Glass or Acrylic? Considerations for Framed Artwork

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Glazing materials, like glass and acrylic sheets, are clear, flat and thin. Beyond these similarities, they differ in most respects and both have advantages and disadvantages for protecting works of art. Selecting the best option depends upon many factors:

- Is the work friable?
- Where will it be displayed?
- How large is it?
- Will it travel?
- Is it replaceable?

Glass

Pros:
Soda-lime float glass is quite hard, brittle and transparent to solar thermal energy. Glass is amorphous silicon dioxide. This is the same basic composition as quartz, but in glass, it also contains sodium, calcium (lime), and potassium atoms. Although it is amorphous, glass functions as a vapor barrier, as a pure crystal would. Glass will not absorb water, nor will it warp or bow when one side is wetter than the other. The surface of glass is "high energy", which means that it is attractive to other materials and adhesives, like animal glue, will bond to it, while the same glue will not stick to the "low energy" surface of an acrylic sheet.

Cons:
Although glass does not warp, water is attracted to the surface of glass, inside and outside, through polar bonding. When water vapor rests on the surface of glass, that water may encounter sodium or potassium atoms and it can react with those elements to form ions. This interaction can lead to leaching of the ions onto the surface of the glass. When ionic sodium gets to the surface of a piece of glass, it is likely to find chloride ions and form sodium chloride, which often is described as "salt fog". This is especially true, if the glass is near salt water. The sodium and potassium compounds, which may form, are not particularly dangerous to paper, or the designs on it, but can be quite harmful to metals and items made of metal, or those that contain metal, like silver halide photos.

Since glass is relatively transparent to solar energy, when it is cool in the morning and strong sunlight passes through the glass, the light will not warm the glass. It will warm paper behind the glass, especially if the surface of the paper is dark. The thermal (infrared) portion of the sunlight will cause the warming paper to dehydrate. The moisture coming out of the paper may hit the cool surface of the glass and condense. However, if art in a frame is properly managed, this should never occur, since that area should never be exposed to sunlight. The knowledge of this possibility still should govern our use of glass in frames.

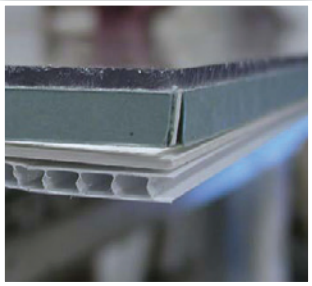
The greatest problem that glass presents is its fragility. To address this concern, as the size of the glass needed for a frame grows, thicker material should be used. Unfortunately, as the glass gets thicker, its weight rises dramatically, which can create serious problems. When glass breaks, its broken edges can be phenomenally sharp, posing an imminent danger to anything nearby. For this reason, museums and other public collections seldom use un-laminated glass. Laminated glass takes advantage of the non-warping characteristics and, when highly sealed packages are required, its vapor barrier potential. Less thoroughly sealed enclosures can be made with acrylic.

Acrylic Sheet

Pros:
Acrylic sheet is soft, impact-resistant and is a thermal insulator. Its surface is so soft that it must be handled delicately to ensure that it does not become scratched, unless an abrasion resistant coating is added that significantly improves its handling. This same soft surface is likely to give way, if the acrylic sheet comes into contact with the framed item, which would not be true of glass. It has profound impact resistance, but in the highest traffic areas, polycarbonate provides the greatest protection. Since it is formed at a relatively low temperature, ultraviolet (UV) inhibiting compounds can be added to its interior and not just to its surface.

Acrylic Sheet Manufacturing Processes

Cons:
Acrylic and polycarbonate sheet are the most commonly used plastic glazing materials. Both may feel hard to the touch, but are in fact quite soft and can be scratched with nothing more than the application of a drafting brush across their surface. If the relative humidity on one side of a sheet of acrylic is higher than on the other side, the acrylic will warp toward the wetter side. Acrylic sheet is not a good barrier to water vapor, while polycarbonate is somewhat better, neither can be recommended for use in long-term sealed packages. These plastic sheets are not very rigid and when larger sizes are needed, thicker material must be used.



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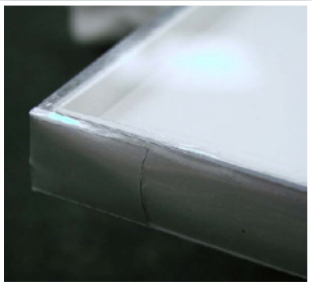

Sealed Package

Sealed Package Considerations:
Other factors that should be considered when a sealed framing or display package is being considered are length of use and sensitivity of the enclosed item. Typically, institutions need sealed packages for items being lent to other institutions for approximately three to nine months. For the vast majority of items on loan, prints, drawings and most photos, a simple package is likely to provide all the climatic protection that will be needed. This usually comprises acrylic glazing, the matted item, a plastic polyflute backing board, and tape around the outside edges, with a strip of barrier material to keep the tape adhesive from polluting the contents of the package.

The bulk of loans are safe in the more modest seal that acrylic glazing affords. Only the most humidity-sensitive items, like protein-based vellum, and albumen photos, require the highest seal glass affords. In a private home, conditions cannot be expected to meet museum standards: there are likely to be four months of heating and three months of cooling. The heating season is dry, since it is so difficult to add enough humidity to a residence in the winter to raise the humidity significantly without getting damaging condensation on the windows. During the cooling season, the air conditioning will remove much of the moisture in the air, but construction materials and methods may allow moisture into the walls at a level that is higher than that in the room. The conditions in a private home are more challenging than those in a museum. Since items framed for the home are likely to stay in their frames for years, glass is a logical choice and long-term sealed framing packages are needed.

In Summary:

Glass – with its non-warping rigidity and its vapor barrier potential – is the ideal glazing material for use in highly sealed enclosure packages, for use with the most humidity sensitive items and for use in enclosures that will be in service for long periods. Non-laminated glass can be used with items that can easily be replaced, but when irreplaceable items are to be displayed in a frame, laminated glass is needed. The low static potential of glass makes it useful for friable items, like chalks and pastels, but static dispersive coatings are even more useful in these applications.

The shatter-resistance of acrylic sheet makes it invaluable for use with high-value items. When coupled with a static-dispersive coating, it can be safely used with friable materials, too. Acrylic sheet can be used to make enclosure packages housing materials that are not too sensitive to changes in relative humidity and will not be exposed to difficult conditions for long periods.

Both glass and acrylic sheet can be found, with UV filtering material added, which makes them invaluable for display of treasured items. The most versatile of glazing materials is an acrylic sheet with UV inhibitors, static dispersive and reflection-canceling coatings. This provides the safety of UV filtration, and when properly lit, it is virtually invisible.

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 Partimoine (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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