GRIST

Fall 1993 - Volume 37, Number 4

Protecting Paper Records and Computer Media from Fire

by John E. Hunter

Resource management agencies must protect many types and large quantities of paper records, computer media, photographic documentation and audio and video recordings from fire, theft and unauthorized access. The extent of protection required and how it is to be provided are governed by agency laws, regulations, guidelines and standards applying to classified information, fiscal and personnel records, museum collection records and museum and archival collections. Within the National Park Service, the protection of administrative records is covered by other NPS, Interior and General Services Administration (GSA) standards and regulations. National Park Service archival collections and museum collection records are to be protected in accordance with the NPS *Museum Handbook*. These requirements also are contained in Special Directive 80-1 (Revised 1990) "Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections." The protection of both collections and their records also are addressed in NPS-28, *Cultural Resources Management Guideline*.

Fig 1. Vertical style of Class 350 insulated filing cabinet for paper records; can be either an Insulated Record Container or an Insulated Filing Device, depending upon whether or not it is drop tested. Source: Schwab Corp.

The protection of records while they are in use is the responsibility of the persons using the records who generally are required to follow specific locally developed standard operating procedures. The protection of records not in use against recognized threats is generally accomplished by storing them in filing cabinets and safes or occasionally, in walk-in vaults. The extent of protection afforded by a container or vault depends upon its design and construction.

Filing cabinets, safes and vaults are of two types: those protecting contents against fire and those protecting their contents against forced attack (i.e., burglary). Very

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few safes and no filing cabinets currently on the market can protect contents against both fire and burglary. However, either type may thwart surreptitious entry when equipped with high quality locking mechanisms. There are vaults that are rated for both fire and burglary protection. This article is concerned only with fire protection; burglary protection may be covered in a future article. Further information about burglary resistant safes can be obtained from Appendix 1 of NPS-22, *Fee Collection Guideline*.

In most instances, four-drawer or five-drawer insulated (i.e., fire-resistive) filing cabinets with combination or key locks will be the most convenient and economical way to protect records (see figure 1). Cabinets of this type are rated to protect their contents for up to one hour during exposure to exterior temperatures of at least 926.7 C (1700°F); interior temperatures are not to exceed 176.7 C (350°F). The insulation in such containers is designed to give off water vapor when the container is sufficiently heated externally. The water vapor keeps the paper contents below the ignition point (but does raise the internal relative humidity to 100 percent). The Underwriters Laboratories (UL) classification for such a cabinet is "Insulated Filing Device, Class 350—1 Hour" (formerly UL "Class D"). When records are to be kept in a space that is above the grade level of the building, such as on the second floor or on the first floor above a basement, they should be in a cabinet that will survive a drop through the floor during a fire. Such impact-rated cabinets are classified by UL as "Insulated Record Containers, Class 350—1 Hour" (formerly UL "Class C"). Impact resistant Class 350—2 Hour" and Class 350—4 Hour" filing cabinets also are available and should be considered in buildings that are likely to burn long enough or hot enough to warrant the extra protection (see figure 2).

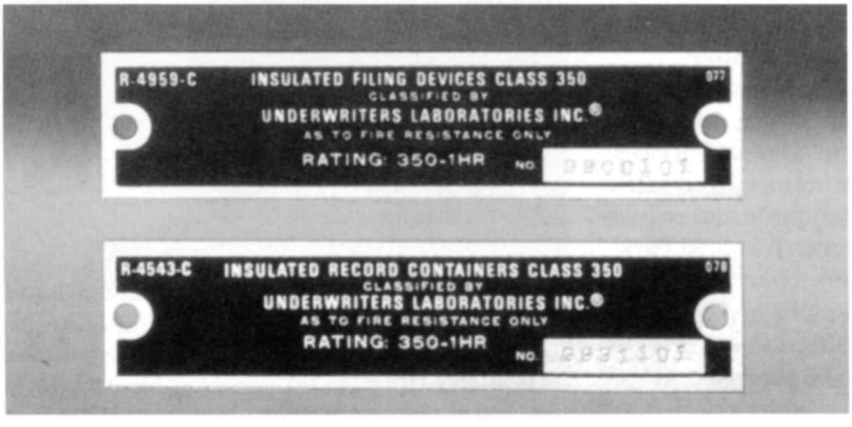
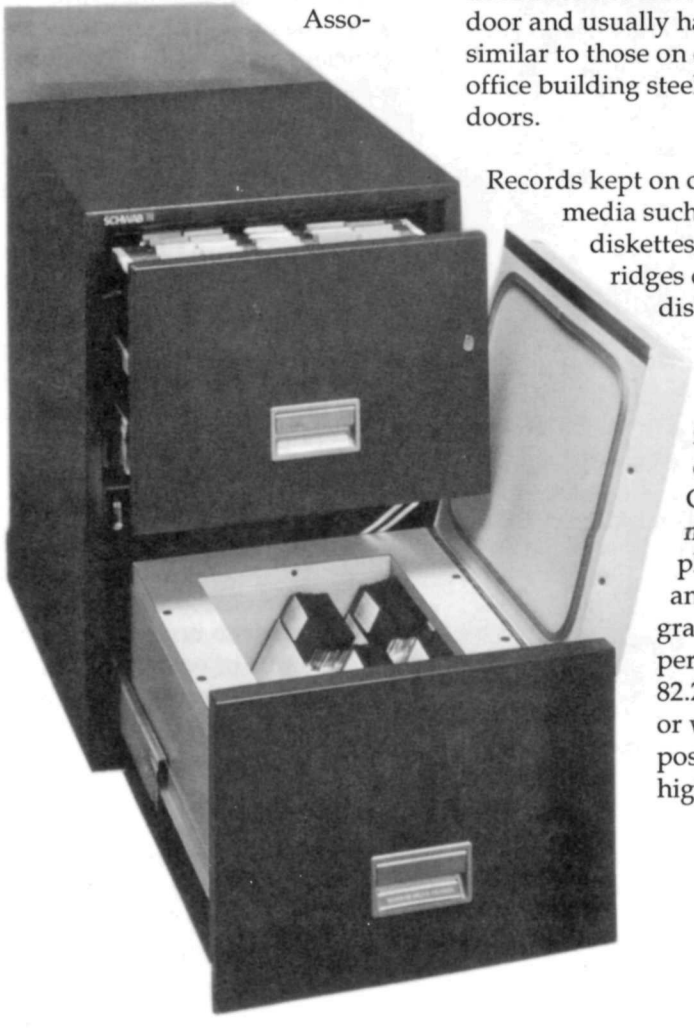


Fig. 2. Typical UL labels for safes and filing cabinets. Source: Schwab Corp.

When records are of a size or shape that they cannot fit conveniently into a filing cabinet, they can be protected in one-door and two-door insulated safes (UL classification: "Fire-Resistive Safe, Class 350—4, 2 or 1-Hour"). Agencies with very large amounts of records may find it more cost-effective to place them in ordinary steel filing cabinets and to keep the filing cabinets in a records vault. Vaults are to be constructed in accordance with either of two National Fire Protection Association (NFPA) codes and standards: NFPA 232, *Standard for Protection of Records*, or NFPA 232AM, *Manual for Fire Protection for Archives and Records Centers*. Vaults so constructed require UL classified "Fire-Resistive Vault Doors, Class 350—6, 4 or 2-Hour." This type of vault door may have a combination or key lock. Also available are UL classified "Fire-Insulated File Room Doors, Class 350—1 Hour" when lesser levels of protection are acceptable. This type of door does not look like a vault door and usually has a lock similar to those on conventional office building steel interior doors.



Records kept on computer media such as floppy diskettes, tape cartridges or Bernoulli® disks cannot be protected from fire in ordinary fire-resistive containers. Computer media are plastic-based and will degrade at temperatures above 82.2 C (180°F) or when exposed to the high humidity present during a fire in a conventional fire-resistive filing cabinet or safe. Consequently, computer media must be protected in containers specifically rated for their storage. Such containers keep the internal temperature below 51.7 C (125°F) or 65.6 C (150°F) and the relative humidity below 80 percent during a fire. There are three general types of protective containers for plastic-based media.

The first is a "mixed media container" which is a fire-resistive filing cabinet or safe containing a media box (which may or may not be removable) that provides additional insulation against heat and protection against high humidity. The basic or outer container is classified the same as a conventional filing cabinet or safe for paper records and is intended only for the protection of paper records. The inner media container is UL classified as "Class 125—4, 3, 2 or 1 Hour." If the media container is removable it has that UL rating only so long as it is inside the basic container; when outside, it may have no rating or a rating of only one-half hour (see figure 3).

The second type of cabinet is a "media safe" which is intended for protection only of computer

Fig. 3. Filing cabinet style of mixed media container, consisting of a Class 350 upper drawer for paper records and Class 125 lower drawer for EDP media. Source: Schwab Corp.

media. The entire unit is UL classified as a "Fire-Resistive Safe, Class 125—4, 3, 2 or 1 Hour." While paper records can be kept in such a safe it is not cost-effective to do so. Media safes should be reserved only for computer media (see figures 4 and 5).

The third type of container is a "media box" which is a small, portable container, usually with a hinged, lockable lid on top. Media boxes conveniently hold small quantities of diskettes and tapes at one's desk during the work day. However, most media boxes have only a 65.6 C (150°F) one-half hour rating and should not be depended upon as the only protection used for backing up computer media records. Some media boxes are small enough to fit inside the drawer of an insulated filing cabinet; when inside the cabinet, they may have the same rating as the media storage portion of a mixed-media container but are not necessarily classified as such by UL.

Fire-Resistive Safes and Insulated Record Containers (i.e., filing cabinets) also are available with a UL classification of "Class 150—4, 3, 2 and 1 Hour." Units so classified will not protect plastic-based computer media but are acceptable for protecting computer disk packs and tapes on reels, photographic negatives and slides, audio tapes, drawings on Mylar® and similar, more durable media.

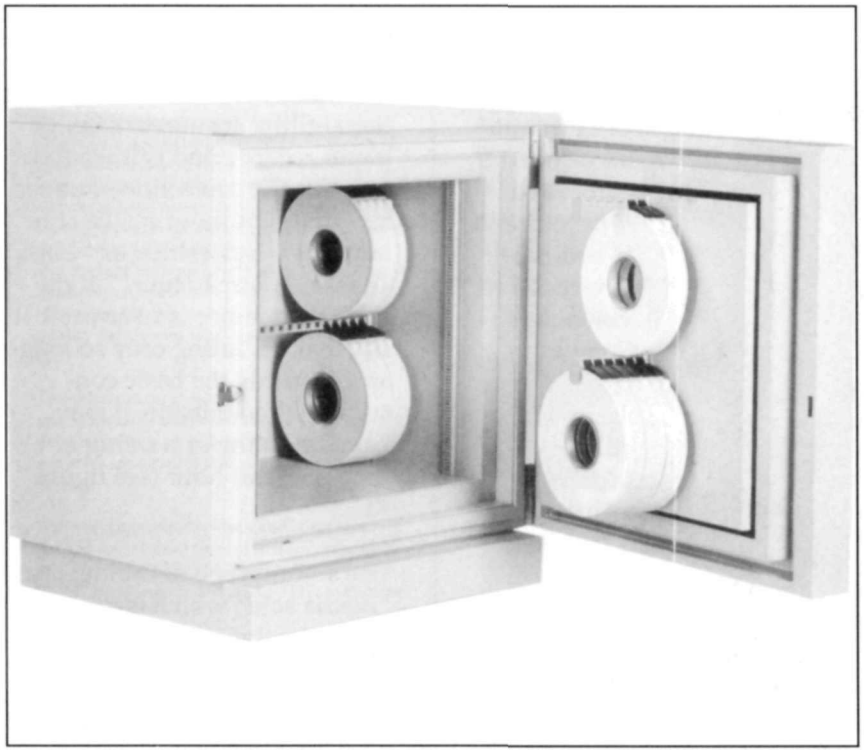


Fig. 4. Single door media safe (Insulated Record Container, Class 125– 1 Hour). Source: Chubb.

The selection of a container should be based on two factors: (1) what kinds of media are to be protected, i.e., paper records, computer diskettes or other plastic-based media and (2) what form of container would offer the most cost-effective, efficient and readily accessible storage, i.e., a filing cabinet with drawers or a safe with shelves?

• If most of the media to be stored will be in file folders, a filing cabinet usually will provide the most efficient storage and accessibility. If the media to be stored is boxed in large ring binders or ledgers, bulky or of odd shapes or varied sizes, then a safe with some configuration of adjustable shelves or racks may be more practical.

• The size of unit required and the number of units is based on the volume of records to be protected. Consideration also should be given to whether the volume of records might grow in the future.

• Determine whether the unit needs a combination or a key lock. Virtually all safes come with a combination lock as standard equipment. However,

most filing cabinets may be ordered with either type of lock or with none at all, or with locks on more than one drawer if desired and as discussed below. If protection against surreptitious entry is desired then only combination locks should be considered.

• Consider the need for optional accessories such as caster bases or decorative trim. Most fire-resistive safes are equipped with wheels but most insulated filing cabinets are not. However, caster bases usually are available for filing cabinets and can make them much easier to move. All types of containers are generally available in a number of different colors, usually at no additional cost. Only certain colors may be available on units purchased from GSA's Federal Supply Schedule vendors.

• Determine whether the floor where the container will be placed can support its loaded weight. The manufacturer's product literature should give net or empty weights for all models. Sales persons can usually help calculate gross or loaded weights based on anticipated contents.

• If the unit could drop through a floor during a fire, select a model that is classified as passing UL's impact or drop test. Additional details on protection of paper records and computer media can be obtained from the article "Filing Cabinets and Safes for Protection of Paper Records, Computer Media and Photographic Records from Fire Damage" by John E. Hunter, National Park Service *CRM Bulletin Supplement*, Vol. 16, No. 5 (1993).

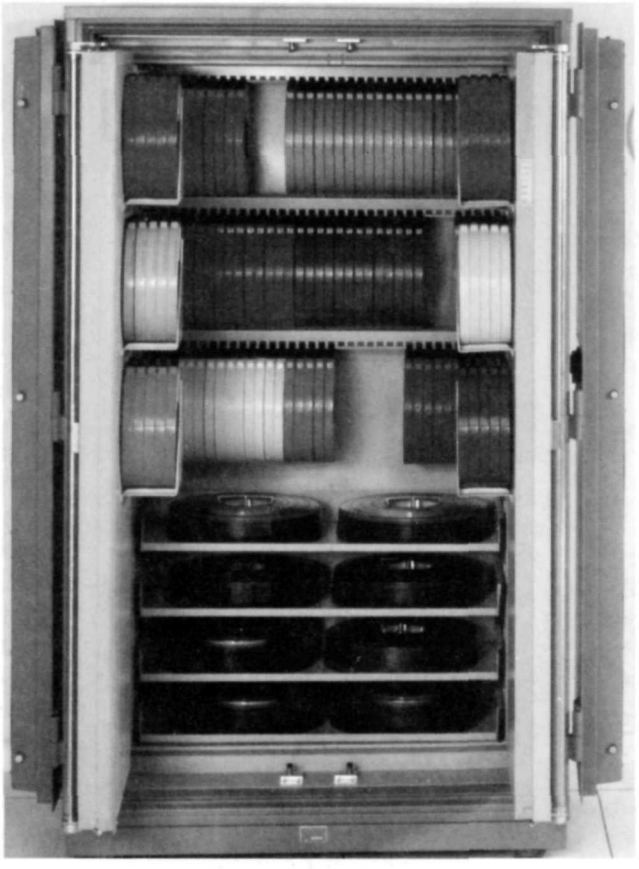


Fig. 5. Double door media safe (Insulated Record Container, Class 150– 1 hour). Source: Schwab Corp.

Safes and filing cabinets for the protection of records will provide optimum resistance to fire if they are kept in a room that is itself as fire-resistive as possible. This usually means that the room is not used for storage of flammable materials such as copy paper, blank forms and curatorial supplies. It also means that the room is locked against unauthorized access and is equipped with fire detection and suppression and intrusion detection systems. To evaluate protection of records and the spaces where they are kept, consult with an agency Safety Officer and/or Law Enforcement Specialist, a fire prevention specialist from the local fire department or other similarly qualified persons. Then take whatever remedial actions are necessary.

Federal agencies can purchase safes, insulated filing cabinets and vault doors under Federal Supply Schedule 71-III-E-7110; that schedule includes both fire-resistive and burglary-resistive equipment. Non-federal agencies can buy the same equipment on the open market.

John E. Hunter is Supervisory Staff Curator with the National Park Service's Curatorial Services Division, Harpers Ferry, West Virginia.

The Metric System – To Be or Not To Be?

by John Ap

Although it has been said that "Necessity is the Mother of Invention," we often show a tendency to make life difficult. In terms of measurement and weights, a number of systems have existed over the centuries which necessitated the division and multiplication in 4s, 8s, 12s and 16s or whatever numeric base was being used. (The Romans used the number 12 as a base.)

So! Once upon a time, it was decided that "life was meant to be easier" and some brilliant individual thought of using the number "10" as the base number. Thus, the metric system sprang into being. A brilliant thought, indeed! So much so that it has become the most universally adopted system of measurements and weights throughout the world today.

It is no small wonder that the metric system took off so well. As a kid, I dreaded the thought of math assignments using pounds, shillings and pence in which everything was divided by 12, in a wonderful country called "Down Under" (Australia). To make matters worse, life was made even more difficult when half pennies were brought into the calculations making it necessary to think in fractions as well. Fortunately in the United States, life was a little easier because the "greenback" uses a metric base. Well, at least bearable for those among us who are non-math whizzes.

If you went to the store and purchased some cloth material which costs $15 per foot but you only needed 7 inches, how quickly could you calculate the cost of 7 inches of cloth material in your head? First of all, you divide $15 ÷ 12 to work out how much it would cost per inch. Then you multiply that figure by 7 to get your answer. That means, $15 ÷ 12 equals $1.25 per inch. Then you multiply $1.25 x 7 and your answer is $8.75.

Next, you had to buy some lobster for dinner which costs $15 per pound. The lobster you have selected weighs 7 ounces. Now, how much would that lobster cost? To obtain the answer, we divide $15 ÷ 16 to get the cost per ounce and then multiply by 7 to get the answer. That is, $15 ÷ 16 = 93.8 cents per ounce. Multiply by 7 and the answer is $6.56.

Unless you are a math whiz or you constantly carry a calculator, divisions or multiplications using 12 and 16 for length and weight measurements respectively, are no easy task for most people. When faced with such a situation we often take the lazy way out and forget it, simply because it is too difficult and bothersome for the average person to work out.

But is there a simpler way? Yes! Life was meant to be easier. By using the metric system our examples given would be calculated as follows: if the cost of the cloth material is $15 per 30 centimeters but you only need 17 centimeters, your calculations would go like this: $15 ÷ 30 = .50 cents per centimeter. Multiply by 17 and your answer is $8.50.

For the lobster it costs $15 per 500 grams (half a kilogram). The lobster selected weighs 250 grams. First we divide $15 ÷ 5 = $3 per 100 grams, multiply by 2.5 and the answer is $7.50.

The question I ask has already been posed to you in the title of this note - "The Metric System: To Be or Not to Be"? It is easy for us to become set in our own ways and generally we do not feel comfortable with change. For many the answer to the question posed about the metric system would be "not to be," in spite of the inconvenience of my using the imperial measure.

On the other hand, some would respond to the question and say "to be." As one who is familiar with the use of the imperial, the U.S. Customary and metric measurement systems, there is no need to convince me of which system is preferred. As a "dinky di" Aussie, my advice would be - "Go For it, Mate!"

John Ap hails from Australia and is currently with the Department of Hotel and Tourism Management, Hong Kong Polytechnic, Hong Kong.

Lab Turns Old Tires Into Insulation

by Richard Broussard
CRREL

Car and truck tires are a necessity to our busy world because they get us where we want to go. But what happens to them when they wear out? Most end up in mountainous used-tire dumps. These used tires—more than two billion nationally—have accumulated faster than we can dispose of them.

What's the answer to the glut? Some are burned for fuel or used to protect boat docks. But the amount used in these ways doesn't begin to deplete the 190 million tires that are discarded each year.

The Corps' Cold Regions Research and Engineering Laboratory (CRREL) has developed a way to recycle used tires such as these for use as road insulation. (photo courtesy CRREL)

During the past winter, the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) highway researcher Robert Eaton, along with technicians Richard Rob Roberts and Richard Guyer, worked with researchers at the University of Maine to use rubber chips made from used tires as an insulating layer beneath a gravel surfaced road to minimize penetration of freezing temperatures into the underlying frost-susceptible soils. This arrangement works because rubber has significantly lower thermal conductivity than soil. A secondary benefit is that tire chips are very permeable and provide excellent drainage for excess water from the road substructure.

The demonstration project was conducted in Richmond, Maine, where tire chips were used as insulation to try to keep cold temperatures out of the underlying soil. The town of Richmond offered a 182.88 m (600-ft.) section of Dingley Road, a gravel road that had often been impassable in the spring, as the test site.

In Maine, as well as throughout the northern tier of states, frost penetrates deep into the soil beneath unpaved roadbeds, causing subsurface water to freeze into lens-shaped layers of ice, resulting in uneven surface frost heaving. During spring, the lenses melt and the water, having no place to go except upward to the road surface, causes the road to turn to mud.

Eaton and his crew installed a series of sensors to measure temperatures in the roadway. "We expected normal frost penetration down to about 1.83 m (6 ft.)," Eaton said. "With a 304.80 mm (12-in.) layer of rubber chips under about a 1.68 m (foot-and-a-half) of gravel roadway, we didn't expect the frost to go beneath the rubber chips. As far as we know, this is the first project in the country where tire chips have been used to create a thick insulating layer beneath a roadway."

The 182.88 m (600-ft.) long research section was used to determine what thickness of tire chips provides the most effective insulation and how much gravel cover is needed for support above the rubber layer. At the research site, tire chips have been spread in 152.40 mm and 304.80 mm (6 and 12-in.) layers beneath a 304.80 mm, 457.20 mm or 609.60 mm (12, 18 or 24-in.) gravel cover. Each layer is monitored by sensors that transmit physical conditions in the roadbed via telephone line to CRREL in Hanover, New Hampshire. This hookup allowed Eaton to monitor physical

conditions in the roadbed from his office.

Ground water sites also were monitored to determine any environmental side effects from the rubber. This 182.88 m (600-ft.) long test site alone used more than 20,000 tires. If successful, Eaton thinks this project could have widespread application throughout the country. Indications are that certain combinations of tire chips and gravel layers have proved successful. What does the future hold? According to Eaton, the project will continue to be monitored for three-to-four years to validate engineering specifications and engineering designs.

However, the outcome seems inevitable. With the enormous quantities of used tires cluttering the countryside and the pressure by environmental interests to recycle them, the country increasingly will look to the road and highway industry to help solve the problem. In Maine, just 9.66 km (6 miles) of road built each year using this technology would absorb every one of the 1.23 million scrap tires generated annually in that state alone.

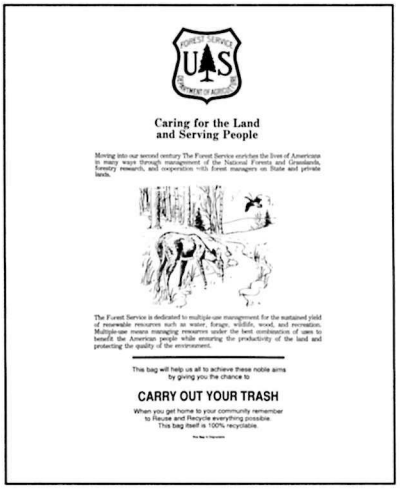
This article is reprinted from the August 1993 issue of Engineer Update.

Trash Bags

In 1990 the New Hampshire Parks Department identified two serious problems. First, bugs in general and bees in particular were becoming an increasing nuisance to visitors. These pests were attracted to the overflowing trash receptacles throughout the parks which were difficult to keep emptied because of the large number of visitors. Further, the trash removal service was becoming increasingly expensive.

To address these problems the Parks Department developed a trash bag program in conjunction with Tufpak, Inc. These bags were given free of charge to visitors who entered the park. Each bag was emblazoned with the request that the users carry their trash out with them when they leave. This project proved extremely successful and the bugs and bees went away while the trash removal costs dropped significantly.

Personnel from other park and recreation agencies soon learned about and began to develop their own trash removal program. For example, the National Park Service used the bag program while promoting part of its 75th Anniversary in 1991 and during the same year the USDA Forest Service was celebrating its Centennial and had bags printed with its logo, an attractive woodland scene and a request to "carry out your trash." Also, the Bureau of Land Management adopted the program and featured continuity of land care



over time on their bags, the Fish and Wildlife Service highlighted wildlife appreciation and the U.S. Army Corps of Engineers promoted swimming safety in the waters they control.

Additional information on developing your own logo or message can be obtained by contacting Derek C. Stannard in Ossipee, NH (603) 539-4126.

Proving Water Safety Is Not a Dry Subject

by Karen Chaney
Vicksburg District, U.S. Army Corps of Engineers

When Park Ranger Dave Dutton gives a program, he usually has the audience howling with laughter and even squirting each other with water pistols. But it is all in the interest of promoting Dutton's favorite subject—water safety.

Dutton has been a ranger at the U.S. Army Corps of Engineers' Sardis Lake in northern Mississippi for six years. While there, he developed an interactive water safety program that delivers some important messages in an entertaining way.

"The public doesn't really know what being safe around water means," said Dutton.

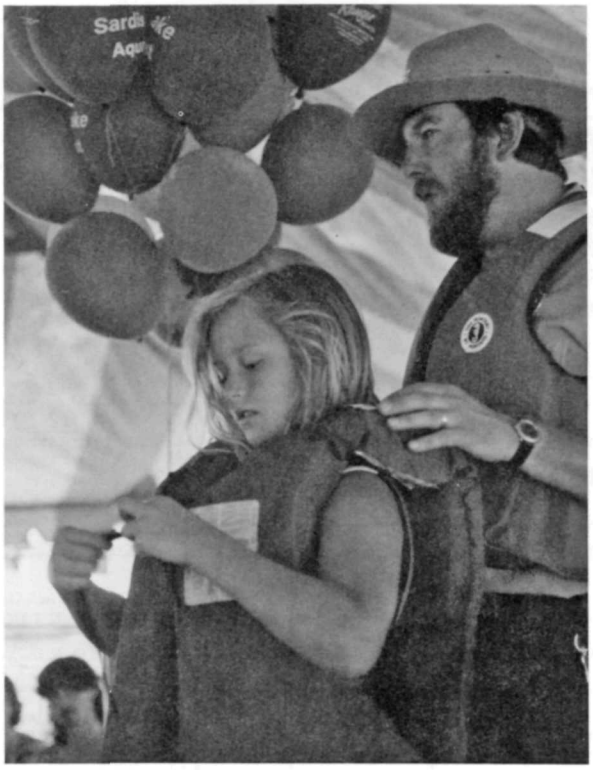
"There is a perception that water safety is a dry subject, if you'll pardon the pun. The general feeling is, `I know how to swim, so what else is there?' "

Dutton's program is called "Water Safety Interpretation—How to Stay Afloat!" It is aimed at fourth and fifth graders, but can also be given to adults.

One way Dutton gets his point across is to have the group take an imaginary boat ride. Four-to-eight chairs are set out to represent the imaginary boat. Participants sit in the "boat" and are given props such as sunglasses and fishing poles.

Several more people are armed with spritz bottles of water to simulate spray; others simulate wind with "cheek-induced air turbulence." Yet another group acts as an "obstruction" which the "boat" will hit. Personal floatation devices are placed under each seat and deliberately turned inside-out.

With everyone in place, the cruise narrator (Dutton) describes a trip which deteriorates quickly into a boating nightmare. Suddenly the boaters experience a violent storm with high winds and waves crashing over the bow, culminating in a collision with an unseen obstacle. As the boat starts to "sink" rapidly, the passengers must frantically scramble to put on their life jackets before they meet a tragic end.



Dave Dutton, park ranger at Vicksburg District's Sardis Lake, demonstrates the correct way to wear a life jacket. (Photo by Raleigh Dial)

The simple demonstration points out much more effectively than a lecture the need to wear floatation devices and not just stick them under the seat of the boat.

Each spring Dutton begins his water safety emphasis with trips to all schools in the area around Sardis Lake. Last spring he spoke to about 2,200 children.

"The statistics show that mainly white males between the ages of 10 and 29 are drowning at Sardis." Dutton said, "It might seem like we should target that age group but, at that stage in their lives, it is much more difficult to get our message across because they consider themselves invincible. So we start at an earlier age and emphasize preventing an accident. "There is no way to know how many lives you've affected, but the only recourse is to just keep trying," Dutton said.

This article is reprinted from the 1993 issue of Engineer Update.

NSPR "Best of GRIST" Awards

The Fairmont Hotel in San Jose, California, was the setting for the announcement of the 1993 National Society for Park Resource's annual "Best of GRIST" awards. At their awards luncheon held on Thursday, October 21, 1993, during the National Recreation and Park Association's yearly Congress, Sharon Hubler, Secretary-Treasurer for NSPR made known the names of the winners of these certificate and cash awards. The winners are:

First Place - $250

Recycle and Solid Waste Management Programs Within Iowa's Camping Areas
by Robert A. Robertson, Ph.D., Assistant Professor, Iowa State University.

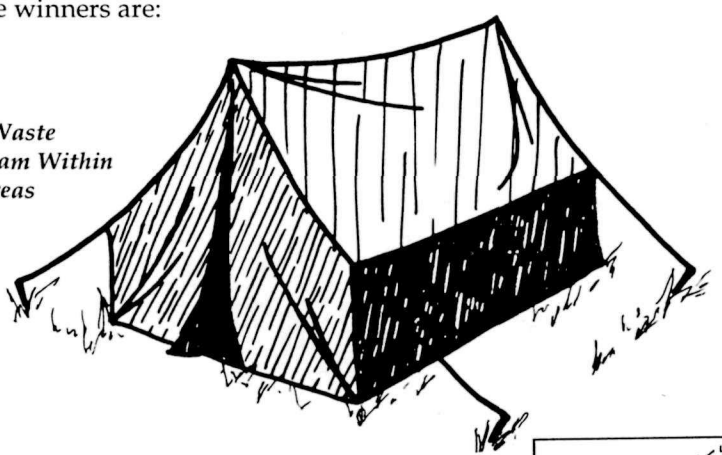
Second Place - $125

Plastic Trash Containers
by George Cottingham, Bradley Woods Reservation Manager, Cleveland Metroparks, Ohio.

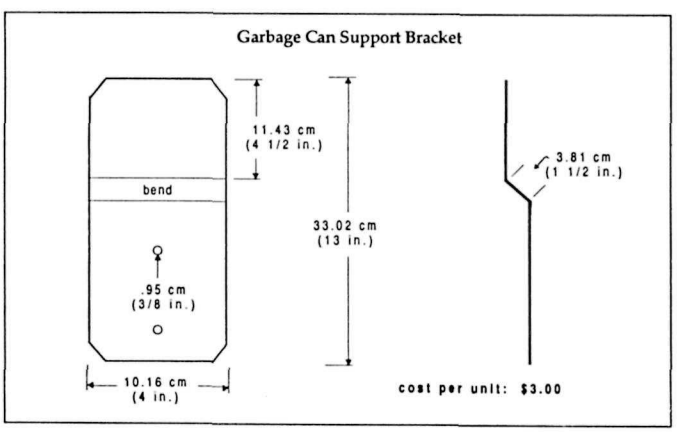
Third Place - $75

Recycle Center
by Tom Snoke, Chief of Maintenance, Florissant Fossil Beds National Monument, Colorado.

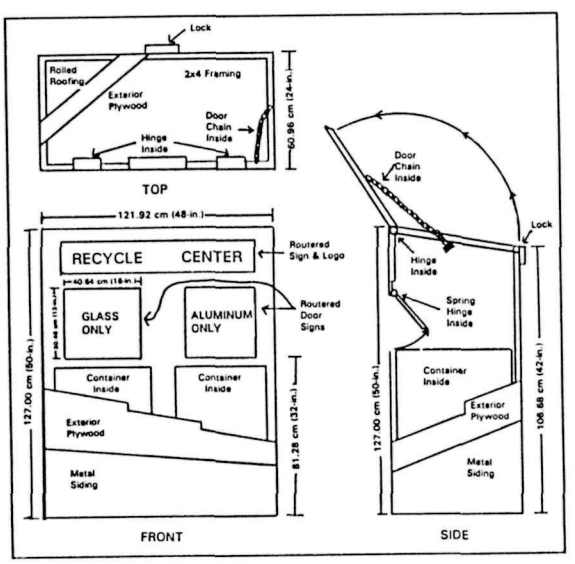
Each year the National Society for Park Resources, a professional branch of the National Recreation and Park Association, recognizes the persons and/or agencies who submitted the three articles considered "the best" that were published in GRIST during the previous four issues (Summer and Fall 1992, Winter and Spring 1993). Dr. Philip McKnelly, Director of North Carolina State Parks, chaired the 1993 GRIST Awards Selection Committee. Some of the criteria used to judge the articles are: need, scope, uniqueness, adaptability for other applications, simplicity, educational value, re-use or recycling.



First Place
Recycle and Solid Waste Management Program Within Iowa's Camping Areas



Second Place
Plastic Trash Containers



Third Place
Recycle Center

Simply Saving the Past: Maintaining Historic Wooden Windows

Excerpted from Preservation Briefs 9
The Repair of Historic Windows by John H. Myers

Evaluate the condition of each unit. The windows on many old buildings are an important aspect of the overall historic character. Their design, craftsmanship or other qualities may make them worthy of preservation. After the architectural or historical significance of the windows has been accurately identified by qualified preservation professionals, the key to successful planning for project work is a careful evaluation of existing conditions on a unit-by-unit basis. A graphic or photographic system may be devised to record existing conditions and illustrate the need for varying levels of repairs.

Check for moisture penetration. After the recording phase, each window unit should be inspected to see if water is entering around the edges of the frames. If so, the joints or seams should be caulked to eliminate this danger. The glazing putty should also be checked for cracked, loose or missing sections which allow water to saturate the wood, especially at the joints. Areas of peeling or cracking paint usually identify points of water penetration, moisture saturation and possible deterioration.

Check for operational soundness and condition of the wood. Next, beginning with the lower portions of the frame and sash, each window should be examined for operational soundness (i.e., opening and closing). Exterior rainwater and interior condensation can flow downward along the window, entering and collecting at points where the flow is blocked. The operation of the windows over time has weakened the joints, causing movement and slight separation. This process makes the joints more vulnerable to water which is readily absorbed into the end-grain of the wood. If the wood is sound, routine maintenance is appropriate. Note: Repairs to severely deteriorated wood could require structural stabilization or even partial replacement. These repairs go beyond the scope of this guidance for routine maintenance.*

Eliminate moisture/apply fungicide. Finally, before undertaking any repairs—at the maintenance level or beyond—all sources of moisture penetration should be eliminated and fungi destroyed using a commercial fungicide.

The routine maintenance required to upgrade a window to "like new" condition usually includes the five steps illustrated in Figures 4a-4f on the next page: (1) some degree of interior and exterior paint removal, (2) removal and repair of sash (including reglazing where necessary), (3) repairs to the frame, (4) weatherstripping and reinstallation of the sash and (5) repainting. These operations are illustrated for a typical double-hung window but may be adapted to other window types and styles as applicable.

**Stabilization and replacement guidance are detailed in Preservation Briefs 9. For this and other essential information in a total of fourteen Briefs, order Historic Building Preservation Briefs #1-14 (set) from the Government Printing Office. Stock number 024-005-01026-2. Price: $13.00, includes postage and handling. Make check payable to: Superintendent of Documents and mail to: Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325.*

Figure 4a. *The following series of photographs of the repair of a historic double-hung window use a unit which is structurally sound but has many layers of paint, some cracked and missing putty, slight separation at the joints, broken sash cords, and one cracked pane. Photo: John H. Myers*

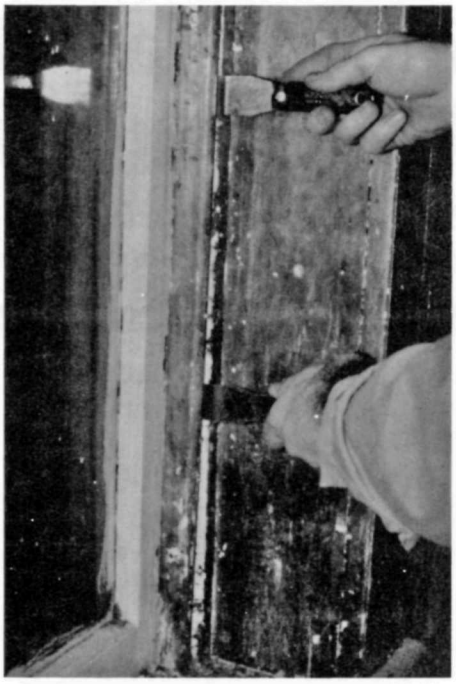


Figure 4b. *After removing paint from the seam between the interior stop and the jamb, the stop can be pried out and gradually worked loose using a pair of putty knives as shown. To avoid visible scarring of the wood, the sash can be raised and the stop pried loose initially from the outer side. Photo: John H. Myers*

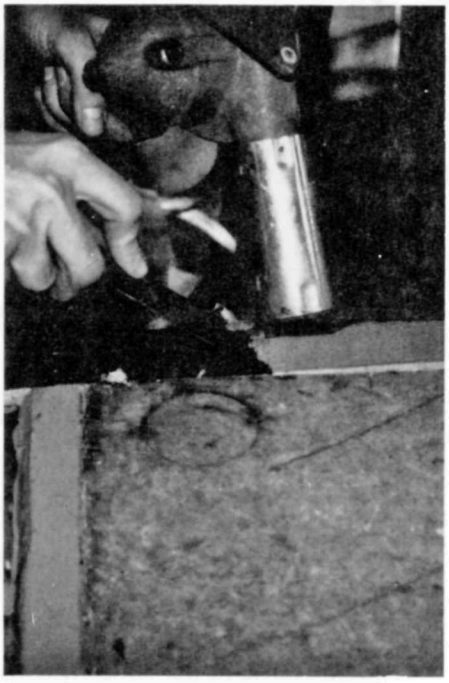


Figure 4c. *Sash can be removed and repaired in a convenient work area. Paint is being removed from this sash with a hot air gun while an asbestos sheet protects the glass from sudden temperature change. Photo: John H. Myers*

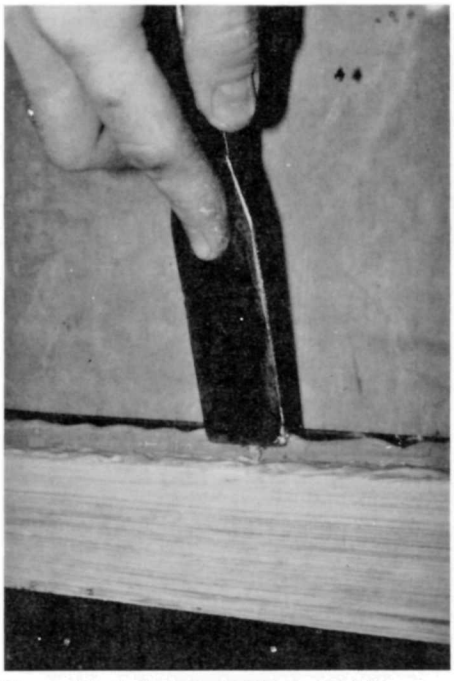


Figure 4d. *Reglazing or replacement of the putty requires that the existing putty be removed manually, the glazing points be extracted, the glass removed, and the back putty scraped out. To reglaze, a bed of putty is laid around the perimeter of the rabbet, the pane is pressed into place, glazing points are inserted to hold the pane (shown), and a final seal of putty is beveled around the edge of the glass. Photo: John H. Myers*

Figure 4e. *A common repair is the replacement of broken sash cords with new cords (shown) or with chains. The weight pocket is often accessible through a removable plate in the jamb, or by removing the interior trim. Photo: John H. Myers*

Figure 4f. *Following the relatively simple repairs, the window is weathertight, like new in appearance, and serviceable for many years to come. Both the historic material and the detailing and craftsmanship of this original window have been preserved. Photo: John H. Myers*