insect Control." International Council of Museums Committee for Conservation, 1987, 200.

12. Florian, Mary-Lou. "The Freezing Process—Effects on Insects and Artifact Materials." *Leather Conservation News,* vol. 3, no. 1 (1986): 1-13.

13. Florian, "The Freezing Process." 1-5.

14. Florian, "The Freezing Process." 3.

15. Florian, "The Freezing Process," 5. (Also see, Florian, "The Effect on Artifact Materials," 203.)

16. Thomson, Garry. *The Museum Environment.* London, 1978, 86.

17. Edwards, Stephen; Bell, B.M; and King, M.E. *Pest Control in Museums: A Status Report.* Lawrence, Kansas, 1988: Appendix B, 1-20; and Story, Keith O. *Approaches to Pest Management in Museums.* Washington, D.C., 1985, 5-50.

Suggested Bibliography

Alpert, Gary, and Alpert, Michael. "Integrated Pest Management: A Program for Museum Environments." Unpublished paper available through Archos, Inc., Cambridge, Massachusetts.

Ascerno, Mark, and Hahn, Jeffery D. "Cockroaches." University of Minnesota: Agricultural Extension Service, 1985.

——. "Pantry Pests." University of Minnesota: Agricultural Extension Service, 1988.

Brandt, Charles Alfred Edwin. "Planning An Environmentally Benign Fumigator/Freeze Dryer for the Provincial Archives of Manitoba." Winnipeg, Manitoba: Provincial Archives of Manitoba, 1983.

Collins, Mark, and Barker, Nicholas J. "Direct Monitoring of Ambient Air for Ethylene Oxide and Ethylene Dibromide." *American Laboratory*, (July 1983): 72-82.

Cutkomp, L. K., and Ascerno, Mark. "Silverfish and Firebrats and Their Control." University of Minnesota: Agricultural Service, 1981.

Department of Entomology. "Powderpost Beetles." University of Minnesota, 1985.

——. "Wood Borers, Bark Beetles, and Seed Insects in Houses." University of Minnesota, 1985.

Deschiens, Robert, and Coste, Christine. "The Protection of Works of Art in Carved Wood from the Attacks of Woodeating Insects." *Museum*, X (1957): 55-59.

Edwards, Stephen; Bell, B.M.; and King, M.E. *Pest Control in Museums: A Status Report*. Lawrence, Kansas: Association of Systematic Collections, 1988.

"Examining for Insect Infestation." Ottawa, Canada: Canadian Conservation Institute, April 1986.

Fisher, Abby Sue. "Pest Busters." Washington, D.C.: The Textile Museum, 1985.

Florian, Mary-Lou. "Control of Biodeterioration: Methodology Used in Insect Pest Surveys in Museum Buildings—A Case History." International Council of Museums Committee for Conservation, 1987.

——. "The Effect on Artifact Materials of the Fumigant Ethylene Oxide and Freezing Used in Insect Control." International Council of Museums Committee for Conservation, 1987.

——. "The Freezing Process—Effects on Insects and Artifact Materials." *Leather Conservation News*, vol. 3, no. l, 1986.

McGiffin, Robert F., Jr. "A Current Status Report on Fumigation in Museums." Technical Report 4. Nashville, Tennessee: American Association for State and Local History, 1985.

Noetzel, D. M., and Ascerno, Mark. "Carpet Beetles and Clothes Moths." University of Minnesota: Agricultural Extension Service, 1981.

"Occupational Health Guideline for p-Dichlorobenzene." Washington, D.C.: U.S. Department of Health and Human Services September, 1978.

"OSHA Issues Ethylene Oxide Standard." *Art Hazards News*, vol. 7, no. 6 (July/August 1984).

Peltz, Perri, and Rossol, Monona. "Safe Pest Control Procedures for Museum Collections." Center for Occupational Hazards, New York, 1983.

Proctor, Nick H., and Hughes, James P. *Chemical Hazards of the Workplace*. Philadelphia: J. B. Lippincott Company, 1984.

Story, Keith O. *Approaches to Pest Management in Museums*. Washington, D.C.: Smithsonian Institution, 1985.

Thomson, Garry. *The Museum Environment*. London: Butterworths, 1986.

"Vikane Holds Potential as a Museum Fumigant." *The Getty Conservation Institute Newsletter*, vol. III, no. 1 (Winter 1988).

Waddington, Janet, and Fenn, Julia. "Health and Safety in Natural History Museums: An Annotated Reading List." Toronto, Canada: Royal Ontario Museum, 1986.

Technical Leaflet #171, "A Holistic Approach to Museum Pest Management," *History News*, Volume 45, Number 3, May/June 1990.

Technical leaflets are issued by the American Association for State and Local History to provide the historical agency and museum field with detailed, up-to-date technical advice. Technical leaflets and reports are available through *History News* magazine to AASLH members or through the AASLH Press catalog to any interested buyer. Membership information or technical leaflet or report reprints may be ordered by contacting American Association for State and Local History, 172 Second Avenue North, Suite 202, Nashville, TN 37201, (615) 255-2971, FAX (615) 255-2979.

American Association for State and Local History endorses no particular product, service, or institution.

A A S L H

TECHNICAL LEAFLET

AMERICAN ASSOCIATION FOR STATE AND LOCAL HISTORY

Disaster Planning for Cultural Institutions

by Beth C. Lindblom and Karen Motylewski

Natural disasters such as Hurricane Andrew's August 1992 assault on southern Florida and Louisiana make all of us acutely aware of our vulnerabilities to disaster. Fortunately, catastrophes of this magnitude are rare, but disaster can strike in many ways. For example, a broken water main inundated the Chicago Historical Society in 1986; fire severely damaged the Cabildo in New Orleans in 1988; the Loma Prieta earthquake damaged several San Francisco museums in 1989; smoke from an electrical fire covered collections throughout the Huntington Gallery in 1985; mold damage threatened Mount Vernon's archival collections. Large or small, natural or man-made, emergencies put an institution's staff and collections in danger.

In its twenty years of service, the Northeast Document Conservation Center (NEDCC) has advised hundreds of institutions through its emergency disaster assistance program (now a part of the field service program and largely funded by the National Endowment for the Humanities). It is unfortunate that conservation and museum professionals often learn about the advantages of emergency preparedness through hard experience, but an emergency does not have to become a full-fledged disaster. In fact, hazards can often be mitigated or avoided altogether by a comprehensive, systematic, emergency preparedness program. Such programs provide a means for recognizing and preventing risks, and for responding effectively to emergencies.

An increasing number of professionals know that small-scale emergencies can be contained if staff members are prepared to react quickly. Damage can be limited even in the face of a large-scale disaster. For example, cultural institutions in Charleston, South Carolina, formed a consor-

tium that focused on disaster preparedness several years before they were hit by Hurricane Hugo in 1989. Many of those institutions sustained only minor damage because they were able to activate their early-warning procedures.

Disaster planning is complex; the written plan is the end result of a wide range of preliminary

Historically appropriate drainage strategies are available for historic house museums. Note the wooden chute and the gravel bed used to reduce water in the basement of this nineteenth-century building. Photo courtesy of the Exeter Historical Society, Exeter, New Hampshire and Northeast Document Conservation Center, Andover, Massachusetts.

activities. The entire process is most efficient if it is formally assigned to an individual who acts as the disaster planner for the institution and is perhaps assisted by a planning team or committee. A museum director may play this primary role or may delegate the responsibility, but it is important to remember that the process must be supported at the highest level of the organization if it is to be effective. The planner should establish a timetable for the project and should define the scope and goals of the plan, which will depend largely on the risks faced by the institution.

For any museum or historical collection, the risk of disaster is a combination of environmental hazards plus the vulnerabilities of buildings, mechanical systems, and collections. An institution-wide risk survey is the best way to assess these factors. Research into past events and previous problems will also help identify dangers. An article of this length cannot cover all of the possibilities, but there are many helpful guides in interactive computer programs, published books and articles, and technical leaflets from regional conservation programs.

Identifying Risks

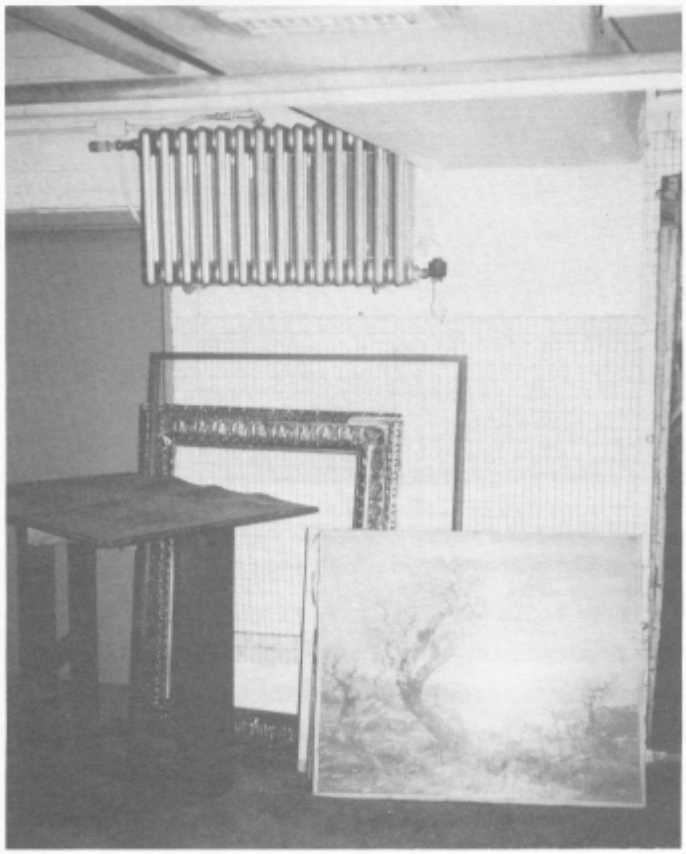
A prudent first step is to list geographic and climatic hazards and other risks that could jeopardize your building and collections. These might include your institution's susceptibility to hurricanes, tornadoes, flash flooding, earthquakes or forest fires, and even the possibility of unusual hazards such as volcanic eruptions. Consider man-made disasters such as power outages, sprinkler discharges, fuel or water supply failures, chemical spills, arson, bomb threats, or other such problems. Take note of the environmental risks that surround your institution. Chemical industries, shipping routes for hazardous materials, and adjacent construction projects all expose your institution to damage. While all institutions are not vulnerable to all disasters, any event that is a real possibility should be covered under your emergency plan.

Look carefully at your building and site. Check the surrounding terrain. Is the building located on a slope? Is the basement above flood level? Are there large trees near the building? Are such things as utility poles and flagpoles secure? Is the roof flat? Does water accumulate? Do gutters and drains work properly? Are they cleaned regularly? Are windows and skylights well sealed? Is there a history of leaks or other building and structural problems?

Within the building, fire protection systems, electrical systems, plumbing, and environmental systems are primary areas of concern. Are there enough fire extinguishers, and are they regularly inspected? Does the building have fire alarms and a fire suppression system? Are they well maintained? Are they monitored twenty-four hours a day? Are fire exits blocked? How old is the wiring? Is it overloaded? Are electrical appliances unplugged at night? Is auxiliary power available if needed? Are water pipes in good shape? Are there water detectors, and do they work? Are there any problems with the climate control system? You may have already thought of many other questions, and you should create a risk assessment checklist of your own.

It is also important to determine the vulnerability of the objects within the collections. What

types of materials are included? Are they easily damaged? Are they particularly susceptible to certain types of damage such as moisture, fire, breakage, and the like? How and where are collections stored? Are they protected by boxes or other enclosures? Is shelving anchored to structural elements of the building? Is it stable? Are any artifacts stored directly on the floor, where they could be damaged by leaks or flooding? All items should be raised at least four inches from the floor on waterproof shelves or pallets. Are materials stored under or near water sources? Analyze your security and housekeeping procedures. Do they expose collections to the dangers of theft, vandalism, or insect infestation?



Collection items stored directly on the floor or under climate-control equipment or air outlets are susceptible to damage from water, smoke, climate, and pollutants. Photo courtesy of Northeast Document Conservation Center, Andover, Massachusetts.

Consider administrative vulnerabilities. Are your institution's collections insured? Is there a complete and accurate inventory? Is a duplicate of it located at another site? Have collection priorities been set? In other words, do you know which collections should be salvaged first in the event of fire, water, or other emergency? Do you have a back-up priority list if you cannot reach the highest priority objects due to building damage or the nature of the disaster?

While these questions may seem overwhelming by the time you complete your survey, you will have a good idea of the significant risks your institution faces. Although there may be a wide range of disaster scenarios, events most commonly result in water, fire, physical, or chemical damage, or some combination of these. The specific procedures of a disaster plan focus on the prevention and mitigation of these types of damage.

Decreasing Risks

Once your institution's hazards are specified, the disaster planner should devise a program with concrete goals, identifiable resources, and a schedule of activities for eliminating as many risks as possible. Geography and climate cannot be changed, but other vulnerabilities can be reduced. If building and collections conditions are regularly monitored, repaired, and improved, many emergency situations will be forestalled.

A regular program of building inspection and maintenance should be a very high priority if one is not already in place. It can prevent or reduce common emergencies resulting from burst pipes, defective climate control equipment, worn electrical wiring, clogged drains, or other problems. If all improvements cannot be undertaken at once, make a schedule and follow it. If some items on your schedule prove impossible or are delayed, move on the next goal and return to the earlier problem when it becomes more practical.

Once building systems are in proper working order, devise a maintenance schedule. Patchwork repairs and deferred maintenance only result in accelerated deterioration, leading to an increased risk of emergencies. Keep a log of building events like clogged drains, furnace cleaning, and equipment failures. The more you know about your building and its operation, the faster (and more economically) repairs can be made.

While water damage is the most common form of disaster for museums, every institution with collections of enduring value needs a good fire-protection system. Since the bulk of emergencies

seem to happen outside normal working hours, reliable detection systems on professional, twenty-four hour monitors are a wise investment. Such systems should be designed and installed by professionals with experience in servicing museums and libraries, because the needs of institutions differ from the needs for home protection. Talk to colleagues and other local institutions or a conservator in your region for recommendations, and always check references.

A well-maintained roof is one of the best protections for the museum building and the artifacts it holds, but collections are very vulnerable during repairs and construction. Be sure your contract includes precautions against damage to your holdings, and that your emergency plan is completed before work begins. Photo courtesy of Northeast Document Conservation Center, Andover, Massachusetts.

Other actions that reduce building and collection vulnerability include maintaining a collection inventory, improving collection storage, and following good security and housekeeping procedures. An inventory will provide a basic list of holdings to assist in assigning priorities for salvage and will be essential for insurance purposes. Improved collection storage, such as boxing and raising materials above the floor level, will reduce or eliminate damage when emergencies occur. Comprehensive security and housekeeping procedures will ward off emergencies such as theft, vandalism, and insect infestation. They will also ensure that fire exits are kept clear and fire hazards eliminated.

A Cooperative Plan

Disaster planning should not happen in a vacuum. To work effectively, it must be integrated into the routine operating procedures of the institution. In fact, you will probably find that in planning for disasters you will also be working toward the accomplishment of other goals. For example, a properly functioning climate control system will prevent fluctuations in temperature and relative humidity, resulting in a better preservation environment and a longer life for all collections. At the same time, this prevents disasters such as water leaks from air-handling units. Similarly, if an institution surveys its collections and creates an inventory for purposes of disaster planning, a corollary benefit is better access to the collections for exhibits, researchers, and staff.

Remember three important characteristics of an effective disaster plan: comprehensiveness, simplicity, and flexibility. The plan needs to address all types of emergencies and disasters that your institution is likely to face. It should include plans for both immediate response and long-term salvage and recovery efforts. The plan should also acknowledge that normal services may be disrupted. How will you proceed if there is no electrical power, no water, and no telephone?

The plan must be easy to follow. People faced with a disaster often have trouble thinking clearly, so concise instructions and training are critical to the success of the plan. The key is to write in a clear, simple style without sacrificing comprehensiveness. Above all, remember that you cannot

anticipate every detail, so be sure that while your plan provides basic instructions it also allows for on-the-spot creativity.

Decide who will be responsible for various activities when responding to an emergency. Who will be the senior decision maker? Who will interact with fire officials, police, or civil defense authorities? Who will talk to the press? Who will serve as a back-up if any of your team members are unable to get to the site? Identify a location for a central command post (if necessary) and space for drying collections. Set up a system for relaying information to members of the salvage team. Because written information is susceptible to misunderstanding, your communications strategy might include notes to be delivered by "runners." Good communication is essential to avoid confusion and duplication of effort in an emergency.

Finally, if the planning process seems overwhelming, approach it in stages. Decide what type of disaster is most likely to occur in your institution, and begin to plan for it. The plan can always be expanded to include other scenarios.

Identifying Resources

Some important steps should be taken before you write your plan. First, identify sources of assistance in a disaster. Determine the supplies you will need for disaster response and salvage efforts for your specific collections. Basic supplies like polyethylene drop cloths, sponges, flashlights, and rubber gloves should be purchased and kept on hand. They should be kept in a clearly marked location, inventoried periodically, and, if necessary, replaced. If you choose to lock the cabinet containing the supplies, make sure the keys will be available in an emergency. A sample list of basic supplies is included with this article (See sidebar). Keep a list of additional supplies that might be needed. This list should include suppliers' names, addresses, and phone numbers, and should provide back-up sources for supplies. Arrangements should also be made for emergency cash or credit, because it is sometimes difficult to get money quickly in a disaster situation.

In recent years, many disaster-planning guides have published lists of supplies and companies that provide disaster services as well as sources of technical assistance. Research these services thoroughly—it is an essential part of the planning process. If possible, invite local service providers to visit your institution to become familiar with your site plan and collections in advance of an emergency. It is also a good idea to plan for back-up companies to provide critical supplies and services in case there is a community-wide or regional disaster. Consider coordinating with other local institutions. You may be able to make arrangements to borrow supplies, expertise, or labor in the case of a small-scale disaster.

Damage on the inside of a building often means problems on the outside. The plaster deterioration at the window is from water flowing down the planted hill. Drains left out of the original design had to be installed later at a higher cost than they would have meant during construction. Photo courtesy of Northeast Document Conservation Center, Andover, Massachusetts.

The disaster planner should identify all appropriate disaster response and recovery services. These can range from police, fire, and ambulance services to maintenance workers, insurance adjusters, and utility companies. Several national companies provide disaster recovery services such as dehumidification and vacuum freeze-drying. Liaisons should be maintained with local emergency services so that they can respond appropriately in case of disaster. For example, you may want to provide the fire department with a list of high-priority areas to be protected from water if fire-fighting efforts permit. You may be able to arrange with the fire department to allow specific staff members from your institution to enter the building for evaluation or salvage if safety allows. It may be possible to rope

Problems inside usually mean problems outside. This damaged ceiling requires evaluation of the roof to determine what repairs are necessary. Photo courtesy of Northeast Document Conservation Center, Andover, Massachusetts.

off areas for arson investigation while allowing accessibility to other areas. All such agreements must be organized in advance for efficient responses.

Other valuable sources of assistance are local, state, or federal government agencies. While it is widely known that the Federal Emergency Management Agency (FEMA) provides disaster assistance programs, institutions may not be aware that these programs can include art objects and cultural resources. An October 1991 FEMA policy change allows federal assistance to pay for conservation of art objects that are damaged in a disaster. Conservation is defined by FEMA as "the minimum steps which are both necessary and feasible to place the items back on display without restoring them to their pre-disaster condition." FEMA does not cover the replacement of destroyed items.

Setting Priorities

The first priority in any disaster is human safety. Saving collections is never worth endangering the lives of staff or patrons. In a major event, the fire department, civil defense, or other professionals may restrict access to the building until it can be fully evaluated. Once safety concerns are met, the next consideration will be to protect records and equipment crucial to the operation of the institution, such as registrar's records, inventories, and administrative files. Collections salvage and building rehabilitation will be the next priority.

Objects or collections of great importance to the institution must be identified ahead of time. If this is not done, valuable time may be wasted salvaging materials of little value or spent arguing about what should be saved first. Ideally, this step includes a floor plan that clearly states the priority of collections for salvage. This should be attached to the disaster plan, but the security of this type of information should be considered. It may be wise to allow only upper level staff access to this part of the plan prior to an actual emergency.

Salvage priorities should be based not only on the value of objects, but on their vulnerability to the particular damage caused by the emergency. If you are not knowledgeable about the hazards for various materials, contact a conservator to help you incorporate these considerations in your salvage plan. Paper and textiles, for instance, are susceptible to mold when they are warm and damp. Many metals will corrode rapidly under the same conditions. Salt water may accelerate corrosion. Ivory, small wooden objects, and lacquer may swell and crack with rapid changes in moisture and temperature. Veneers and furniture may be constructed with water-soluble adhesives. Objects may become very brittle after exposure to the temperatures of a fire. All categories of collections have special handling and salvage procedures developed by experienced professionals. Because the instructions for salvage of the wide variety of objects found in museum collections is beyond the scope of this article, a brief

reading list has been included for further information.

Writing The Plan

Once the necessary preliminary steps have been undertaken, writing the plan should be relatively straightforward. Although each plan will be different, a sample outline is given below:

1. Introduction—stating the lines of authority and the possible events covered by the plan.

2. Actions to be taken if advance warning is available.

3. First-response procedures, including who should be contacted first in each type of emergency, what immediate steps should be taken, and how staff or teams will be notified.

4. Emergency procedures with sections devoted to each emergency event covered by the plan. This will include what is to be done during the event, and the appropriate salvage procedures to be followed once the first excitement is over. Include floor plans.

5. Rehabilitation plans for getting the institution back to normal.

6. Appendices, which may include evacuation/floor plans; listing of emergency services; listing of emergency response team members and responsibilities; telephone tree; location of keys; fire/intrusion alarm procedures; listing of collection priorities; arrangements for relocation of the collections; listing of in-house supplies; listing of outside suppliers and services; insurance information; listing of volunteers; prevention checklist; record-keeping forms for objects moved in salvage efforts; salvage procedures.

Maintaining The Plan

No matter how much effort you have put into creating the perfect disaster plan, it will be largely ineffective if your staff is not aware of it, if it is outdated, or if you cannot find it during a disaster. A concentrated effort must be made to educate and train staff in emergency procedures. Each staff member should be made aware of his or her responsibilities, and regular drills should

Basic Emergency Supplies and Equipment

The following is a sample list of basic supplies that should be kept on hand in the event of an emergency:

- Dehumidifier
- Metal Cart
- Plastic (milk) crates
- Flashlight
- Fifty-foot extension cord (grounded)
- Portable electric fan
- Wet vacuum
- Blank newsprint
- Freezer or wax paper
- Plastic trash bags
- Plastic buckets and trash can
- Paper towels
- Sponges
- Mop
- Monofilament nylon (fishing) line
- Broom
- Gloves (rubber/leather)
- First aid kit
- Clipboards
- Emergency funds (cash and purchase orders)

be conducted if possible. Keep several copies of the plan in various locations, including a location that is off the site (ideally in waterproof containers). Each copy of the plan should indicate where other copies may be found.

Most importantly, the disaster plan must be updated periodically. Names, addresses, phone numbers, and personnel change constantly. New collections are acquired, building changes are made, and new equipment is installed. If a plan is not kept completely up to date, it may not be able to assist you effectively in dealing with disasters.

Disaster planning is essential for any institution to provide the best possible protection for its collections. Disaster can strike at any time—on a small or a large scale—but if an institution is prepared, the damage may be decreased or avoided. A disaster plan must be considered a living document. Its risk-assessment checklist must be periodically reviewed, its lists must be updated, and its collection priorities revised as needed. An effective disaster plan will ensure that historical collections in our cultural institutions are safeguarded for the benefit of those who come after us. ■

Beth C. Lindblom is an archivist who is currently field service representative at the Northeast Document Conservation Center. Karen Motylewski is director of field service at the same institution.

Suggested Reading

The following sources provide further basic information on disaster planning for museums.

Hunter, John E. "Museum Disaster Preparedness Planning." In *Protecting Historic Architecture and Museum Collections from Natural Disasters*, edited by Barclay Jones. (Boston: Butterworths, 1986), 211–230.

Museum News, May/June 1990.
(Special focus issue on emergency preparedness for museums.)

Recommended Practice for the Protection of Museums and Museum Collections, No. 911. Quincy, Massachusetts: National Fire Protection Association, 1991.

O'Connell, Millie. "Disaster Planning: Writing & Implementing Plans for Collections-Holding Institutions." *Technology and Conservation* Summer 1983, 18–26.

Walsh, Betty. "Salvage Operations for Water Damaged Collections." *Western Association for Art Conservation Newsletter*, vol. 10, no. 2, May 1988.

Wilson, J. Andrew. "Fire Fighters." *Museum News*, November/December 1989, 68–72.

HISTORY NEWS TECHNICAL LEAFLET

A PUBLICATION OF THE
AMERICAN ASSOCIATION
FOR STATE AND LOCAL HISTORY

Protecting Cultural Heritage Properties From Fire

By J. Andrew Wilson
Assistant Director
Fire Protection and Safety
Smithsonian Institution

Few people would argue that disaster preparedness does not need to be included in any long-range historic property preservation plan. Where arguments may arise, however, is what constitutes a threat to any given property or its contents? If everyone responsible for heritage properties were to list the hazards confronting their properties, the lists would no doubt vary greatly from state to state, county to county, town to town, and building to building. The lists would encompass a wide range of hazards and risks—flood, earthquake, tornado, hurricane, theft, insects, mold, fire, vandalism, air pollution, etc. If one master list was created and circulated to everyone, *(continued)*

with instructions to strike out all those hazards that do *not* apply specifically to you, the list would probably come down to a single common threat—FIRE. *Fire* is the single greatest threat *all* cultural heritage properties face; none are immune from it. Until the owners/trustees of these properties develop plans for dealing with the fire threat, they place the building and its occupants, visitors, and furnishings at risk. The complexity of these plans may vary from a simple evacuation plan, to a fire prevention program, to a more complex plan, which includes passive and automatic fire protection systems.

Property damaged by floods can often be dried out and restored. Structural damage from an earthquake might be repaired. Stolen property always has a chance of being recovered. Damage from fire, however, is usually permanent and irreparable. Historical buildings or contents, once reduced to ash, can *never* be restored. Fire is more cunning and less discriminating than a thief is. It can travel (spread) through very small openings and concealed spaces to reach other parts of a building, deprive occupants of a life supporting environment, and cause partial to total destruction of property.

There exists a cavalier attitude in this country that "fire won't happen to me," that, "it is someone else's problem." Americans also place a lot of blind faith in their local fire department to save them and their property from any fire that may occur, and believe insurance will cover the rest. Reality is very different, and our daily fire statistics bear this out. About 2 million fires are reported each year in the U.S.[1] There has been an annual average of: 102 fires in museums; 212 fires in libraries; and 1450 fires in places of worship.[2] Unfortunately, statistics are not kept for fires in historic buildings. It would probably be safe to estimate the annual number of fires in historic buildings to be well in excess of all those above combined, i.e. >1765.

At the very least, every property, including private residences, should have an emergency self-protection plan that spells out how to report a fire and safely evacuate the premises.

FIRE PREVENTION

Cultural institutions are just as susceptible, if not more so, to the wide variety of common ignition sources that are responsible for most fires elsewhere. The most important factor in preventing a fire loss is through the maintenance of a good fire prevention program. The fire protection program (policy) needs to be in writing and updated periodically. Management and staff responsibilities need to be defined, and fire prevention procedures established. This program must be based on a high standard of housekeeping, orderliness, maintenance of equipment, continuous staff training and awareness in both recognizing and eliminating fire hazards (ignition and fuel sources).

At the very least, every property, including private residences, should have an emergency self-protection plan that spells out how to report a fire and safely evacuate the premises.

Safeguarding Ignition Sources

Some of the leading causes of fires in historic properties are: heating devices, such as space heaters and heating and cooking stoves; arson and suspected arson; electrical wiring and appliances; smoking; and air conditioning. Through care and diligence, many of these ignition sources can be guarded against; however, the risk of fire will always remain a distinct possibility.

Much can be done to minimize the chance of a fire starting or spreading with little or no expenditure of monies. Your elementary school training taught you that it takes fuel, air, and heat (an ignition source) for fire to occur. You cannot do much about air, but you can control both the fuel and the ignition sources in your facilities.

[1] U.S. Fire Administration data for CY 1997
[2] National Fire Protection Association (NFPA) Standard 909 – Protection of Cultural Resources, 1997 edition.

To reduce the likelihood of fire, start by controlling potential ignition sources:

• Smoking should be prohibited throughout all cultural institutions—No exceptions! Large noncombustible ashtrays, preferably filled with sand, should be provided on the exterior of the building, to preclude staff and visitors from tossing their live cigarettes into the surrounding dry mulch or vegetation.

• Welding, cutting, or burning perhaps represents the number one cause of fires in cultural heritage properties, as so many fires occur to buildings under renovation or repair. A daily "hot work" permit system should be established and strictly enforced. This system should require a contractor or other person wanting to perform hot work, to have a signed permit from a responsible staff person after it has been determined/agreed upon that:

✓ all combustible materials are protected [This can be accomplished by covering all combustibles with fire retardant blankets, or constantly wetting the area down],

✓ a fire watch is established [this involves having a designated person or persons standing by with a portable fire extinguisher for the duration of the work, plus half an hour beyond, to extinguish any blazes that may start], and

✓ the area is carefully inspected afterwards to detect any fire or smoke.

To this end, incorporation of an early warning fire detection system, should be part of any fire protection program.

• Fuel fired portable heaters should be prohibited. Portable electric heaters also should not be permitted because of their high potential as an ignition source, possible electrical circuit overloads, and high operating costs.

• Electrical appliances such as hot plates, toasters, coffee makers, etc., should be restricted and allowed only with written management approval. The authorizing official should ensure the appliance: is listed or approved by a recognized testing laboratory (these products must pass tests to help assure they are fire safe); has a visual light to indicate when the appliance is "on"; is installed on a non-combustible surface and separated from other combustibles by at least 18 inches. Appliances and electrical cords should be routinely inspected for obvious problems (burn spots, frayed wires, etc.), and immediately repaired or disposed of when problems are found. It is also a good practice to look for and purchase appliances that incorporate an automatic shut-off after so many minutes/hours of non-use, and to unplug electrical appliances when they are not in use.

• Heating, air conditioning, and other mechanical equipment and major appliances should be installed by professionals in compliance with codes. This equipment should also be maintained, inspected, and tested in accordance with recognized safe practices.

• Electrical wiring should be installed in strict accordance with code and only by qualified electricians. Extension cords and multiple plug adapters should be avoided. If a circuit keeps tripping off or a fuse keeps blowing, it is overloaded with too many electrical appliances. Never try to remedy the problem with a higher rated fuse, penny under the fuse, or taping open the circuit breakers. Either reduce the electrical load or have additional circuits added.

• Consider installing arc-fault circuit interrupters on your electrical circuits. This is a relatively new (1998) product that will shunt power to a circuit upon detection of any arcing in the wires—a usual occurrence prior to an electrical fire. This product is not to be confused with ground fault circuit interrupters, which help prevent electrocution.

• Lightning protection should be checked by an expert to ensure that it is adequate, in good repair, and properly grounded.

These are just some of the more common ignition sources one can and should guard against. One must also strive to separate combustible materials from potential ignition sources and minimize the amount and continuity of combustible materials in any one area.

Safeguarding Fuel Sources

• Safe containers (metal cans with tight fitting metal lids) should be used for collecting waste papers, oily

rags, and other refuse, and for storing packing material. Waste materials should be removed from the building on a regular basis (daily as a minimum).

• Store important papers or collections in fire resistive safes or storage cabinets. Even good, well-constructed cabinets that are not labeled "fire resistive" will help protect their contents to some degree from fire, water, and other possible types of damage.

• Flammable liquids should be stored in and dispensed from approved safety cans only. These containers have a spring-loaded cap and a wire mesh screen (flame arrestor) inside the can. In addition, the quantities of these materials permitted in the building should be held to an absolute minimum, and stored in approved flammable liquid storage rooms or within flammable liquid storage cabinets.

• Hallways, stairways, and access aisles must be kept clear of all storage; DO NOT USE THESE AREAS FOR STORAGE, EVEN TEMPORARILY! Housekeeping and storage in all other areas should be neat and orderly.

• Do not store or place materials against electrical outlets, light fixtures, or heat producing equipment.

• Storage should be prohibited in mechanical equipment rooms, electrical closets, telephone closets, and within 3 feet of the front of electrical circuit boxes and panels.

• Interior finishes (carpeting, ceiling tiles, acoustical wall coverings, etc.) that can be ignited with a match should never be used. Ask manufacturers or distributors to provide fire retardant products, with certification of flame resistance.

• Exhibits, as well as any interior/exterior modifications, should be constructed of fire safe materials to reduce the fire risk. Always ask your designer, fabricators, or supplier if they can offer the material you want in a fire retardant variety. These materials may be a little more expensive but can substantially reduce the risks to your collections and building.

• Consider the use of a fire retardant chemical or paint to treat combustible materials as a means to reduce the chance of ignition.

• Holiday decorations should only be the fire retardant type, and well separated from lights and other potential ignition sources.

While an outstanding fire prevention program will effectively preclude most fires from starting, the risk of a fire remains. Since fires can develop at alarming speeds (from flame to flashover in a matter of minutes), immediate knowledge of a fire condition is essential to both serve as a warning for life safety, as well as summon assistance to fight the fire. To this end, incorporation of an early warning fire detection system, should be part of any fire protection program.

Two critical components for ensuring that a fire detection system functions properly are periodic testing and maintenance.

FIRE DETECTION SYSTEMS

Fires produce a variety of products and byproducts, including smoke, heat, light, sound, and various gases. There are a variety of fire detectors available today that can sense each of these products, and usually one can mix and match detectors on a common fire detection system. For most historic properties, however, smoke detectors usually offer the best means for detecting a fire at its very earliest stages.

The most common types of smoke detectors available and used in buildings today are spot-type photoelectric or ionization detectors. Without going into detail as to their principles of operation, photoelectric detectors react more quickly to smoldering fires that produce visible smoke, whereas ionization detectors react more quickly to invisible products of combustion and flaming fires. The type of detector(s) selected for use may vary from room to room depending upon the construction, furnishings, and operations encountered. A fire protection specialist should be consulted for advice. A single spot-type smoke detector can generally protect a room up to 900 square feet. If a room is larger than that, or you want more optimal detection, consider using a mix of photoelectric and ionization detectors in the space.

Smoke detection systems have become rather sophisticated with the advances in computer technology. Today's systems can often list/adjust the sensitivity setting of the detector, adjust for dirty conditions, provide an exact address of the detector [e.g. "Green Room—Second Floor"], and perform specific actions upon activation [e.g. close doors, shut down power, etc.], among other things. Wireless systems are also available, which can be a benefit in historic structures where running wiring may be difficult.

Perhaps the most sensitive smoke detection systems available are the air sampling systems that continually draw and examine the air from a room or rooms. These types of smoke detection are very expensive, and do not readily lend themselves to protecting an entire building. They do, however, offer an aesthetic advantage, in that no visible devices need be installed in the area(s) being protected. Instead, very small diameter tubing can be discreetly inserted into the room, with nothing visible showing.

An automatic sprinkler system is the single most important fire-safety system a cultural property can have.

Prior to installing a fire detection system, a decision has to be made as to what is its purpose. If the fire detection system is strictly for life safety (the building can burn down as long as everyone gets out in time), then the system need only to sound an alarm in the protected premises. If, however, the intent of the system is to not only sound a local alarm, but also summon trained personnel to fight the fire, then the system must be monitored around the clock. This should preferably be done at the local fire department or a certified control station.

Two critical components for ensuring that a fire detection system functions properly are periodic testing and maintenance. Before selecting a system, inquire about service contracts, and check references. It is also very important to protect smoke detectors during operations that produce dust, smoke, or spray (e.g., cutting wood, spray painting, welding, burning, etc.). Spray or dust can accumulate on the inside of the detectors rendering them inoperative or causing false alarms. Ensure protective covers are removed and the system is operating when work has been completed for the day. Never leave a detector or system out of service overnight without providing additional fire watches.

Many cultural institutions feel that an excellent housekeeping and fire prevention program, combined with a state-of-the-art fire detection system, constitutes an optimal fire protection program. This level of fire protection may be suitable for the protection of fine art galleries housed in fire resistive buildings, where the total fuel load within the gallery is limited to a few paintings on the walls or sculpture on the floor. In this environment, ignition sources are easily controlled, and spread of fire from one object to the next is unlikely due to the physical separation of the fuel sources. In almost any other environment, however, fire is too unpredictable. Arson or other incendiary fires may be difficult to guard against. Lightning is a threat in certain parts of the world, and there are always the unforeseen careless actions we humans occasionally make. A fire detection system will be helpful provided that it: 1) responds quickly to the fire condition, and 2) human intervention is almost immediate. This latter point is especially critical since fire detectors can only *detect* a fire, and not extinguish it.

FIRE SUPPRESSION SYSTEMS

If one were to examine every cultural property (historic building, museum, library, place of worship, etc.) lost to a fire, the only factor they would share in common would be lack of an automatic fire suppression system. Many would have had good housekeeping programs, or fire detection systems, or have been constructed of non-combustible materials, but they were still total fire losses. Being properly prepared for a fire often means incorporating an automatic fire suppression system. A suppression system, designed to quickly control or extinguish a fire that is beyond the means of a portable extinguisher, is the best insurance against a large loss fire.

Generally speaking, only gas based or water based

automatic fire suppression systems are suitable for protecting cultural properties. Gaseous systems are suitable only for protecting the contents of a tightly sealed room that can contain the gas once it is discharged. Any breach to the room, e.g. open door or window, operating ventilation system, wall/floor openings around pipes or conduit, etc., will permit the gas to escape and void its usefulness in extinguishing the fire. Up until ten years ago "Halon" was the only gas available that was "safe" for use around people and collections. Halon was found to cause serious damage to the ozone, however, so further production was banned worldwide. Several replacement gases have been developed and are available (FM 200®, Inergen®, FE 13®, etc.), although none of them can be used as a drop-in replacement for Halon. Each gas can provide an effective and "clean" method to control fire in an enclosure, as long as the system is properly designed, tested, and maintained. The drawbacks to these systems include: a limited amount of agent; they must be adequately confined within the room of discharge; the discharge velocity of the gas must be considered (most systems are capable of blowing objects about the room); they require above average maintenance; and they do not protect the building structure.

An automatic sprinkler system is the single most important fire-safety system a cultural property can have.

The alternative to a gas based fire suppression system is a water based one, a.k.a. a sprinkler system. Immediately after the Windsor Castle fire (U.K.) in 1992, the Cabildo fire (New Orleans, LA) in 1988, the Byer Museum (Evanston, IL) in 1984 (and probably many other cultural fires), government or museum officials were heard to have made remarks along the lines of "good thing there were no sprinklers, otherwise the (water) damage would have been much worse." Unfortunately, many myths and misunderstandings regarding automatic sprinkler systems are entrenched in the minds of many people in the cultural field today. Many people in the cultural field also have an innate fear of having pipes filled with water overhead, a disaster waiting to happen. This fear is probably grounded in the many mishaps that occur with other piping systems, e.g. domestic water lines, roof and other drains, condenser lines, etc.

An automatic sprinkler system is the single most important fire-safety system a cultural property can have. In its simplest form, a sprinkler system is a network of overhead pipes (with or without water in them) connected to a water supply. Attached to these pipes, at regularly spaced intervals, are automatic sprinkler heads. Each sprinkler is held shut or sealed by an element that will melt or break away at a predetermined temperature (normally 135-165°F). In a fire situation, only the sprinkler head(s) nearest (exposed to) the fire will open and discharge water onto the fire. Not all sprinklers open, as many people believe. In fact, rarely does it take more than one or two sprinkler heads to control or extinguish a fire. Sprinklers can be looked upon as individual firefighters, standing by 24 hours a day. A typical sprinkler head, however, discharges about 20 gpm, while fire hoses may discharge 125-250 gpm. In addition, almost all water discharged from a sprinkler head goes onto the fire; whereas water from fire fighting operations may not always be directed onto the fire, thus causing unnecessary damage.

The various types of automatic sprinkler systems, briefly described below, all have certain common features. Each has a control valve where the system can be turned off, a waterflow alarm that activates when water movement occurs within the pipes (and generally transmits the alarm to a constantly attended control room), and an automatic sprinkler head which distributes the water.

Wet-pipe system— Overhead pipes are filled with water and the system is always ready for operation. This type of system is both the simplest and most reliable of all automatic sprinkler systems. A wet-pipe system should not be used in spaces subject to freezing temperatures or where mechanical damage to the pipes is likely.

Pre-action system— Overhead pipes are normally dry. A supplemental fire detection system *must* be

installed in the same area as the sprinklers. Activation of this supplemental fire detection system releases a valve that allows water to fill the pipes, essentially converting the system to a wet-pipe system. Water is not released until a sprinkler head is activated. This type of system minimizes the possibility of accidental water damage due to a sprinkler pipe or head being mechanically damaged. However, since a pre-action system is dependent upon a supplemental fire detection system to get water into the pipes, and has other moving mechanical parts, it requires much more maintenance and therefore its reliability in a fire situation, while very good, is not as high as the simple wet-pipe system. Pre-action systems are suitable for areas subject to freezing, provided the incoming water supply piping for the control valve is in a heated location.

Dry-pipe system— Overhead pipes are filled with air under pressure. The air pressure is significant enough to hold "closed" a valve that allows water into the system. Should a sprinkler head open, the air bleeds off and the water valve is allowed to open. Water then flows through the system and out the open heads. This type of system should only be used in areas subject to freezing. The use of dry-pipe systems in historic buildings should be limited to loading docks, unheated structures, etc.

Sprinkler systems can almost always be unobtrusively installed into historic buildings and other cultural properties. Automatic sprinkler heads are manufactured in a wide assortment of shapes, sizes, styles, and even colors, to meet practically any aesthetic consideration. Concealed heads are completely invisible, hidden by small cover plates that are flush to and the same color as the ceiling. Some low profile and recessed heads only project out from the wall or ceiling a fraction of an inch. Sprinkler piping can often be hidden along crown molding, or concealed within void spaces. Use of copper or plastic pipe can help reduce the size of the pipe, and sidewall sprinkler heads can be mounted along walls, often avoiding the need to run any pipes directly overhead. False soffits can also be created to hide piping and blend in architecturally. Of course hiring a sprinkler designer and installer sensitive to historic preservation needs is also important.

Preservationists must view protection of the property from fire as an essential goal of heritage preservation, and act accordingly.

Many building and fire codes now require installation of sprinklers because of their proven life safety capabilities. The odds of someone being killed by a fire in a fully sprinklered building are about as rare as that for sprinklers to accidentally operate due to manufacture's defect (practically nil). The advantages to installing a sprinkler system in a cultural institution should now be obvious:

- minimize fire damage (your greatest threat) to the building and its contents,
- drastically reduce water damage (resulting from fire fighting operations),
- prevent injury or loss of life,
- proven reliability.

Water mist fire suppression systems have been getting some publicity of late as a replacement for both sprinklers and gaseous systems. As the name implies, these systems produce very fine water droplets (similar to fog) for extinguishing engine room fires on ships. In fact, that is the only application where their use has been approved by codes or standards. Please beware of individuals trying to sell you on purchasing and installing a water mist system. The hope of transferring this technology to land based operations has not yet panned out, and may never do so. At the 1999 Annual Meeting of the National Fire Protection Association, a special forum on water mist technology was conducted by the experts in this field. They were unanimous in saying that this technology cannot and should not be transferred to any other application, unless the end user is willing to invest hundreds of thousands of dollars in testing for the specific end use application. As of this writing, water mist systems have proven to be ineffective in extinguishing small fires, even on ships.

SUMMARY

Historic buildings and other cultural institutions should be viewed as monuments to humanity, to be preserved for perpetuity. Sometime in the life of the building a fire is likely to occur. It may not happen this year or next, or for the next 100+ years, but eventually it will happen. If proper fire protection safeguards are not provided, then individuals, nations, and cultures will continue to lose their heritage to fire. Preservationists have the responsibility for avoiding these losses in or to historic buildings. The threat of destruction or damage from fire, must be weighed against the intrusion on historic fabric from installation of fire safety features. In the end, preservationists must view protection of the property from fire as an essential goal of heritage preservation, and act accordingly. A fire protection program should not be a choice, but a necessity.

FOR FURTHER READING

National Fire Protection Association. NFPA 909, *Standard for the Protection of Cultural Resources — Including Museums, Libraries, Places of Worship, and Historical Properties.* Quincy, MA. 1997

National Fire Protection Association. NFPA 914, *Recommended Practice for Fire Protection in Historic Structures.* Quincy, MA. 1994

Morris, John. *Managing the Library Fire Risk.* University of California. 1979. ISBN 0-9602278-1-4

The Fire Protection Association. *Fire Protection in Old Buildings and Historic Town Centres.* London, UK. 1992. ISBN 0 902167 40-5

The Fire Protection Association. *Heritage Under Fire — A Guide to the Protection of Historic Buildings.* London, UK. 1992. ISBN 0 902167 94 4

Advisory Council on Historic Preservation and the (U.S.) General Services Administration. *Fire Safety Retrofitting in Historic Buildings.* 1989

J. Andrew Wilson is the assistant director for Fire Protection and Safety at the Smithsonian Institution. He can be contacted at 490 L'Enfant Plaza, Suite 4202, Washington, DC 20560-0932, (202) 287-3611 or awilson@si.edu

HISTORY NEWS TECHNICAL LEAFLET

A PUBLICATION OF THE
AMERICAN ASSOCIATION
FOR STATE AND LOCAL HISTORY

Closing the Barn Door: Dealing with Security Issues

BY STEVAN P. LAYNE, CPP, CIPM

Many of our most respected institutions, historic houses, and other cultural properties suffer from a common malaise—lack of security awareness. When no one can remember the last time property was missing, or someone acted suspiciously, or staff members felt threatened, it is easy to grow complacent and ignore some common sense practices. These practices work to deter crime, reduce liability, enhance life-safety, and protect assets.

In a recent informal survey of cultural institutions, 100% of the respondents advised that most recent losses were clearly related to inside sources—employee theft. The second leading cause of loss—staff complacency.

Though current technology offers numerous alternatives with all the "bells and whistles," it is not necessary to have the most expensive, most elaborate electronic scheme to protect the small to mid-sized facility. In fact, we find in many of our site visits that the facility has been long burdened by unnecessary costs in the installation, service, maintenance, or leasing of electronic systems. Alarm companies are not necessarily unscrupulous; they are, however, in business to sell you devices, gain recurring revenue through service and monitoring contracts, and there's no guarantee that the vendor knows any more than common electrical skills.

How then, may a facility with few staff members, low budget, and heightened protection concerns find practical, cost-effective solutions to protection problems? The solution is surprisingly simple, and within reach of institutions of any size, budget, or staff. We begin by paralleling the process applied by professional consultants—the gathering of information. You need to think about the level of protection you really need, the maximum amount you can spend, and what it is that you actually want to accomplish. Do you want to catch someone who might hide in the building until after closing, detect entry from a basement window, or call the police when there is a dangerous visitor? Once you have put together this basic information, the next step is determining what you need, and where to get it: [1]

Sample devices.

1. Is the company reputable?
2. Is the company experienced?
3. How long have technicians been employed?
4. Is the company licensed? Current license?
5. Do they have experience with similar systems?
6. Do they have the staff and resources to respond to after-hours service calls? Time for average response?
7. Have other clients filed complaints?
8. Are all employees screened, licensed, bonded?
9. Is a list of other clients/contacts available?
10. Is the company insured? Coverage limitations?
11. Is the contract beneficial for both parties?
12. Is the company nationally affiliated?
13. Do they distribute devices and parts nationally?
14. Are all costs for installation, service, parts replacement, or service calls spelled out in the contract?
15. Is there a written document that tells you exactly what you are getting, and what it will do?

You need to present your list of objectives, or if possible, more specific detail about the systems you want if you have that information. The most desirable method, of course, would be to have a non-product affiliated firm or individual provide detailed specifications suitable for putting out to bid. In absence of specifications, you should be able to describe the systems and/or devices you seek. An institution should put out to bid the specifications, or description of systems, with no less than three competing vendors.

Security officers, or anyone assigned the responsibility, use handheld scanners to record the time and location of each "station" checked. The information is downloaded to a computer, producing a daily written record of each location checked within the building. Photo courtesy of author.

Many smaller institutions question the need for electronic protection, citing the lack of funding for any protection needs. "It is the duty of all museum operators to take reasonable steps to reduce the risk of a reasonably foreseeable type of loss from occurring to any object in the collection while on the museum property, on loan, or in transit, by the action of unknown third parties, staff or visiting scholars, or through fire, flood or similar natural disaster or other foreseeable forces of people or nature." [2]

Many institutions, especially those with a small staff, find it difficult to provide full time security staff. The next best alternative is the installation of electronic systems. Even when security officers are present, the use of electronic systems helps to monitor areas that cannot be observed at all times. "All museums shall have intrusion detection and signaling systems. These systems should be monitored 24 hours per day, 7 days per week." [3]

Alarm systems and video surveillance systems are intended to deter losses from both outside and internal sources.

Physical and mechanical barriers are necessary, they also help to eliminate potential problems from employee involvement, by limiting the institution's exposure to dishonest employees, those with substance problems, and persons who have displayed unsavory characteristics in the past. We agree that one mistake should not ruin someone's chances to be productive. That is why federal law prohibits denying employment to persons who have been convicted of a single crime (unless that crime is directly related to the type of employment). For example, you would not hire a convicted pedophile to supervise a museum program for children. What the civil courts have declared, on numerous occasions, is that employers are obligated to perform a *reasonable* inquiry into each applicant's background and character. You need to take this very seriously, regardless of the

[1] From *The Cultural Property Protection Manual,* LCI Revised 2001

[2] See *Suggested Guidelines in Museum Security* Sect. 1.0 Duty to Protect the Collection Section 1.1

[3] See *Suggested Guidelines in Museum Security* Sect. 6.0 Burglar Alarms/Security Electronics Sect. 6.1

size and makeup of your staff. The fact is that every category of employee—including directors, curators, volunteers, and contract employees—has been stealing from collections. Without exception, everyone with access to the facility, especially those with access to the collection, should undergo the following:

- Completion of an objective application form
- Verification of information submitted on the application
- Conduct of a criminal history check
- Credit history
- Verification of former employment
- Verification of education
- Completion of a personal interview

If you are unable to verify any of the information presented, you should not hire. Volunteers are no exception. You need to check anyone with access to the collections. You even need to check contractors doing work, unsupervised, on your property. Use a separate form for contractors to complete, verifying their compliance with the requirement to perform criminal histories on their own employees. [4]

Each facility faces different threats to its protection based on location, area crime, type of collection, and possibly, political environment. We know it takes a combination of physical security, natural barriers, electronic security, and personnel procedures to effect a positive protection plan. It's never too late to "close the barn door," especially after known losses occur.

THE RIGHT WAY TO "CLOSE THE BARN DOOR"

A common source of loss is actually the failure to properly secure the facility at the close of the day. Too often, open windows, unsecured doors, or equipment left running are the causes of fires, ease of unauthorized entry, or the failure to find "stay behinds."

The process is simple, common sense, but most often neglected. Assign someone within the organization to take full responsibility for locking up. Whether this is a security person, administrator, supervisor, even contract security, there needs to be a daily process which

Contractor Requirements

1. All contractor personnel will complete a police records check through Federal, State, Local, or commercial sources. A list of personnel showing their date of birth and the results of criminal history checks must be returned to the client, Attn: Security Manager, prior to the commencement of work.

2. Contractors will enter and exit the building only at an entrance designated by the client. Photo identification will be provided at the point of entry. Each contractor employee will be issued an ID Badge, which must be displayed at all times while on client property.

3. A work schedule will be submitted one week in advance to the Security Manager, listing arrival and departure times, areas where work will be performed, and personnel involved.

4. Use of power tools, nail hammers, or special equipment will be listed in the work schedule.

5. All tools and equipment will be secured at all times in the work area. Contractors are responsible to secure their equipment.

6. All tool cases, equipment cases, lunch boxes, other containers may be checked by client security officers upon exiting the building.

7. No interruption of power, water, or other utilities will be done without prior coordination with the facility maintenance supervisor.

8. Alarm systems, devices, wiring, or control panels will not be moved, utilized, or disturbed in any way without prior coordination with the facility maintenance supervisor.

9. Contractor personnel must remain in the work area, except for use of restrooms closest to the area, vending machines in or near the work area, or public areas. Contractor personnel will not enter other non-public areas of the facility without client escort or pre-approved authorization. Breaks will be taken in areas pre-arranged with the client.

10. No client property will be moved, covered, or work performed within five feet without prior coordination with the client.

Other restrictions may be added, as needed, by mutual agreement between the contractor and the client.

[4] See Contractor Requirements (above)

requires following a prescribed sequence, and also requires documentation of compliance.

The Daily Closing Checklist (on page 5) should be utilized by whomever actually performs the task of checking and locking up. If you can afford it, an electronic system may be utilized to assure that areas around the building are checked each night. No matter how it is done, or by whom, it must be done. It is important to disconnect any potential source of fire, such as coffee pots, space heaters, or other electronic devices at the close of business each day. It is also important to close and secure all windows and all exterior doors. Each interior space, to include rest room stalls, equipment rooms, janitors' closets, and offices must all be checked to ensure that no one has hidden within the building. It is easy to assume that because a door is closed, no one is inside. However, intruders often use this ploy to gain free access to a building. Alarm systems do work but may easily be bypassed by those who understand the system, particularly if they have once had legitimate access to your system codes and control panel locations. You need to take advantage of every aspect of protection procedures to deter the acts of potential intruders, especially former or present employees.

Unruly Patrons

Dealing with unruly patrons, undesirable patrons, or those who for other reasons are banned from entry creates a situation that many smaller institutions are not fully prepared to deal with. Of course you may call the police whenever these situations arise, but do not always rely on police for instantaneous response. And unless you have fulfilled certain legal requirements, police can only ask someone to leave. They are not, in fact, trespassing, until they have violated a lawful order, or posted notice not to be present on your property. It is not the daily task of staff members to deal with these problems, without the proper documentation and published policy of the institution. Thus, the first step in dealing with potential problems is to formulate and publish the institution's policy for removing persons from the property.

The following is a generic outline of how you might form your policy:

Code of Conduct

In order to deal effectively with the removal of any person from a public institution, it is necessary to establish parameters, or "rules of engagement," more or less. If you place yourself in the shoes of the subject of removal, you would certainly hope that there is a good reason behind the request to leave. As a visitor, you may be unaware of a rule you have inadvertently violated. It makes sense, therefore, to determine, publish, and disseminate a definite list of rules, or code of conduct, violation of which may lead to ejection. While reasonable rules or acceptable conduct may vary with the type of institution and operating philosophies, the list of violations below may be suited for application in most institutions:

- Use of or under the influence of alcohol or drugs
- Non-compliance with reasonable standards of personal hygiene
- Refusal to follow directions of institutional staff
- Consumption of food or beverages in exhibit area
- Violation of controlled or restricted area
- Continual violation of exhibit barriers
- Failure to control minor children
- Attempted theft or vandalism
- Interruptive behavior
- Spousal abuse
- Child abuse

Documentation

Once a violation is determined, it is important to document everything, how the determination was made, such as "reported by a patron," or "observed by video surveillance," or "confronted staff member." Violation of known or posted rules is an "incident" and should be recorded as such on the proper incident report form.

First Response

Initial response to incidents should also be a matter of practiced procedures. In many institutions, it is common practice to "call security" for everything. However, this tends to undermine the real intent of on-site security. When used excessively it interrupts normal operations and lessens the ability of other staff to deal with these everyday events. When a violation or potential violation occurs within view of a staff member, it is that staff member's responsibility to take immediate action directly or by notifying someone else, according to protocol—as long as that action does not place the staff member in any jeopardy. For example, if a patron is too close to an object, it is a simple matter for the staff member to say, "excuse me, but we ask everyone to stay at least two feet back from the object."

As long as the patron complies and there is no confrontation, the problem is solved, and there is no need to call anyone. Protocols should be in place so staff members will know what type of incident should be immediately reported to a higher-up or security—like a fight.

Non-Compliance

If, however, the patron refuses to comply, the incident is escalated to the next level of response. This may be a staff supervisor, or a security officer. Your written policy defines how you want such confrontations to be handled. It is advisable to settle these matters as quietly and as professionally as possible. Once the incident has reached the level where the institution, by *pre-defined* policy, dictates they be asked to leave, the next level of response is necessary.

DAILY CLOSING CHECKLIST

Function	Date/Employee	Date/Employee
1. Lock all exterior doors.	_____/_____	_____/_____
2. Check all rooms, closets, storage areas.	_____/_____	_____/_____
3. Disconnect all special devices, heaters.	_____/_____	_____/_____
4. Open all cash drawers, register drawers.	_____/_____	_____/_____
5. Activate interior alarms.	_____/_____	_____/_____
6. Upon exiting, activate perimeter alarms.	_____/_____	_____/_____
7. Identify persons found on the property.	_____/_____	_____/_____
8. Check all out buildings, sheds, storage.	_____/_____	_____/_____
9. Check parking lots, noting license #(s).	_____/_____	_____/_____
10. Log all discrepancies, unusual incidents.	_____/_____	_____/_____
11. Check building exteriors.	_____/_____	_____/_____
12. Special Checks:	_____/_____	_____/_____
13. Re-check heaters, electrical appliances.	_____/_____	_____/_____
14. Make additional walk-through inspection.	_____/_____	_____/_____
15. Set night lighting as instructed.	_____/_____	_____/_____
16. Observe exterior before exiting building.	_____/_____	_____/_____
17. Exit designated door and secure.	_____/_____	_____/_____
18. Check exterior doors and windows.	_____/_____	_____/_____

NOTE: NO ONE is authorized in building during closing procedures. Check entire building before proceeding. If suspicious persons or vehicles are near exit, contact police and request escort.
BE ALERT/BE SAFE!!

Ejection Procedure

You have to determine who has the authority to cause someone to be ejected, and how this procedure will take place. Your options include:

- **Staff Supervisor** – Requests violator leave immediately by closest public exit.
- **Security Supervisor** – Advises violator they must leave, escorts to closest public exit.
- **Police Officer** – Removes violator based on signed complaint of institution representative.

No two situations are alike. Whoever handles the incident needs to be versatile, cool and calm under stressful situations, and prepared to act immediately if necessary. It is desirable to have this procedure take place quickly and quietly. The more people who become involved, the longer the situation is drawn out, the more likely it is to become escalated. Staff members need to be aware that as long as they handle the incident without additional assistance, it is more likely to be solved peacefully. In fact, a common tactic is for a staff member to advise the subject to leave now, because once security or the police or called, they may be arrested.

All staff members must be aware that anytime a physical confrontation takes place, and anyone representing the institution puts their hands on a violator, that person is going to jail. No one should be considered for removal unless probable cause exists to believe that individual has violated known and published rules, regulations, or standards of behavior. If the violation doesn't warrant an arrest, then the subject should not be restrained or detained in any manner.

SUMMARY

You must have a complete list of rules for conduct; by staff, visitors, and others. Complete reporting and documentation must accompany every incident, even if nothing more than a verbal confrontation. Use security and/or police sparingly. Once the decision is made to remove, follow through as quickly as possible. Be professional. Do not let someone's overheated emotions come into play, especially if that person is a staff member.

For additional information about protection of cultural properties, visit The International Foundation for Cultural Property Protection at www.IFCPP.org

or contact:

Layne Consultants International
Stevan P. Layne, CPP, CIPM
(970) 468-5522 Dillon (303) 377-2176 Denver
LayneCnslt@cs.com

REFERENCES

Suggested Guidelines in Museum Security — ASIS Museum, Library, and Cultural Property Committee

The Cultural Property Protection Manual — Layne Consultants International

The International Foundation for Cultural Property Protection — www.IFCPP.org

Stevan P. Layne, CPP, CIPM is principal consultant and CEO for Layne Consultants International (LCI). The firm is an independent, non-product affiliated consulting firm specializing in the protection of cultural institutions. LCI provides services worldwide to cultural properties, including protection evaluation, design and specification of electronic systems, protection training, and security management. Steve Layne is a former police chief, public safety director, and institutional security director. He is a graduate of the FBI's Police Management program and serves as a visiting lecturer at several colleges and universities. He is the founding director of the IFCPP.