Looking at Glazing:
Finding the Best Solution to Protect Your Art Works and Historic Artifacts

L’uomo Della Bietta, Leonardo da Vinci, Instituto Nazionale per Grafica, Rome, Italy

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An Overview:

• Why Glazing is Important
• A Brief History of Glazing
• How Glass and Acrylic are Made
• Glazing Application Examples
• Glass & Acrylic Properties
  • UV Blocking
• Anti-Reflective Properties
  • Cleaning
• Shipping Considerations
• Storage Considerations
Why place ANYTHING between the viewer and the work?...

A Brief History of Glazing
George Seurat, Bathers at Asnieres, 1884.

Pollutants

Pocket Guides Conservation of Paintings by David Bomford, The National Gallery Publications: 41

Dirt partly removed.

https://www.cam.ac.uk/
Food and Beverage
Human Expectorants
Accidental damage

Vandalism

THE $400-MILLION ELBOW

Man Vandalized a Picasso Portrait of Dora Maar at Tate Modern

Shaked Marosi, a 21-year-old from north London, was arrested for allegedly ripping the $40 million painting. The damage to the artwork is being assessed by a Tate conservation team.

PAIN IN THE ARTS Bungling Brits damage more than 1,000 precious items in museums and galleries

Careless staff, sticky-fingered kids and even a tin of leaky SOUP to blame for the accidents
History of Glazing

Adriaen van der Spelt (Dutch, 1630-1673), Frans van Mieris (Dutch, 1635-1681), Trompe-l'Oeil Still Life with a Flower Garland and a Curtain, 1658. Art Institute of Chicago
Erin Garcia, Managing Curator of Exhibitions
California Historical Society
Glass Production

Division of Parks and Forestry Photograph Collection, New Jersey State Archives, Department of State.

https://www.architecture.com/image-library
Glass Production
Glass Production

1. Charging the raw material
2. Melting in the furnace
3. Floating in metal bath
4. Annealing
5. Cutting

Processing: From new materials to glass strip

Tin bath 2000°F
Regular Float Glass vs. “Water White”/Low Iron Glass
Acrylic Production
How is Glazing Used?

- Traditional Framing
- 2-Sided Frames
- Microclimate Frames
- Sealed Enclosures
- Double Glazing
- Stand-Offs
- 5-sided Box Covers & Frames
- Display Cases
How is Glazing Used?

- Cabinet Doors
- Wall Vitrines
- Wall Niches
- Mounts
- Pressure Mounts
- Scanning
- Second Surface Applications
2-Sided Frames

Leonardo da Vinci: 500 Years
J. Paul Getty Museum
Microclimate Frames

Brooklyn Museum Paintings Conservator Josh Summer showing back of frame of Marsden Hartley’s *Ghosts of the Forest* (1938)

Brooklyn Museum Paintings Conservator Josh Summer and Tru Vue International Museum and Conservation Liaison Alisa Vincentelli admiring Marsden Hartley’s *Summer Clouds and Flowers* (1942)
Sealed Enclosures
Copperplate printed fabric under double glazing to protect original glass while offering UV protection.

Original glass is placed in frame and a spacer is applied. (Conducted by Virginia Whelan).

New anti-reflective acrylic is placed over the glass, to add UV protection
Stand-Offs
5-Sided Box Covers

Lost and Found: The Secrets of Archimedes
©The Walters Art Museum, Baltimore
5-Sided Box Frames

Wood backing matches original frame
Display Cases
Microclimate Cases

Courtesy Seattle Art Museum. Photos by Geneva Griswold
Wall Vitrines

With Cunning Needle, Courtesy the Winterthur Museum, Photo by Jim Schneck
Mounts
Pressure Mounts for Textiles
Scanning
Second Surface Applications

Silicon Valley Bank Offices, Salt Lake City, Fennie+Mehl Architects

Photograph adhered to back, or “second surface”.

Acrylic

Backing support
The Properties of Glass

Pros
• Rigid: doesn’t deflect or warp like acrylic
• Virtually impermeable, especially if laminated. Good for microclimate cases.
• Low electro-static charge makes it safer to use on friable media than regular acrylic (but not as safe as Optium).

Cons
• Brittle: It can break and damage the art work.
• Heavy: Twice the weight of acrylic of comparable thickness
A Closer Look at Laminated Glass....

Pro: Sharp shards will stay in place
Cons: Heavy and difficult to cut
Polishing edges can strengthen the glass

https://jitcompanies.com/ultravue-laminated-glass-strength/
The Properties of Acrylic (except Optium)

Pros
• Light weight (half the weight of glass of comparable thickness)
• Doesn’t shatter like glass

Cons
• More permeable than glass, not effective for microclimate cases.
• Expands and contracts under temperature fluctuations
• Can warp and deflect
• Scratches easily
• Has high electro-static charge, which attracts ambient dust and friable media
The Properties of Optium
Anti-Reflective, Anti-Static acrylic (and 99% UV Blocking)

Pros
• Light weight
• Doesn’t shatter like glass
• Has LESS static charge than glass
• Hard coat protects from easily abrading

Cons
• As permeable as regular acrylic
• Expands and contracts under temperature fluctuations
• Can warp and deflect
A Brief Look at Permeability of Acrylic...

Water vapor transmission rate: 0.014 grams of water vapor over 100 in² area per day
A Brief Look at Abrasion Resistance...
Looking at static

<table>
<thead>
<tr>
<th>Conductivity Level (Ohms/Square)</th>
<th>Degree of Conductivity</th>
<th>Degree of Anti-static</th>
<th>Glazing Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 \times 10^{16}$</td>
<td>Less conductive</td>
<td>Non anti-static</td>
<td>Regular, uncoated acrylic</td>
</tr>
<tr>
<td>$1 \times 10^{15}$</td>
<td></td>
<td></td>
<td>Regular, uncoated glass</td>
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<tr>
<td>$1 \times 10^{14}$</td>
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<tr>
<td>$1 \times 10^{13}$</td>
<td>Less anti-static</td>
<td>Museum Glass® and Conservation Clear® Glass</td>
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Why is anti-static important?...
Friable Media...

Acrylic previously used to frame a pastel, shown here over a white paper: Unbound pastel media was drawn to the acrylic glazing by static charge.
High Traffic Areas...
High volume framing...
Looking at acrylic deflection

For a 60” x 60” sheet, in hot room over 3 years:

0.118 or 1/8 in. (3mm) thick: 1 1/16 in.
0.177 or 3/16 in. (4.5mm) thick: 15/16 in.
0.236 or ¼ in. (6mm) thick: 7/8 in.
Sometimes deflection can help!
Looking at acrylic expansion and contraction

- Allow approximately 1/16" (1.6mm) per 12" of length for each 20°F temperature change.

- In conditions of extreme humidity or temperature, greater allowances may be necessary.
Rules of thumb on acrylic thickness for traditional framing

Up to 40” x 40”: 1/8 in. (3mm)
40” x 40” to 60” x 60”: 3/16 in. (4.5mm)
Above 60” x 60”: ¼ in. (6mm)
Looking at UV Blocking Acrylic...

99% UV blocking
UV absorbers in the acrylic

Up to 93% UV blocking
UV blocking at surface only
UV Blocking Ranges: 380nm vs 400nm
What Happens to Acrylic and Glass in a Fire?
Looking at Anti-Reflective properties of Acrylic and Glass

Regular acrylic (and glass) reflect about 8% of light.

Anti-Reflective Acrylic reflects about 1.6%, (and glass about 1%).
How Do the Anti-Reflective Coatings Work?
Different from Non-Glare...
How is Anti-Reflective Glazing Made?

Sputter coating technology:

Various steps are involved in the sputter coating process

Example of a “coating stack” of various metal oxides on an acrylic substrate that was pre-coated for hardness
Magnets with water for cooling are inside targets.

Plasma formed with electric current.

Argon gas is pumped into the chamber.

Glazing in chamber with targets above.
Magnified view of the target surface, showing metal atoms and Argon gas as it hits the target.

The metal atoms as they fall and rest on the glazing surface.
Effects of Lighting on Anti-Reflective Glazing
Properties of Light

- Angle
- Diffusion
- Intensity
- Color/Temperature
Optimizing anti-reflective properties: Angle of light
Budgets
Cleaning Protocol
This illustration, created by the Centers for Disease Control and Prevention (CDC), shows the virus' spiky, crown-like fringe that shrouds each viral particle—giving it a “coronated” appearance.
Cleaning Optium

*Do not use acrylic cleaners*

Cleaning Supplies Needed:
- Isopropyl Alcohol
- Distilled Water
- Gloves (Optional)
- 2 Micro-fiber cloths
  - One for wet cleaning
  - One for drying

Steps:
- Mix water and isopropyl alcohol 1:1
- Spray on micro-fiber cloth
- Use cloth to clean glazing
- Dry off with second cloth

Alternatives:
- Non-Ammonia Glass Cleaners can be used on Optium
- Dilute solutions of detergent can also be used
Why not use acrylic cleaners on Optium?

Acrylic cleaners contain micro-abrasives that are great for polishing standard acrylic. But they can damage the optical coatings, making the surface look iridescent. Similar to when oil and water mix.
Cleaning Regular Acrylic

• Use clean, damp microfiber cloth
• Apply only light pressure
• Dry off with second cloth
• **DO NOT** use window cleaning sprays, kitchen scouring compounds, or solvents such as:
  • Acetone
  • Gasoline
  • Lacquer thinner

Cleaning Glass

• Use a clean, soft, lint-free microfiber cloth.
• Spray a small amount of ammonia-free glass cleaner onto the cloth.
• Spraying on the cloth will prevent overspray.
• Press the cloth against the glass and clean in round, circular motions.
Cleaning Cloths

Dirt & particles are trapped and removed between the fine microfiber material.
Shipping
Glass Skin: **DO NOT USE** on anti-reflective glazing
(unless you’re willing to risk damaging the glass)
Storage
Thank you!

Questions?

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