

# A Consumer Guide to Materials for Preservation Framing and the Display of Photographic Images

Created by Image Permanence Institute with support from Tru Vue



**F**raming and displaying your photographs (both traditional and modern digital) is one of the best ways to enjoy them and share them with your friends and family; however, it can also place great stress on them, resulting in fading, yellowing, embrittlement, and other types of decay, and ultimately reducing their life-span. The goal of this guide is to help you understand why photos on display become damaged and how thoughtful framing and display practices can help keep your pictures safe. Let's start with describing the various parts of a good-quality frame.

## ANATOMY OF A FRAME PACKAGE

A frame package is made up of several important parts that contribute to the decorative, rigid structure that protects a photograph on display. The individual parts of a good-quality frame package are shown in Fig. 1. More elaborate frame packages can include other components, but this shows the basic setup.

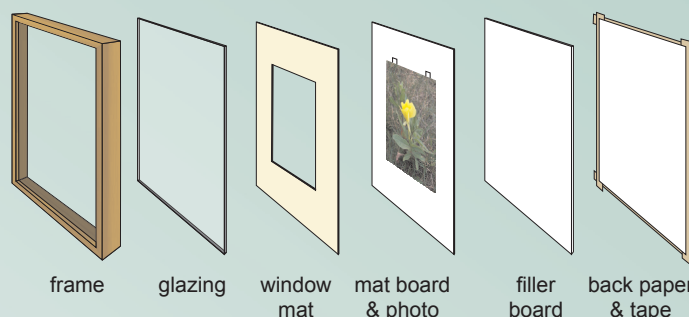


Fig. 1

### The Frame

In addition to providing an attractive border, the frame functions as the structural support that holds the entire package together. The frame must be strong enough to support the weight of all of the other framing materials and the photo, while hanging on the wall or standing on a shelf.

### The Glazing

The glazing, which can be either glass or plastic (such as acrylic or polycarbonate), is the clear sheet over the face of the photo that provides protection from dust and pollution and that also filters out some of the harmful UV energy (see page 3). Glazing can be treated or coated with a variety of substances to more fully block damaging UV energy as well as to reduce reflections from its surface, making it easier to view the photo.

### The Window Mat or Spacer

The window mat can be a decorative element, but its main purpose is to hold the glazing away from the surface of the photo (see Fig. 2). In some instances, it may be desirable not to have a window mat but to have the edges of the photo go right under the edge of the frame. In this case, spacers are placed out of sight just inside the edge of the frame between the photo the glazing (Fig. 3).

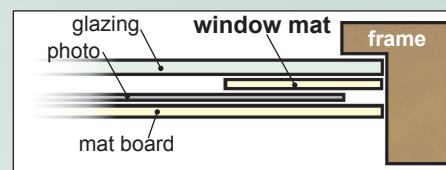


Fig. 2

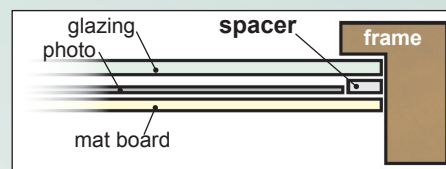


Fig. 3

## The Mat Board

The mat board is the rigid surface to which the photograph is attached and held in place. It should be a good-quality, nonreactive paperboard. It should also be strong enough to support its own weight plus that of the photo so that it doesn't sag over time.

## The Filler Board

The filler board is placed behind the mat board to fill up the space between the back of the mat board and the back edge of the frame (Fig. 4). It is important that the filler board also be made of a nonreactive material. Even though the filler board doesn't touch the artwork directly, a poor-quality board might cause damage by giving off harmful pollutant gases over time.

## The Back Paper

A liner paper is adhered to the back of a wooden frame to keep dust and insects out (Fig. 4). In addition, it helps to reduce fluctuations in humidity and limit infiltration of airborne pollutant gases. It also provides a nice surface on the back of the frame to which to attach a label.

It is difficult to attach back paper to a metal frame. If a metal frame is used, polyester tape should be applied around the edge of the inner framing package to seal the contents (see Fig 5). The edge of the frame hides the tape.

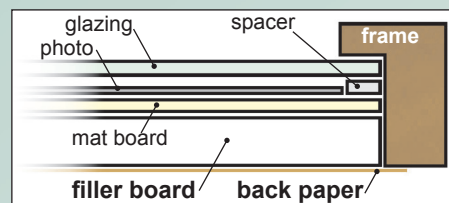


Fig. 4

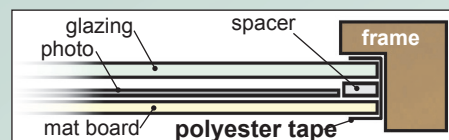


Fig. 5

## Labeling

While not a structural element of the frame package, a label on the back, providing information about the photo and the frame, can be very helpful later on. Useful data on a label might include descriptions of the people or the scene in the photo, the date the photo was taken, the photographer, the date of framing, and the framer. When labeling by hand, use a pencil or waterproof, fade-resistant, pigment ink pen. When printing labels, use a laser printer; many inkjet printer inks are sensitive to fading or abrasion.

# FORCES OF PHOTO DECAY

## Decay on Display

Most people think that light causes most of the damage to photos on display, but there are other forces that contribute to the decay of photographs, including heat, pollution, moisture, and even the framing materials themselves. Below are descriptions of each of these, but we will start by discussing exactly how light harms photographs.

## Light Fading

The rate at which photographs are damaged on display and the type of damage that appears are determined by two properties of light: quality and quantity. Light *quality* doesn't refer to how well the bulb was manufactured or how long it will last before burning out, but to the type of light: tungsten, fluorescent, or sunlight. *Quantity* of light refers to its *intensity*, that is, how bright the bulb is. The light from a child's nightlight is similar in quality to that from a hundred-watt lamp bulb, but the quantity of light emitted by the nightlight is far less.

The quality of light is often correlated with the color of light. Most people know that tungsten light tends to be yellow and that fluorescent light is fairly white (although older bulbs often made things look green). Sunlight varies in color throughout the day and with different types of weather. Sunsets are marked by their glowing orange, while an overcast day can look dark grey-blue. The color of light affects both the way in which photos on display change and the speed with which they change. Blue light is higher in energy than green, yellow, or red light, and the higher the light energy, the more likely it is to damage photos. Right next to blue light in the spectrum (see Fig.7) is ultraviolet (UV), which can be the most damaging of all. The term *UV light* is a really misnomer. The word *light* applies only to the energy that we can actually see, and UV is invisible to humans (although some animal species can see in this range).

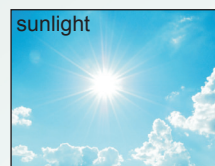


Fig. 6



It is more appropriate to refer to UV *energy*. Next to red in the spectrum is infrared energy. Infrared is less damaging in terms of its light energy, but it can cause framed photos to heat up. The three forms of energy—UV, visible light, and infrared—harm photos in different ways.

### Damage by UV Energy

Each type of light (tungsten, fluorescent, and sunlight) contains different amounts of UV energy. Sunlight contains the highest UV levels and is the most damaging, followed by fluorescent. Tungsten carries very little UV energy.

UV energy can damage photos by fading the image as well as yellowing and/or embrittling the paper. One of the ways it fades photos is by breaking the internal chemical bonds of the color molecules that form the image. This causes the molecules to become colorless and invisible to our eyes. The more this happens, the more the image fades. This process is called *photolysis*.

Another way that UV energy fades photos is by *photo-oxidation*. UV energy excites the color molecules, making them more sensitive to oxidation (the same process that causes iron to rust). This is a two-step process (excitation-oxidation) that won't take place without both UV energy and an oxidizing agent. Unfortunately, our air is full of oxidizing agents, most notably ozone. Both photolysis and photo-oxidation can cause photographic prints to yellow or become brittle over time (see Fig. 8).

Tungsten lighting emits fairly low levels of UV. Because of this, many people mistakenly believe that, since they light their homes with tungsten bulbs, they don't have to buy UV-blocking glazing for their frames. However, research by a major manufacturer of photographic prints has shown that the dominant type of light in homes is still sunlight through window glass.<sup>1</sup> This means that the photos we display are actually being subjected to the harshest of type of light and therefore really do need protection.

### Damage by Visible Light

Visible light (non-UV) can also be damaging to photos. Visible light usually isn't strong enough to cause photolysis, but it can still cause some photo-oxidation. So, while it is very important to reduce a photo's exposure to UV energy, that won't prevent all fading. We can reduce damage by visible light by reducing the quantity of light, and we can do this by placing our framed photos in low-light areas or by moving the photos and the light sources further away from each other. Because our framed photos must be exposed to *some* visible light if we want to see them, it is all the more important to reduce any damage from UV energy or poor-quality framing materials.

### Damage by Infrared Energy

Like UV energy, infrared energy exists in varying amounts in each type of light. Tungsten and sunlight have more infrared than fluorescent. As mentioned, infrared energy can heat framed photos. This can dry out the photograph, causing it to warp or shrink and pull at its mounting points. Heat also accelerates other types of decay. It sometimes takes longer to notice damage caused by heat than to see damage caused by UV or visible light, but the damage is always occurring, even when UV-protective glass is used. Again, keeping framed photos in naturally low-light-level areas in the home will reduce the amount of damage over time. If tungsten light is aimed directly at a photo, feel the glazing for warmth. If it feels hotter than other areas of the room then lower the light levels or move the photo and the light source further apart.

### Dark Fading

While light fading is easy to describe, dark fading is more complicated. Dark fading is the damage that occurs when photos are stored in the dark, as in boxes or photo albums. Where it gets confusing is that dark fading also occurs in the light, simultaneous to light fading, so it's always happening to our framed photos too. Dark fading is not caused by the dark; it is the sum of the damage caused by forces that do not need light, and those forces continue whether the lights are on or off. The forces behind dark fading are heat, pollution, and humidity.

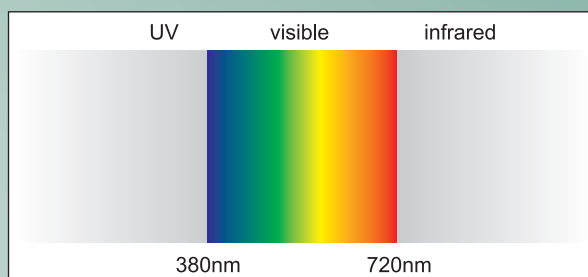


Fig. 7



Fig. 8

The heat that damages photos is not the kind of heat we associate with an oven or even a very hot day. Room temperature for us is hot for a photo. Most photos last longer when stored in cool or even cold storage spaces. Since we prefer our living conditions to be around 70 to 75 degrees, the lives of our photos are forcibly shortened. There's really not much we can do to prevent this for our photos on display. The one thing we can do is make sure that the lighting we use to illuminate our pictures does not also heat them up.

Pollution in the air can come from outside the home in the forms of ozone, oxides of nitrogen, and other gases that are the products of our industrial society, but pollution can also come from sources inside the home, such as household cleaners, electronic equipment, and curing paint and adhesives. Don't clean your frames with chemicals, and always let a freshly painted room cure for at least two weeks before rehanging your pictures. Pollution was the cause of the image fading shown in Fig. 9.



Fig. 9

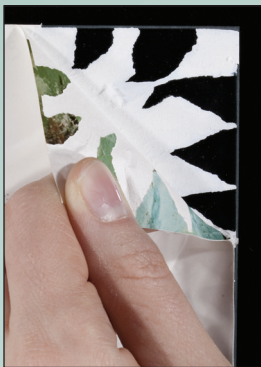


Fig. 10

Damage by moisture comes in many forms. In the case of framed images, one of the most common and the most destructive is *blocking*, which is the adhesion of a smooth surface—in this case, the glazing—to the surface of a photo. In high humidity the top layer of many photos can soften and become like glue, bonding the photograph and glazing together. It is often impossible to remove a blocked photo without destroying it (see Fig. 10). This is why it is so important to use a window mat or frame spacers to prevent direct contact between photograph and glazing.

High humidity can also result in mold growth that damages the image (Fig. 11). Mold is also a health hazard. If mold growth is not too severe, a professional conservator can remove it. The dyes used in some modern digital photos have a tendency to bleed at high humidity. Details in the image will blur, making the photo look out of focus (Fig. 12); the colors can shift as well.



Fig. 11



Fig. 12

#### *Damage from Poor-Quality Framing Materials*

The materials used to frame a photograph can also cause damage, if they are of poor quality. Usually, the worst culprits inside the frame are the paper materials that make up the mat board, the window mat, the filler board, or the backing paper. These can fade, mar, or yellow the photo.<sup>2</sup> Wood frames and some adhesives can also cause damage.



Fig. 13

The reactions caused by these materials, like those we see from air pollution, are often oxidation reactions that result in image fading. In a black-and-white image the faded silver can migrate to the surface of the print and be converted back into metallic silver by other pollutants (either from the framing materials or the air), forming a mirror-like sheen on the print's surface. In the case of the photo on the left (Fig. 13), a poor-quality mat covered the outside edges of the print and caused the silver mirroring. The oval shape in the center of the print is where the mat did not cover the print. Often this form of damage is caused by papers that contain lignin. Lignin is a natural substance in wood that, if not removed during pulping, can be very hazardous to photos. Not only

can it cause fading or mirroring like the example shown here, but it can also cause severe yellowing of photos.

It is not always the image that is damaged; sometimes it is the paper support. Acidic mat boards, filler boards, and

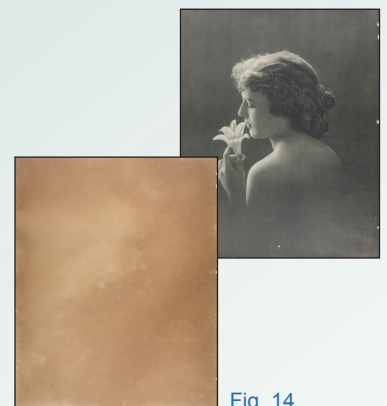


Fig. 14



frames can “burn” paper, causing it to turn brown and become brittle (Fig. 14). A photograph with this type of damage must be handled very carefully to avoid breakage. All of these problems can be prevented by selecting good-quality framing materials to begin with.

### Self-Destructive Photographs

Some photographic materials themselves can give off harmful chemical gases that turn around and cause further damage the photo. This is called *autocatalysis* because the photo catalyzes its own decay. Any photo printed on a poor-quality paper or unstable plastic can deteriorate and release chemicals that then accelerate decay.

### Confounding Combinations

Not only do the different forces of decay described so far occur independently, they also exacerbate each other and make the damage even worse. The framed photograph and detail in Fig. 15 show what has often been called the “picture-frame effect.” This black-and-white photo was framed and displayed on a wall in an office. UV energy entered the frame and reacted with one of the layers of the photo creating a pollutant that then faded the image. The faded silver was then converted into an orange substance in the dark areas of the print by yet another pollutant that came from either the photo itself or the framing materials. In order to occur, the effect needed UV energy, an unstable print, the pollutants, and the closed environment of the frame. Removal of any one of those factors could have prevented the damage we see.

Thus an important point to remember regarding the ways in which photos are harmed when framed and on display is that the damage to the photograph isn’t always caused by light or UV energy. Damage can also be due to the framing materials, moisture in the air, pollutants from a variety of sources, and sometimes all of the above.

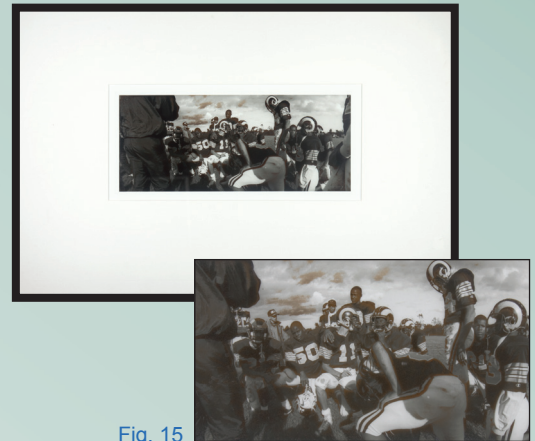


Fig. 15

## BEST PRACTICES FOR FRAMING

### How to Select the Right Framer

The first choice to be made is whether to use a professional framer or to select ready-made frames from a local or online retailer and frame your photos yourself. While convenient and often less expensive, ready-made frames usually contain glass that has not been coated for UV protection, and many also have filler boards made of acidic, lignin-containing paperboards that can yellow or fade your photographs. If the frame’s package doesn’t list the appropriate materials, then assume it doesn’t contain them.

A professional frame shop gives you access not only to a wider range of frame designs but also to expertise in the types of materials needed to protect your particular type of photo. But how do you pick the right frame shop? Like any profession, some members are more educated and skilled than others. You wouldn’t pick a surgeon randomly out of a phone book and you shouldn’t pick your framer that way either. Seek recommendations from friends, but also check the Professional Picture Framers Association (PPFA) website to find a certified framer in your area. Certified framers must have a demonstrated basic level of skill and knowledge.

### How to Select the Right Materials

What are the best materials to use? There are a variety of opinions on these matters, but it’s usually best to follow guidelines published by recognized groups whose business is it to give quality advice (as opposed to selling particular products). One such group is the International Organization for Standardization (ISO). Made up of experts from member countries, ISO committees write standards for use by everyone—both the average consumer and the major museum. One standard of particular interest to anyone framing photos for display is ISO 18902—*Imaging*

#### HELPFUL LINKS

Use the links below to find a framer certified by the Professional Picture Framers Association or a conservator through the American Institute for the Conservation of Artistic and Historic Works.

##### Find a Framer through PPFA

<http://www.pmai.org/ppfaconsumerhome.aspx>

##### Find a Conservator through AIC

<http://www.conservation-us.org/>

*materials—Processed imaging materials—Albums, framing and storage materials.*<sup>3</sup> This publication describes requirements for all components of the framing package to ensure their quality, inertness with respect to photos, and their ability to preserve and protect photos on display for extended periods. You needn't buy this document, though. The way to know if framing materials have met the requirements of ISO is to check the package or product literature for this statement: "Meets *ISO 18902—Imaging materials—Processed imaging materials—Albums, framing and storage materials.*" Or you can check with the manufacturer.

Some materials may say only: "Passes *ISO 18916—Imaging materials—Processed imaging materials—Photographic activity test for enclosure materials*" or "Passes PAT." The photographic activity test (or PAT) is a simple test used by manufacturers to determine whether their products will cause fading or yellowing of photographs.<sup>4</sup> While this is an excellent test and is usually a good indicator of whether a framing material will harm a photo, it is better if the product meets ISO 18902, which, in addition to the PAT, has a variety of other requirements necessary to determine if the product will be safe and suitable for use in framing photographs.

There are many other terms used to suggest that a product is of a certain quality. These are not standardized or legal terms but are simply marketing terms, such as "acid-free," "archival," "museum-quality," or "conservation board." Sometimes manufacturers have their own definitions for these terms, and it's important to be sure to understand their meaning so you know whether you are getting the quality you want. Below are specifics on how to select each component of a framing package.

### *How to Select the Right Frame for Your Photograph*

Frames are typically made of wood, plastic, or metal. In addition to being a decorative element, the frame holds the various parts of the framing package together and forms a rigid structure by which the whole assembly can be propped on a shelf or hung on a wall. First and foremost, it is important to select a frame that is physically strong enough to carry out this function. The bigger the frame package, the stronger it will need to be, especially if glass glazing is used. Aluminum is often used for frames because it is inert and won't react with photos. Other metals can be used, but they must be sealed to prevent corrosion. Wood frames also need to be sealed because they may give off harmful chemicals. *All frame sealants must pass the photographic activity test.* It also helps to seal the edge of the frame package with polyester tape to minimize any harm a wood frame might cause (see Fig. 5).

### *How to Select the Right Mat Board, Window Mats, and Backing Paper*

As mentioned before, one of the best indicators of quality is that the board meets ISO 18902—*Imaging materials—Processed imaging materials—Albums, framing and storage materials.* In addition to passing the PAT, that standard requires that all paper and paperboard materials have a pH between 7.0 and 9.5, be buffered with at least 2% calcium carbonate, and be lignin-free. None of the above requirements, on its own, implies sufficient preservation quality; some "acid-free" products may still fade or yellow a photo. Colored papers and boards should be bleed- and fade-resistant as well.

### *How to Select the Right Mounting Method for Your Photograph*

In general, heat mounting, spray-adhesive mounting, and pressure-sensitive tapes are not recommended for preservation framing because they are not easily removable. It's best to select a method that can be undone so that the photo can be reframed at a later time if desired. Easy removal of the photo from a frame and mat also allows those materials to be reused. Photo corners work well with photos that are sturdy and haven't decayed. Photo corners should be made from an inert plastic such as polyester or a high-quality paper. The adhesives should be both acid- and rubber-free. Hinges made from Japanese tissue and starch adhesive work best for fragile photos. There are other ways to mount photos onto mat boards as well, and different types of photos may need different approaches. A professional framer or photograph conservator will be your best guide.

### *How to Select the Right Glazing for Picture Frames*

Both glass and plastic glazing are available for frames. Glass has the advantage of being resistant to scratching, but it is heavy and fragile. Very large photos should be framed with plastic glazing, as plastics are lighter and less prone to breakage. Plastic, however, is more easily scratched. Both glass and plastic glazing are available with special coatings to reduce glare and block UV.

As you would expect, one of the most important qualities to look for in glazing is UV blocking. The UV energy is



absorbed at the surface of UV-blocking glass and is thus prevented from reaching and damaging the photograph, as illustrated in Fig. 16. ISO 18902 recommends glazing that blocks at least 97% of UV energy. Look for glazing that makes this claim. ISO also requires that the glazing pass the photographic activity test. Other qualities to look for are anti-reflection coatings, color-neutral or color-enhancing coatings, and scratch resistance. Anti-reflection coatings disperse the light that strikes the glazing, thus reducing reflections from light sources such as indoor lights or windows. Some glazing manufacturers add colorants to their coatings to make the glazing appear more neutral in color. This is because framing glass naturally has a slightly green tint, which can affect the color of the photo behind it. Finally, some glazing is treated to resist scratching. This is really important for plastic glazing, as it is more susceptible to scratching during handling. A professional picture framer can help you make the right glazing choice.

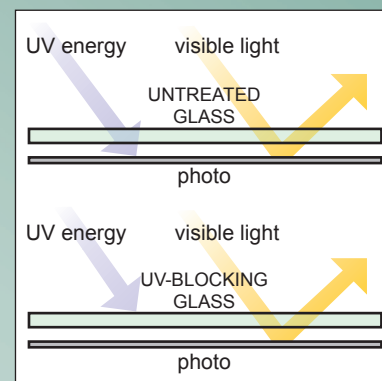


Fig. 16

## RECOMMENDATIONS FOR DISPLAY

Once the photo has been properly framed, the next step is proper display. Your photos should be thoughtfully placed around the home, both for decorative and preservation purposes. It will be critical to pick spots on the wall or shelves that are not illuminated by direct sunlight through windows at any time of the day or year. Select indoor lighting that is low in wattage, and keep the bulbs close enough to adequately illuminate the photo but not so close as to heat it up. Doubling the distance between the photo and the light reduces the light level four times, not two, so even a small increase in that distance can have big effects. The same principle applies to heat. Your framer or your local lighting store may have tips on selecting bulbs that will enhance the color of your photos as well.

The rooms you select for displaying your photos should be cool and dry. Keep the best photos out of the kitchen and bathroom, and avoid putting them over the mantle. Also beware of cleaning chemicals. Don't clean your frames with anything but a dry or moist soft rag (or according to the manufacturer or framer's instructions). If you paint a room where photos are displayed, remove the photos from the room for a few weeks to allow time for the paint to cure and the solvents to be fully released.

Most museums like to rotate their pictures on and off display to keep their galleries fresh. You can do this too, to keep your home collection fresh. This practice also reduces the time each image is on display and extends its life. Rotate two prints, and both will last almost twice as long. Rotate three, and they'll likely last three times as long, and so on. Rotating the photos also gives you a chance to inspect them occasionally and look for any early signs of trouble. If your photos are mounted on mats of the same size, you need only remove the old matted photo from the frame and replace it with another matted photo. The ones in storage can be kept in their mats in a quality storage box of the right size.

## CONCLUSION


While the manufacturers of framing materials and professional framers can do a lot to help you create attractive framing packages to display your treasured photos, they can never truly guarantee that your photos will last. This is because it is partly your job to make sure your photos won't fade or yellow over time. Ultimately it is you who will decide what framing materials to use and where and how you will display your pictures. Preservation is not something that just happens. Take the time to educate yourself. Information can be obtained from this and other IPI consumer guides, but there are many other ways to learn more about preservation framing. Your local framer, manufacturers of high-quality framing materials, and professionals at your local museum can all help you better understand how to keep your precious photos on the wall, or on the shelf, and on view for you, your family, and your friends to enjoy for years to come.

### TOP FIVE PRESERVATION FRAMING AND DISPLAY TIPS

1. Educate yourself on quality framing materials and practices.
2. Utilize the skills of a professional picture framer.
3. Choose glazing that blocks at least 97% of UV energy.
4. Select mat boards and adhesives that meet ISO 18902.
5. Display your framed photos in cool, dry areas away from direct sunlight.

## REFERENCES

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2. D. M. Burge, J. M. Reilly, and D. W. Nishimura, "Effects of Enclosure Papers and Paperboards Containing Lignins on Photographic Image Stability," *Journal of the American Institute for Conservation*, 41, 2002.
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4. ISO 18916 *Imaging materials—Processed imaging materials—Photographic activity test for enclosure materials* (Geneva: International Organization for Standardization), 2007.



**A Consumer Guide to Traditional and Digital Print Stability**

**A Consumer Guide for the Recovery of Water-Damaged Traditional and Digital Prints**

IPI offers these other consumer guides to help you keep your family photos safe for generations to come.

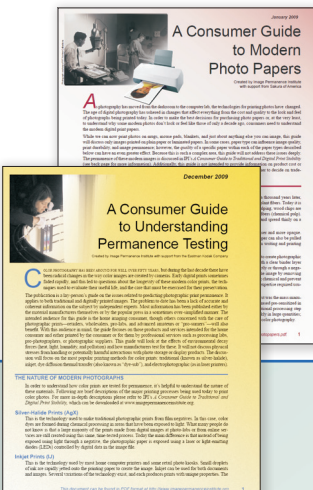
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**A Consumer Guide to Understanding Permanence Testing**



R.I.T.

Image Permanence Institute  
Rochester Institute of Technology  
70 Lomb Memorial Drive  
Rochester, NY 14623-5604  
[www.imagepermanenceminstitute.org](http://www.imagepermanenceminstitute.org)

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