

# Protecting Framed Works From Heat and Smoke

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Thankfully, fire is rarely seen in institutions that preserve our cultural treasures. Museums, archives and libraries are designed and operated to have minimal fire load. They also are monitored with utmost care. Unfortunately, private collections may not take the same precautions and there also are dramatic exceptions to this in institutions. Memorable examples include the fire at Windsor Castle in 1992 and the devastating fire in 1978 at The Museum of Modern Art in Rio de Janeiro.

For the most part, public collections have systems that suppress fire and staffing that affords constant monitoring. The Louvre in Paris even has its own fire company. Often, the fire suppression systems are concentrated in the storage area and they may be based on gases that consume oxygen, gases that replace oxygen, water mist or liquid water. Storage involves compact housing of the collections in boxes, drawers, shelves or racks. This makes the fire load more dense and less available to fire suppression mechanisms.

## Flame

When we think of fire, we may think of the flame itself and its consequences. In display areas, the collections are spread out and are often in a vertical orientation. Verticality is important, since fire burns upward.

Spreading beyond the flame are smoke and heat, which are threats with much greater reach. When there is open flame in a closed space, the temperature at the top of the spaces rises to disastrous levels almost instantly. This is why we are advised to crawl out of buildings that are on fire.

## Heat

The heat from fire will desiccate objects in its path, which enhances their ignition potential. As the heat gathers, it will cause physical changes in materials. Plastic sheets will bow toward the heat and eventually, craze and bubble. Plastic also is a thermal insulator and is less likely to transmit the heat than glass. Heat's effects on glass will be less immediate. Glass is more heat stable, but also is a thermal reservoir so it will transmit the heat to the material behind it.

For both glazing types, protection from the heat is a critical safeguard for the framed item. Their protective properties can prevent the complete loss that occurred at the Huntington Library in Los Angeles in 1985, when a blast of heat in an elevator shaft burst the elevator doors open. This fire destroyed a portrait by Sir Joshua Reynolds, while its gilt frame was stripped of its surface dirt and its gilding was left intact.

## Smoke

Smoke can travel further than the heat and may be the most pervasive threat of all. In light of this, mechanical components of public collections may be segregated from the collections

in a separate structure. Smoke comprises incompletely combusted hydrocarbon particles. These particles are aromatic, meaning that they contain rings of carbon atoms. Their atomic structures make them chemically active and contribute to smoke's pervasive and persistent danger. Smoke will invade any open material and can persist there for surprisingly long periods. Books, which were exposed to smoke hundreds of years ago, can still carry its odor. Keeping smoke away from preserved material requires careful enclosure of those materials. A glazing sheet is the logical beginning component in this protective layer. Both acrylic sheet and glass are good choices to keep smoke away.

A backing board behind the framed item also is essential to smoke protection. Creation of a seal between the glazing sheet and backing board also helps with smoke mitigation, as well as with pest and climate management. Repeated tests on backing board materials were conducted by members of the Washington Conservation Guild. They took art storage materials to fire-testing areas and ignited them. They learned that channels, or flutes in a double wall board, will serve as chimneys in a fire. This enhances the combustion of the board. In storage settings, these boards can only be recommended for use if there is a fire suppression system in place. In display settings, these boards will be shielded from



*The photographs once housed inside these frames were pulled from the 29th floor of the LaSalle Bank Headquarters following a massive fire in 2004. Although the effect of the blaze's intense heat is readily visible here: the Plexiglas melted and bowed outwards, away from the artwork, The Conservation Center's Disaster Response team successfully recovered, preserved, and re-framed the photographs to protect them again for years to come.*



*Most of the collection was salvageable, due largely to the curator who had the entire collection framed to museum standards. During the fire, the framing materials served as a protective barrier, saving many of these unique and important pieces.*

the initial heat of a fire and a plastic board will warp out toward the heat.

A plastic backing board will keep smoke away, where a paper board may not. Boards without channels are a much safer choice. Polypropylene honeycomb board and boards that combine two skins of aluminum with a plastic core are preferred.

### Fire Suppression Systems

Fire suppression systems employ water or gas to extinguish fire. Gaseous fire suppression systems starve the flames of oxygen and work best in smaller spaces. Gaseous systems are ideal for control of fire in storage areas, while larger exhibition areas are more suited to systems that use water. In more confined spaces, the water can be delivered as a mist, which is less physically disturbing than a spray.

Systems designed to spray water require pressurized water in pipes above the protected area. This water can be constantly present, can be a wet pipe or can be held at a distance to be delivered when the fire occurs as dry pipe or per-action systems. Because the wet pipe systems are more reliable in a fire, they often are required by building codes. They also introduce another risk factor, accidental wetting, when no fire is present. The sprinkler heads in these systems are fragile. If they are hit with a ladder or other building element, they will spray pressurized water until the system can be turned off at the hydrant. These accidents are far more common than fires in museums. Having a glazing sheet in front of the framed item is an essential element in the protection of the item from damage from the spray.

### Private Collection Considerations

When working with private collections, strategic placement of artworks and artifacts in homes should be considered. Displaying items in kitchens can put a piece at risk for exposure to heat, humidity and grease from household cooking. Artworks should not be installed in bathrooms because of the immense fluctuations in humidity and exposure to condensation. Also, albeit traditional to display artworks over a fireplace, it is not ideal due to risk of exposure to elevated levels of heat and soot. Having a piece archivally framed and housed with glazing can help protect against these exposures, but proper placement of artworks in the home takes that protection one step further.

It is not only paper and paintings that deserve the additional layer of protection that glazing provides. Costumes, weavings, ethnographic objects, and other types of artworks and artifacts benefit from the protection of acrylic when installed in a vitrine or shadowbox. In addition to keeping soot, dirt and other particulates off the pieces, this also can lower maintenance costs.

Glass and acrylic may act as thermal reservoirs in environments of high heat, but if artworks are installed with proper housing, including spacers, the glazing likely will be far enough away from the piece such that its thermo-conductive properties do not affect the artwork. Glass has a

low level of thermal conductivity, approximately 1.05 W/(m K), while acrylic has an even lower level of approximately 0.2 W/(m K). This means that, while the materials used in glazing have the capability to conduct heat, it is not of large enough concern to forego utilizing glazing as an additional layer of protection against disaster.

Protecting works of art and other cultural treasures with a glazing sheet in front and a backing sheet in back enhances preservation and protection from heat, smoke and flame. If the glazing and back sheet are sealed together, around their edges, protection from smoke, pests and atmospheric pollution also is provided. Ultimately, the glazing sheet is the first line of defense against fire. In future issues of QuickVue, we also will show that the glazing sheet provides protection against vandalism and should be considered a standard part of public display of valuable collections.



**April Hann Lanford** is the Conservation Center's vice president of client services and the primary on site consultant. She has assessed damage to prestigious collections around the country. Though many of The Center's clients prefer that their names are kept confidential, collections Hann has reviewed publicly include those of LaSalle Bank, The Museum of Contemporary Art in Chicago, Tulane University, The New Orleans Museum of Art, and The University of Iowa Museum of Art. She has also led the disaster response team efforts for The Center during Hurricane Katrina, California wildfires, the Iowa flood, Hurricane Sandy, and flood in Boulder, CO. For more information on The Center, please visit [www.theconservationcenter.com](http://www.theconservationcenter.com)



**Hugh Phibbs** began working in commercial framing in Washington, D.C., in 1976. Three years later, he joined the conservation staff of the National Gallery of Art. At the Gallery, he worked in the Paper Laboratory and the Department of Exhibitions and Loans, coordinating the preservation of works of art on paper, books and panel paintings on loan. He has written on preservation for Picture Framing Magazine and the Journal of the American Institute of Conservation. He also has taught preservation classes for the Smithsonian Resident Associates Program, the Professional Picture Framers Association (PPFA), the American Institute for Conservation of Historic and Artistic Works (AIC), the Centre de Conservation du Livre (CCL) in Arles, France; and the Institut National du Patrimoine (INP) in Paris, France. He has given workshops to the staffs of The Louvre, The Hermitage, The Metropolitan Museum of Art, The Getty Museum, MoMA, The Harvard Libraries, and The Smithsonian Museums of Art. He is a professional associate of AIC and recipient of the University Products Lifetime Achievement Award. He retired from the National Gallery in 2014 and continues to write and teach about preservation, while working on innovations for the field.

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