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

artsy.net

Why place ANYTHING between the viewer and the work?...

A Brief History of Glazing

Pollutants

https://www.cam.ac.uk/

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

George Seurat, Bathers at Asnieres, 1884.
Dirt partly removed.

Room 32 in the National Gallery, London, Giuseppe Gabrielli (active 1850-1890) ©UK Government Art Collection

Food and Beverage Human Expectorants

Anonymous museum, photo by Yadin Larochette

heardgrapevine.blogspot.com

en.wikipedia.org

hammer.ucla.edu

Accidental damage
Vandalism

christies.com

DOH! DEPT OCTOBER 23, 2006 ISSUE

THE $40-MILLION ELBOW

By Nick Paumgarten
October 16, 2006

NEWS

Man Vandalized a Picasso Portrait of Dora Maar at Tate Modern

Shakeel Massey, a 20-year-old from north London, was arrested for allegedly ripping the $26 million painting. The damage to the artwork is being assessed by a Tate conservation team.

Hakim Bishara January 2, 2020

588 Shares

IMPRESSIONIST & MODERN ART | INTERVIEW | NOVEMBER 14, 2014

Discovery: Revelations from a damaged Monet

Conservators were given an unusual opportunity to examine the artist's early technique after a visitor to the National Gallery of Ireland put his hand through the canvas in 2012

Daily Art Magazine

SHOP ARTIST PERIODS STUFF WTF ART HISTORY MORE

JUST WEIRD

Art Under Attack – 11 Famous Masterpieces Damaged By Madmen

By Zuzanna Stanska
Published on September 22, 2017

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

Jon Lockett
27 Dec 2016, 16:36 | Updated: 28 Dec 2016, 3:10

Uncontrolled Environments

radio.com

ads.hd.js.vt

Mind my Picasso... superyacht owners struggle to protect art

Billionaires try to cut risk to priceless paintings from flying champagne corks

▲ Joe Lewis, who owns Tottenham Hotspur FC, keeps Francis Bacon's Triptych on the lower deck of his yacht Aviva. Photograph: Jack Taylor/Getty Images

theguardian.com

afar.com, Hearst Castle

Tony Swain. Photo by Alisa Vincentelli

en.wikipedia.org

History of Glazing

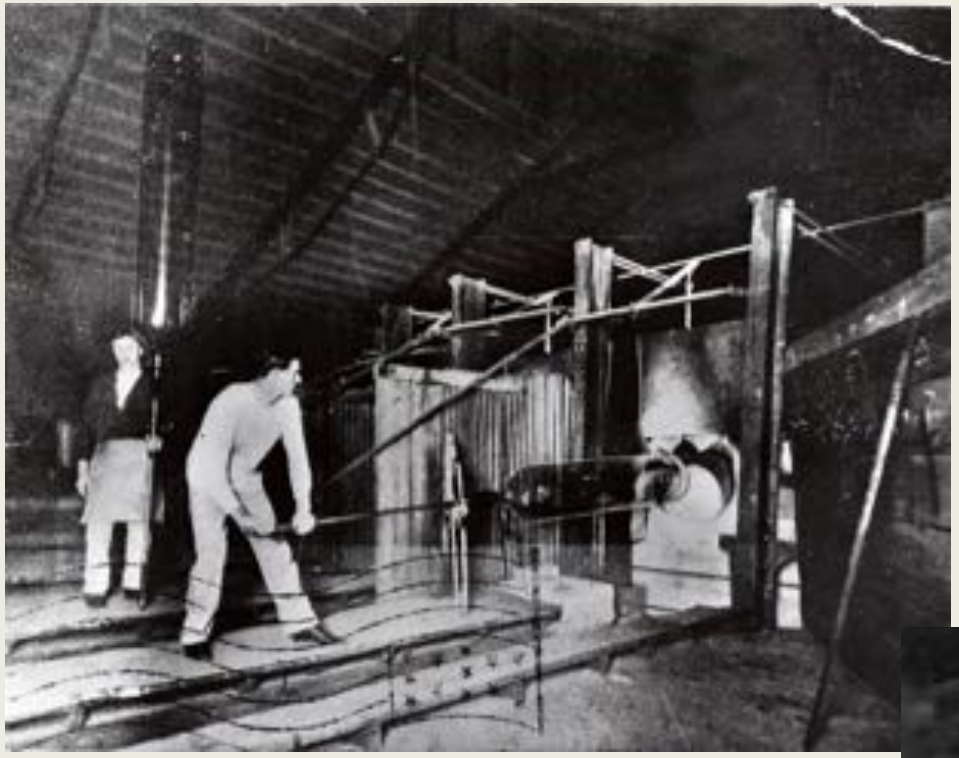
Adriaen van der Spelt (Dutch, 1630-1673), Frans van Mieris (Dutch, 1635-1681), *Trompe-l'Oeil Still Life with a Flower Garland and a Curtain*, 1658. Art Insitute of Chicago

thedarkbag.com

California Historical Society

Erin Garcia, Managing Curator of Exhibitions California Historical Society

Glass Production



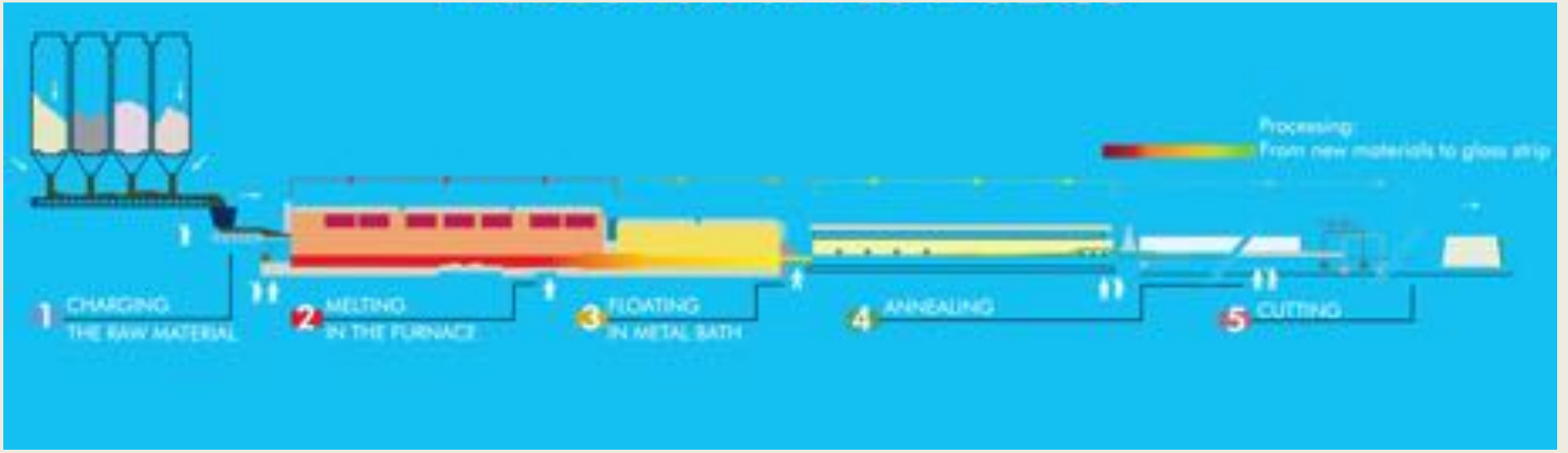
Division of Parks and Forestry Photograph Collection, New Jersey State Archives, Department of State.

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

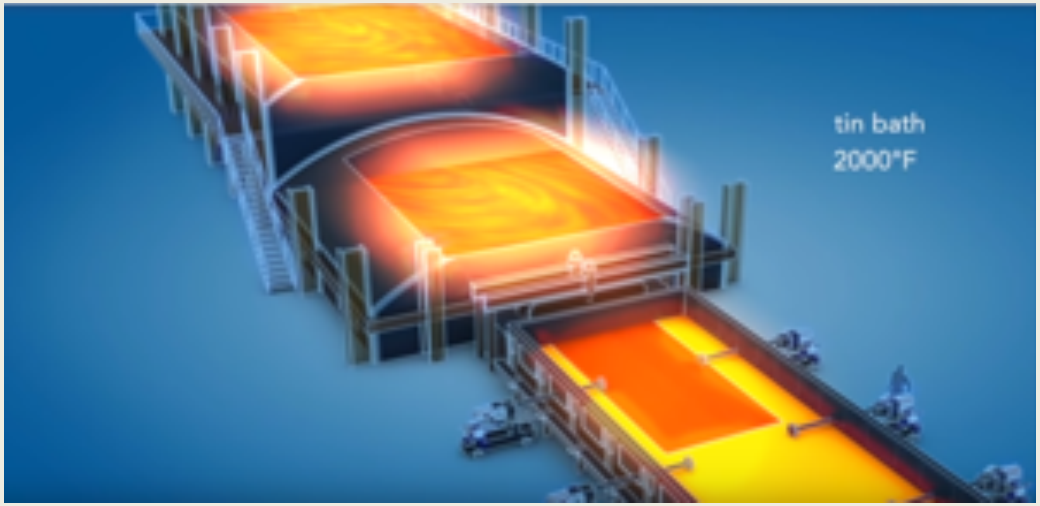
Glass Production

giftcityuk.glass-engraver.co.uk

Glass Production

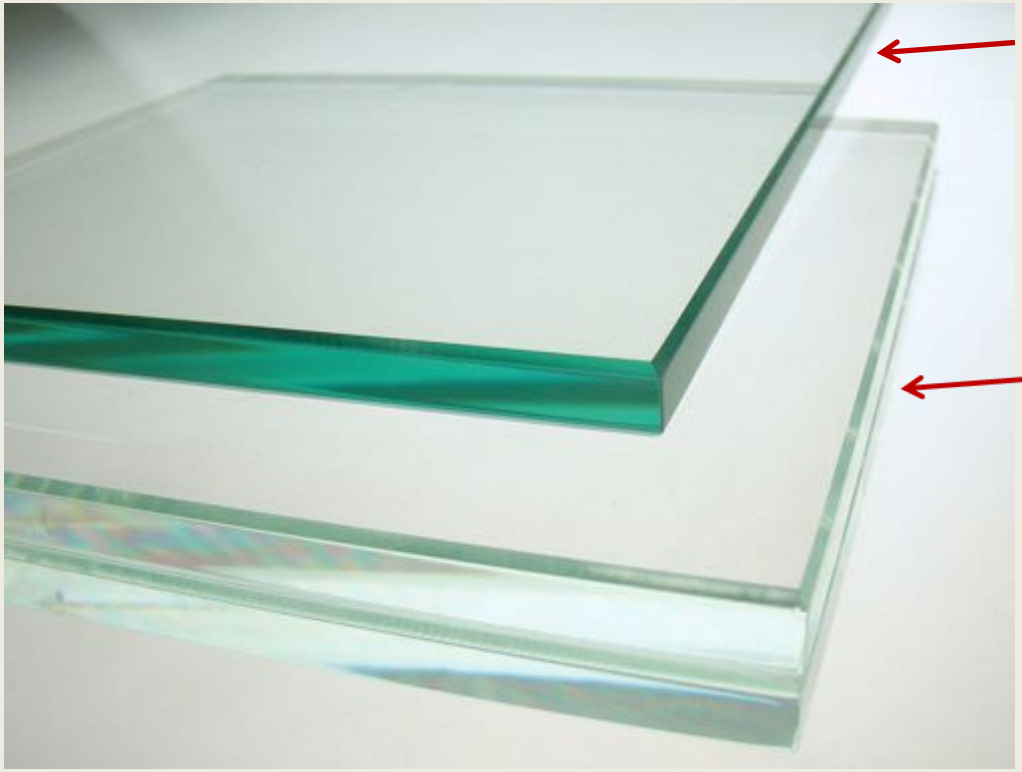


aisglass.com



solosglass.com

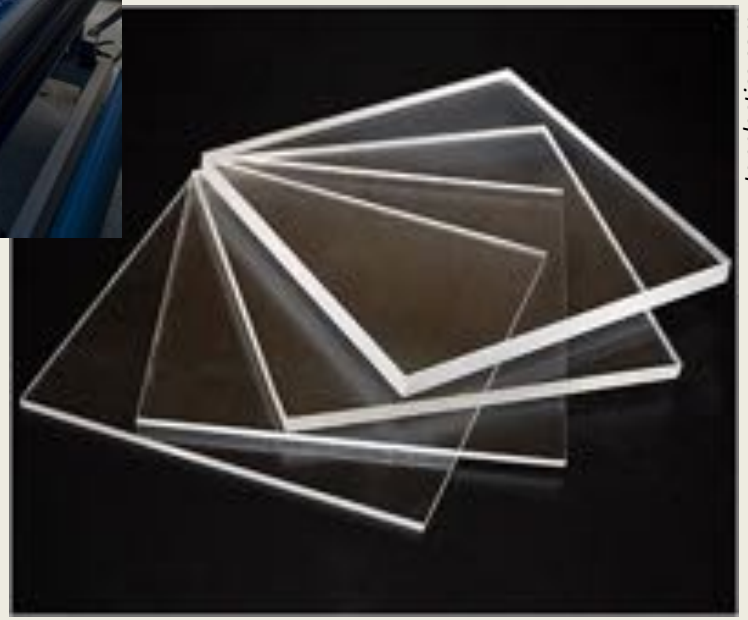
Regular Float Glass vs. “Water White”/Low Iron Glass



Acrylic Production

exportsindia.com

plaskolite.com



tapplastics.com

How is Glazing Used?

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

tru-vue.com

How is Glazing Used?

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

Traditional Framing

John Singer Sargent. *Man Wearing Laurels*. Los Angeles County Museum of Art, Mary D. Keeler Bequest (40.12.10). ©2010 Museum Associates/LACMA

Josef Koudelka: National Doubtful. Courtesy of the Art Institute of Chicago

2-Sided Frames

Leonardo da Vinci: 500 Years
J. Paul Getty Museum

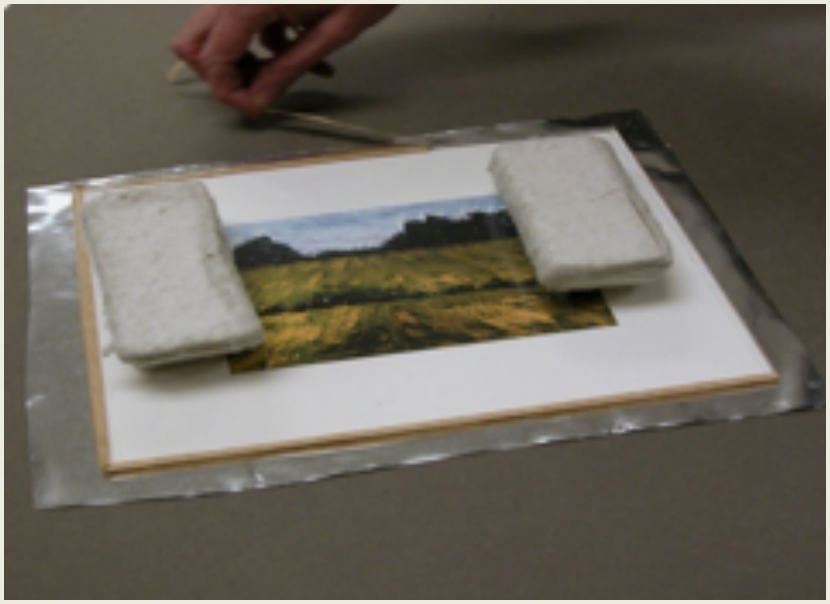
Microclimate Frames

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)

Photos by Yadin Larochette

Sealed Enclosures



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Secondary glazing

Copperplate printed fabric under double glazing to protect original glass while offering UV protection.

tru-vue.com

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

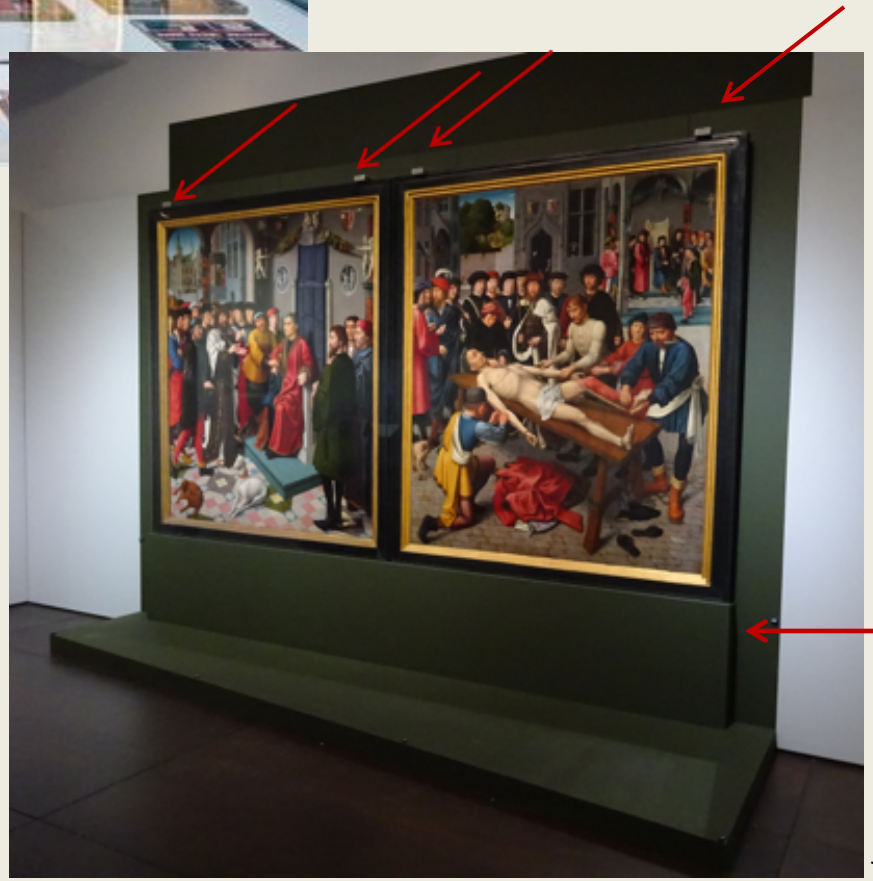
tru-vue.com

New anti-reflective acrylic is placed over the glass, to add UV protection

Stand-Offs

archplastics.com

monarchmetal.com



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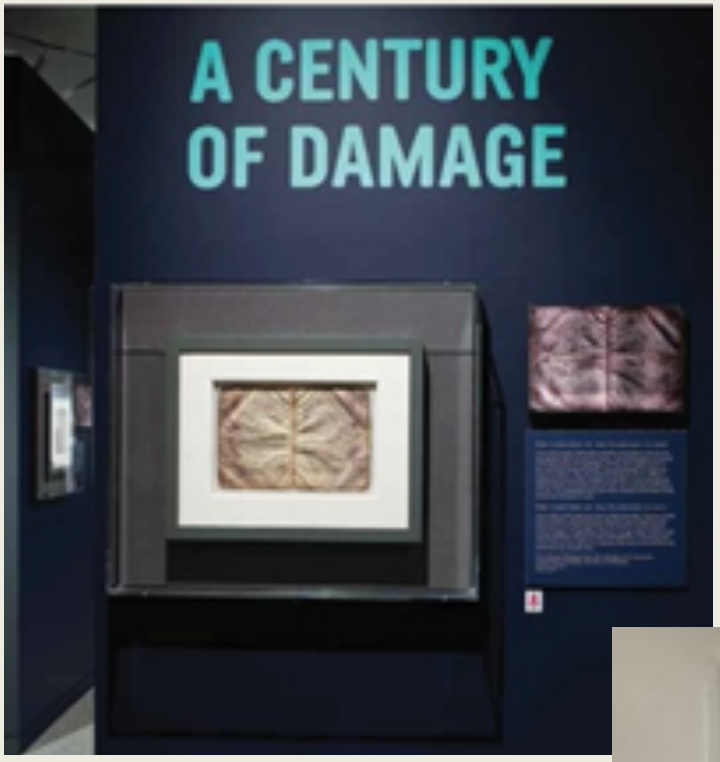
5-Sided Box Covers

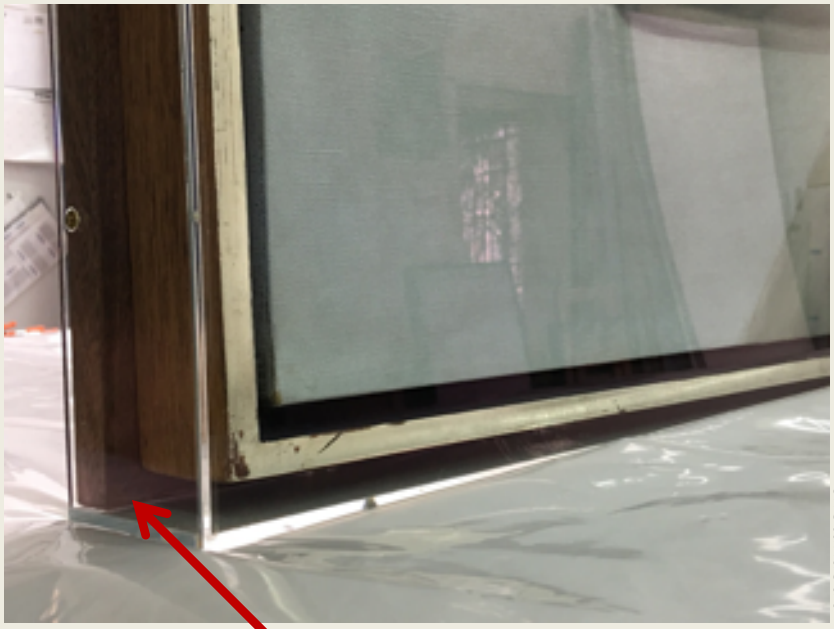


Lost and Found: The Secrets of Archimedes
©The Walters Art Museum, Baltimore

archplastics.com

5-Sided Box Frames

anonymous



anonymous

Wood backing matches original frame

Display Cases

archplastics.com

archplastics.com

Photo by Blake Miremont at Architectural Plastics

Microclimate Cases

Courtesy Seattle Art Museum. Photos by Geneva Griswold

Cabinet Doors

©The Morgan Library and Museum. Photography by Graham Haner, 2010

Wall Vitrines

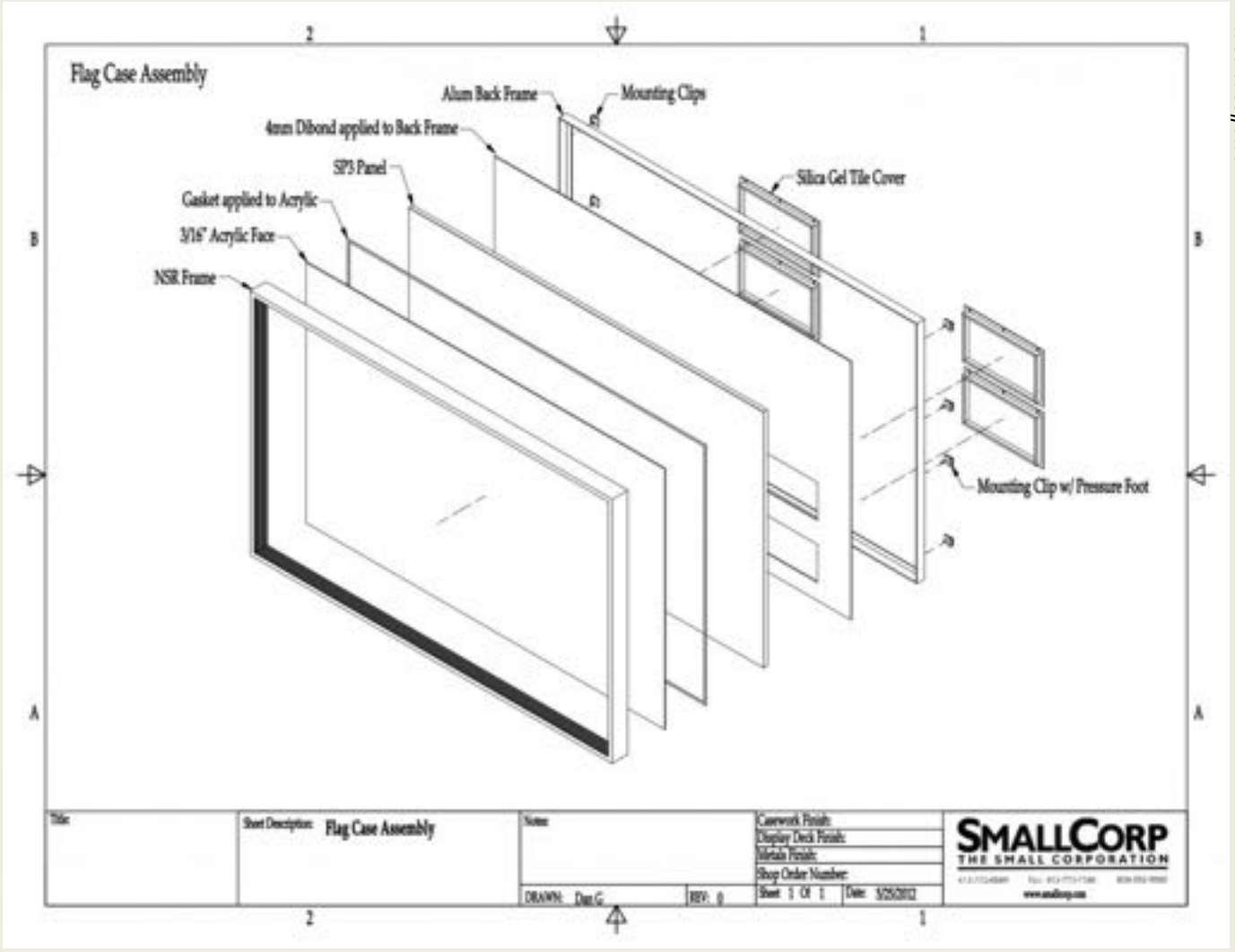
With Cunning Needle, Courtesy the Winterthur Museum, Photo by Jim Schneck

Mounts

archplastics.com

geminibuildsit.com

Pressure Mounts for Textiles



smallcorp.com

Scanning

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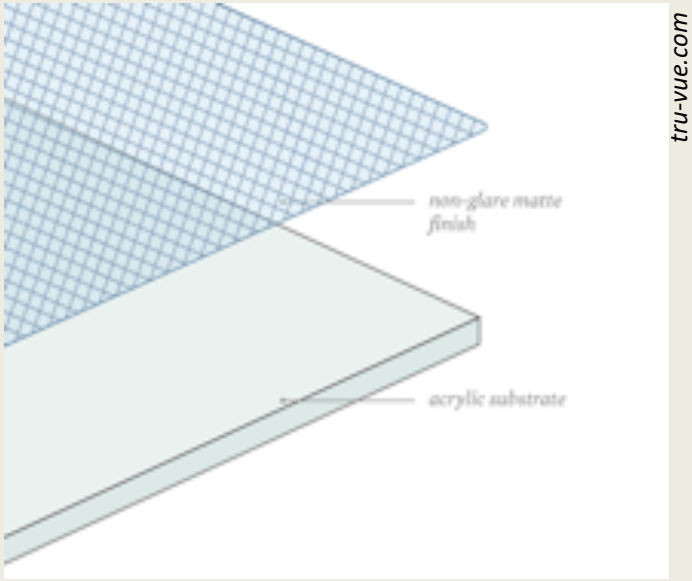

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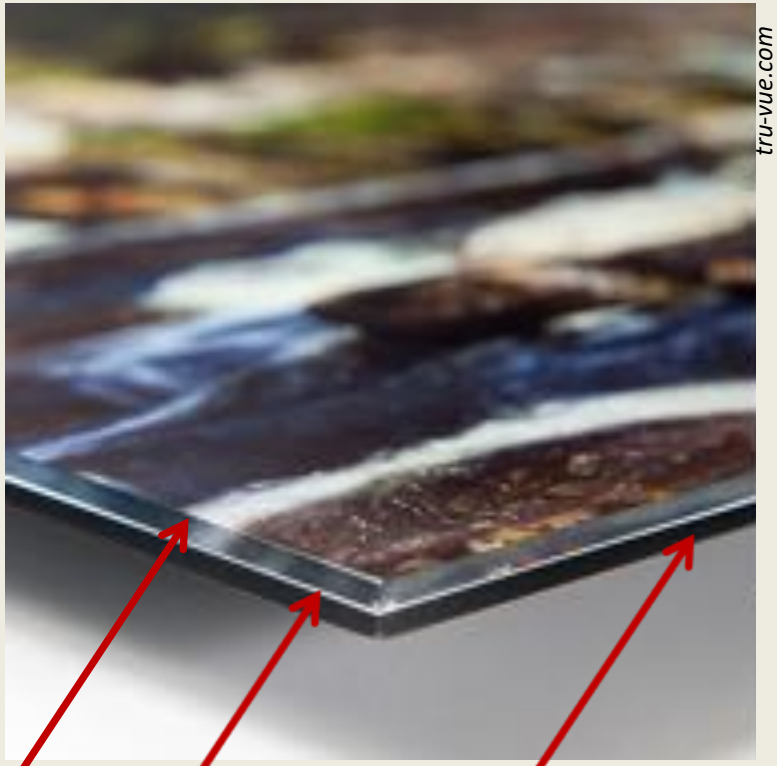
Second Surface Applications

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



The Properties of Glass

Example of laminated glass: shards stayed in place when it broke during transport.

Pros

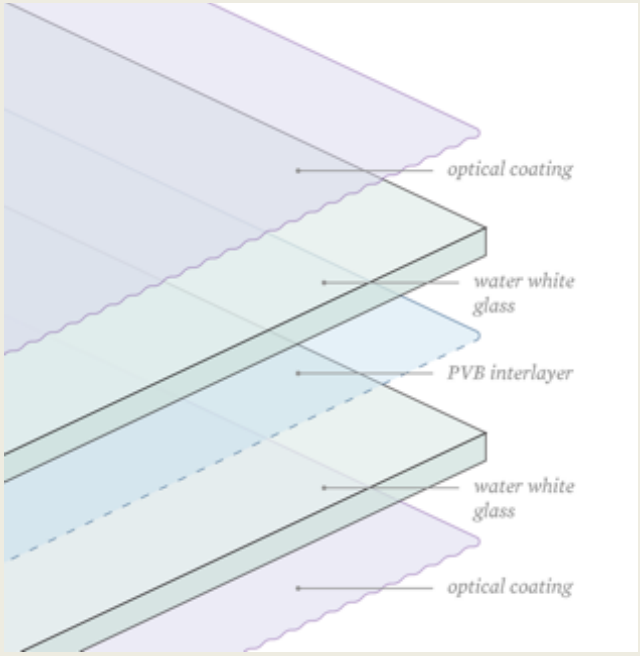
- Rigid: doesn't deflect or warp like acrylic
- Virtually impermeable, especially if laminated. Good for microclimate cases.
- Low electro-static charge makes it safer to use on friable media than regular acrylic (but not as safe as Optium).

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….

info.glass.com



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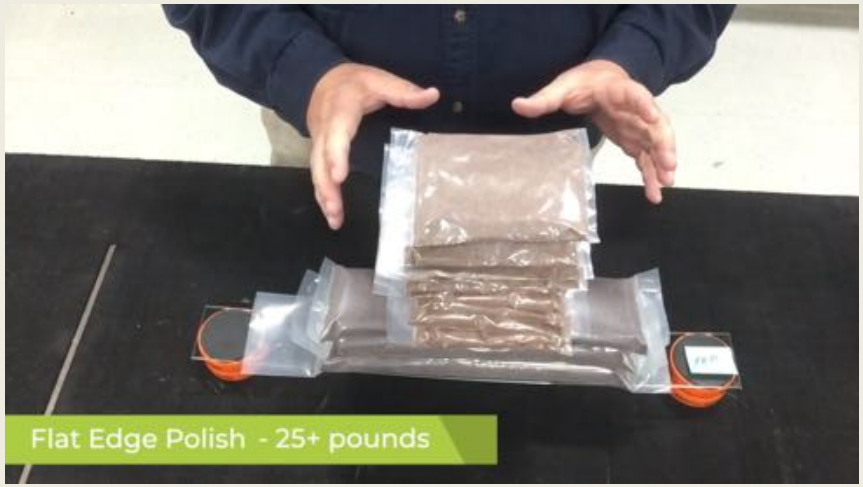
Pro: Sharp shards will stay in place
Cons: Heavy and difficult to cut

Polishing edges can strengthen the glass

jitcompanies.com



jitcompanies.com

jitcompanies.com

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)

tru-vue.com

Pros

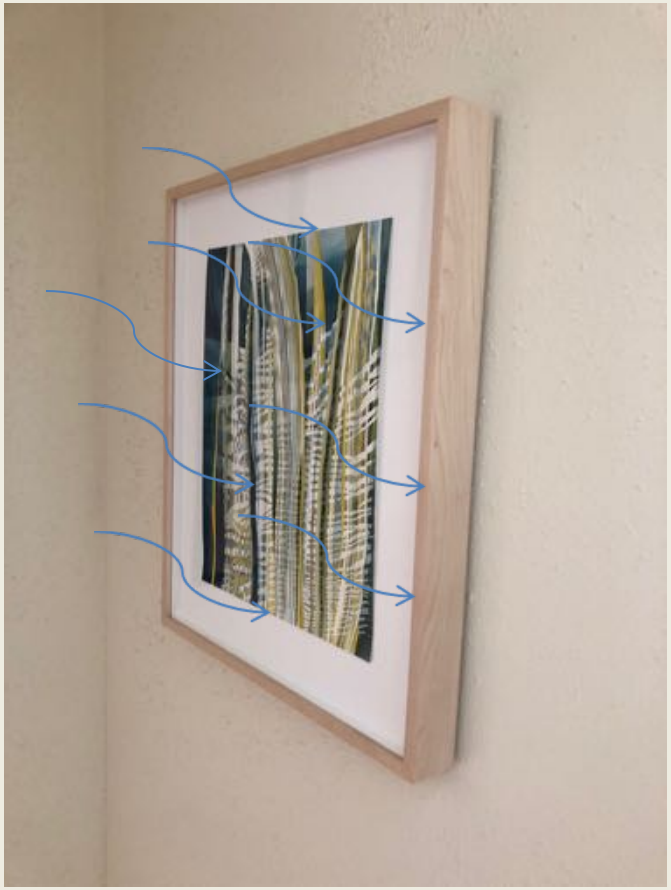
- Light weight
- Doesn’t shatter like glass
- Has LESS static charge than glass
- Hard coat protects from easily abrading

Cons

- As permeable as regular acrylic
- Expands and contracts under temperature fluctuations
- Can warp and deflect

A Brief Look at Permeability of Acrylic…

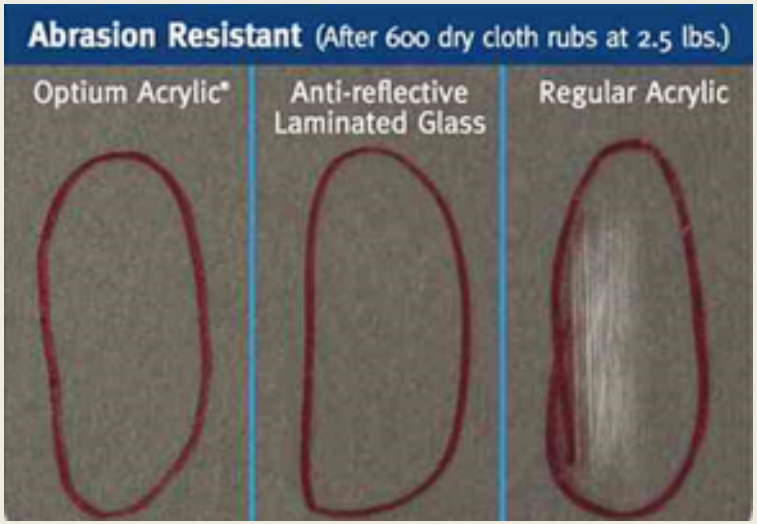
petco.com



Water color by Yael Lurie, photo by Yadin Larochette

Water vapor transmission rate: 0.014 grams of water vapor over 100 in^2 area per day

A Brief Look at Abrasion Resistance…



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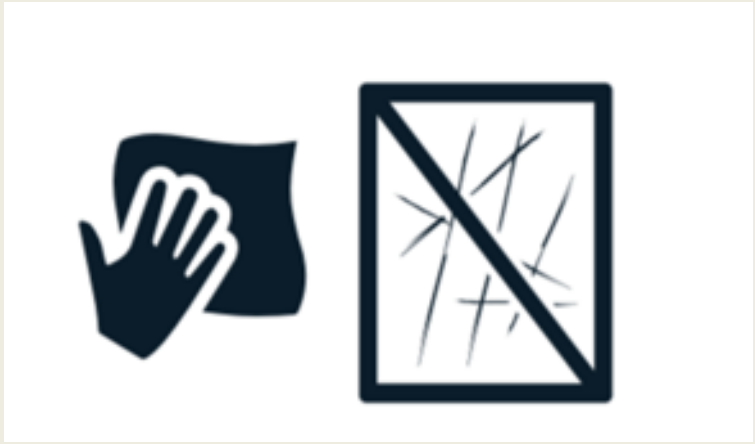
artexfas.com



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Looking at static

Conductivity Level Ohms/Square	Degree of Conductivity	Degree of Anti-static	Glazing Material
1×10^{16}	Less conductive	Non anti-static	Regular, uncoated acrylic
1×10^{15}			Regular, uncoated glass
1×10^{14}			
1×10^{13}		Less anti-static	Museum Glass® and Conservation Clear® Glass
1×10^{12}			
1×10^{11}		anti-static	Optium Museum Acrylic®
1×10^{10}			

tru-vue.com

brickellmattress.com

theverybesttop10.com

Why is anti-static important?...

PS1 Simone Fatall, *Day of Sorrow*, 2012

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…

wikicommons: Louvre

High volume framing…

lornasimpsonstudio.com

Downingframes (IG)

Looking at acrylic deflection

PLEXIGLAS® SHEET: Surface Deflection

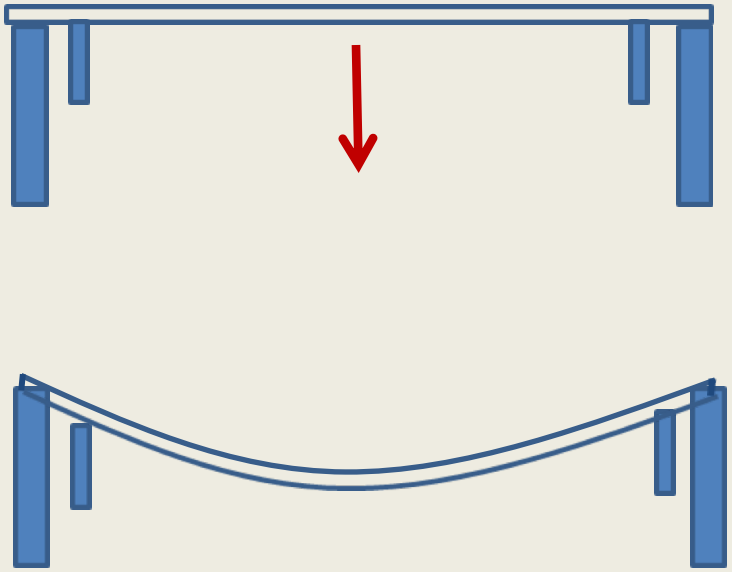
ACRYLIC SHEET

PLEXIGLAS® SHEET:
Estimated surface deflection of horizontally mounted, flat panels:

All four edges simply supported. Load is weight of the Plexiglas® sheet only.
Temperature = 120°F.

Thickness (in)	Size(in)	Initial(in)	One Year(in)	Three Years(in)
0.118	12 x 12	1/16	1/16	1/16
0.118	18 x 18	1/16	1/16	1/16
0.118	24 x 24	1/8	3/16	3/16
0.118	30 x 30	3/16	5/16	5/16
0.118	36 x 36	5/16	7/16	7/16
0.118	42 x 42	3/8	9/16	9/16
0.118	48 x 48	1/2	11/16	3/4
0.118	60 x 60	3/4	1	1 1/16
0.177	12 x 12	1/16	1/16	1/16
0.177	18 x 18	1/16	1/16	1/16
0.177	24 x 24	1/16	1/8	1/8
0.177	30 x 30	1/8	3/16	3/16
0.177	36 x 36	3/16	5/16	3/8
0.177	42 x 42	5/16	7/16	1/2
0.177	48 x 48	7/16	5/8	5/8
0.177	60 x 60	11/16	7/8	15/16
0.236	12 x 12	1/16	1/16	1/16
0.236	18 x 18	1/16	1/16	1/16
0.236	24 x 24	1/16	1/16	1/16
0.236	30 x 30	1/16	1/8	1/8
0.236	36 x 36	1/8	1/4	1/4
0.236	42 x 42	1/4	3/8	3/8
0.236	48 x 48	7/16	1/2	9/16

plexiglas.com



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.

tru-vue.com

Sometimes deflection can help!

tru-vue.com

Looking at acrylic expansion and contraction

craftsmanspace.com

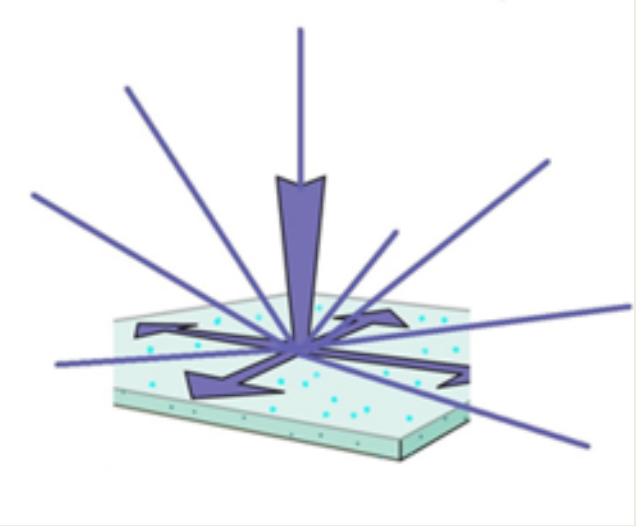
- Allow approximately 1/16" (1.6mm) per 12" of length for each 20°F temperature change.
- In conditions of extreme humidity or temperature, greater allowances may be necessary.

Photo by Yadin Larochette

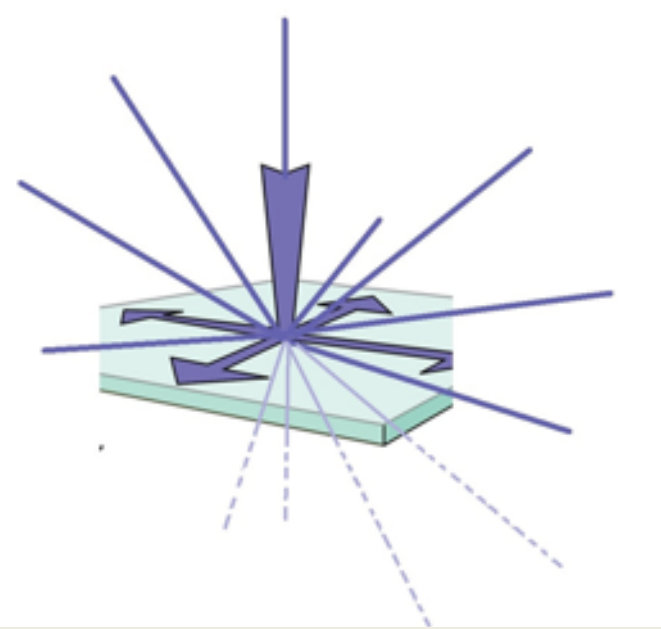
Rules of thumb on acrylic thickness for traditional framing

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…

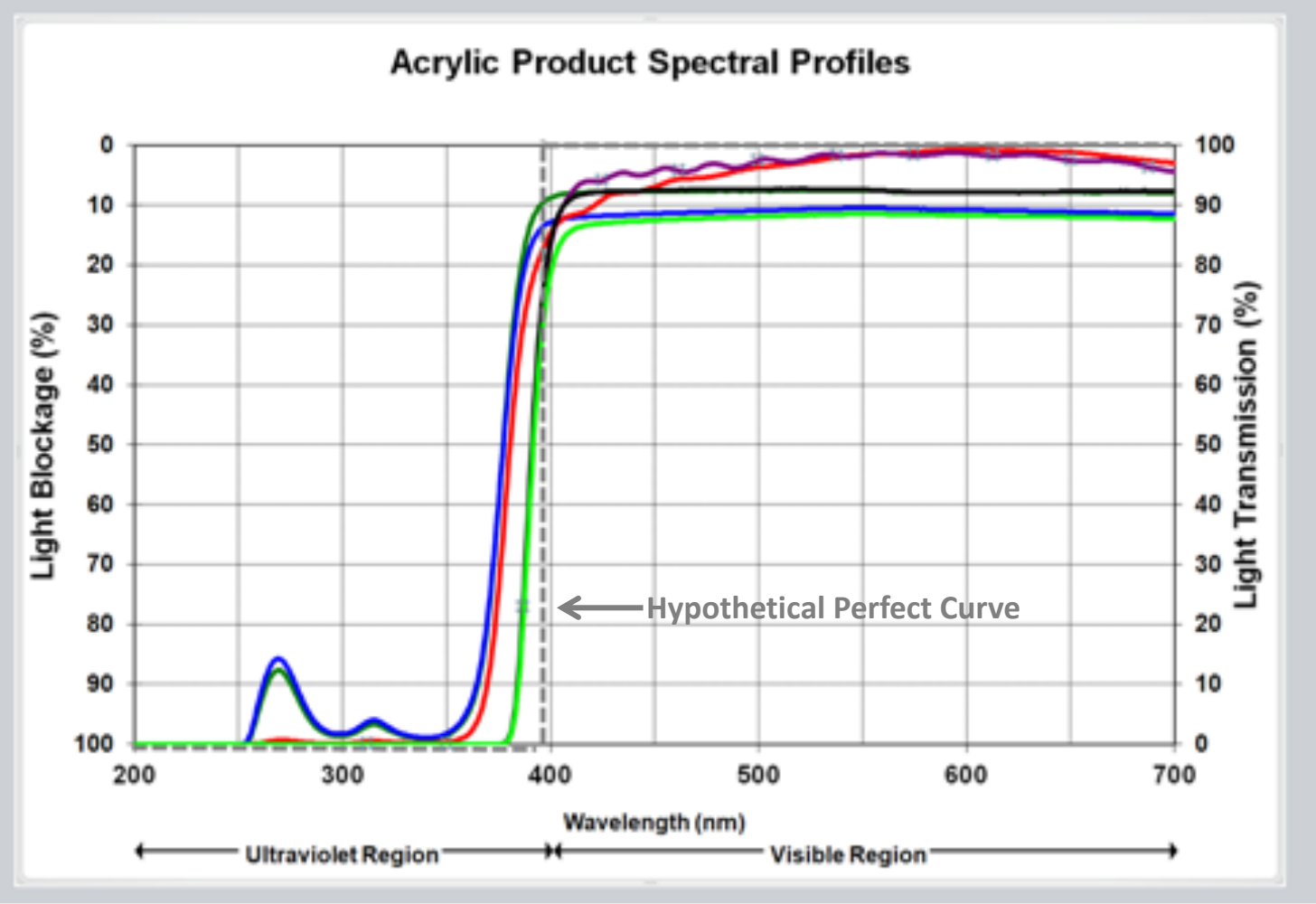


99% UV blocking
UV absorbers in the acrylic



Up to 93% UV blocking
UV blocking at surface only

UV Blocking Ranges: 380nm vs 400nm



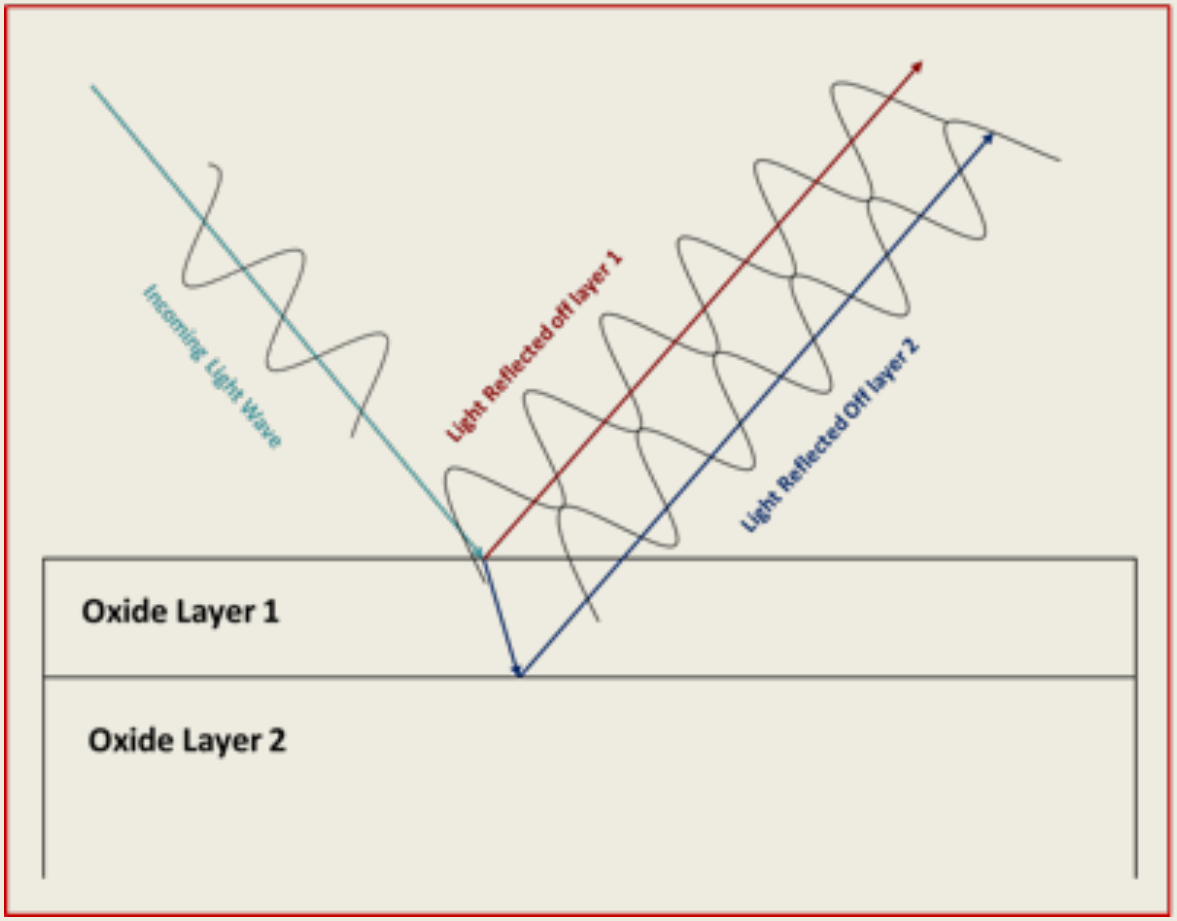
What Happens to Acrylic and Glass in a Fire?

Looking at Anti-Reflective properties of Acrylic and Glass

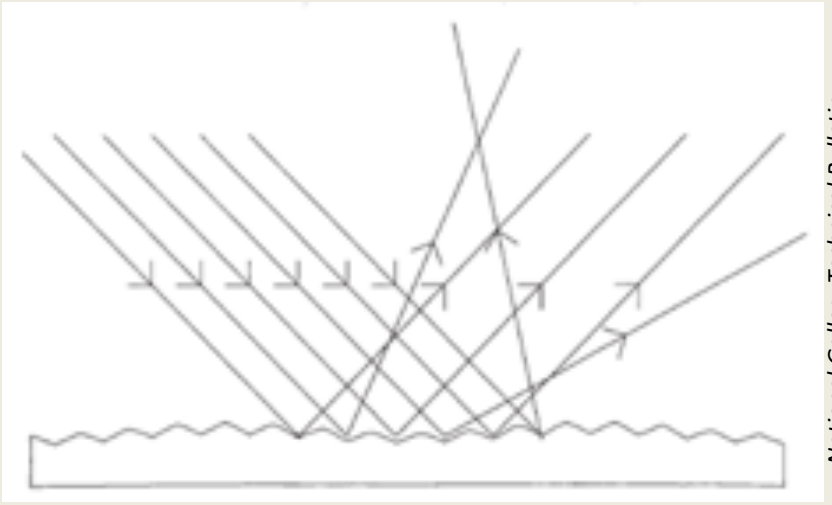
Anti-Reflective Acrylic reflects about 1.6%, (and glass about 1%).

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

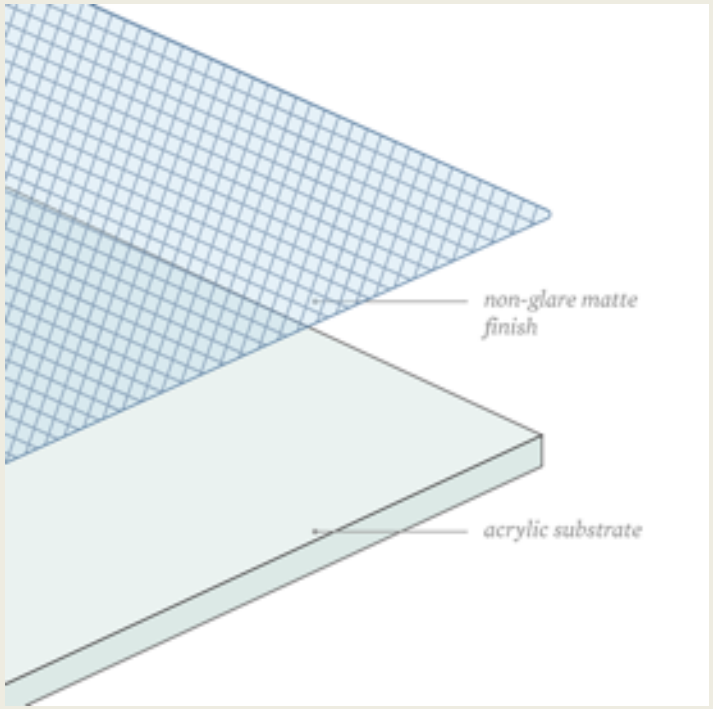
How Do the Anti-Reflective Coatings Work?



Different from Non-Glare…



National Gallery Technical Bulletin



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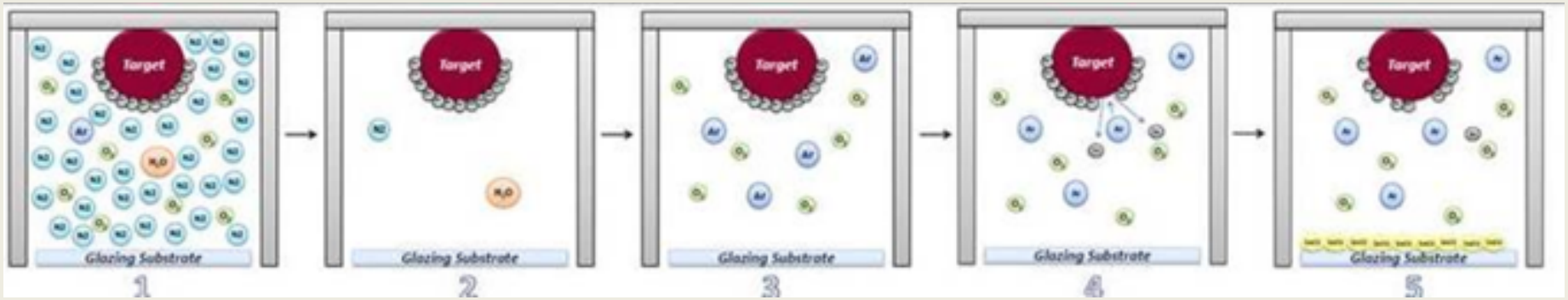
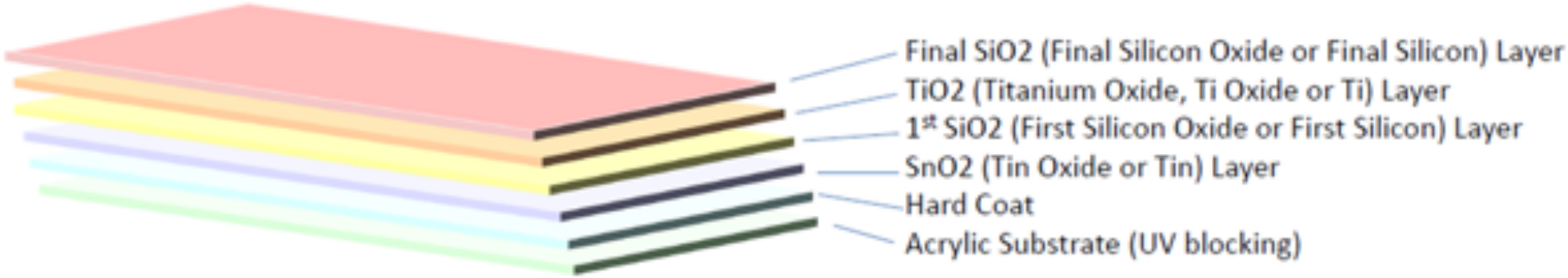
How is Anti-Reflective Glazing Made?

Sputter coating technology:

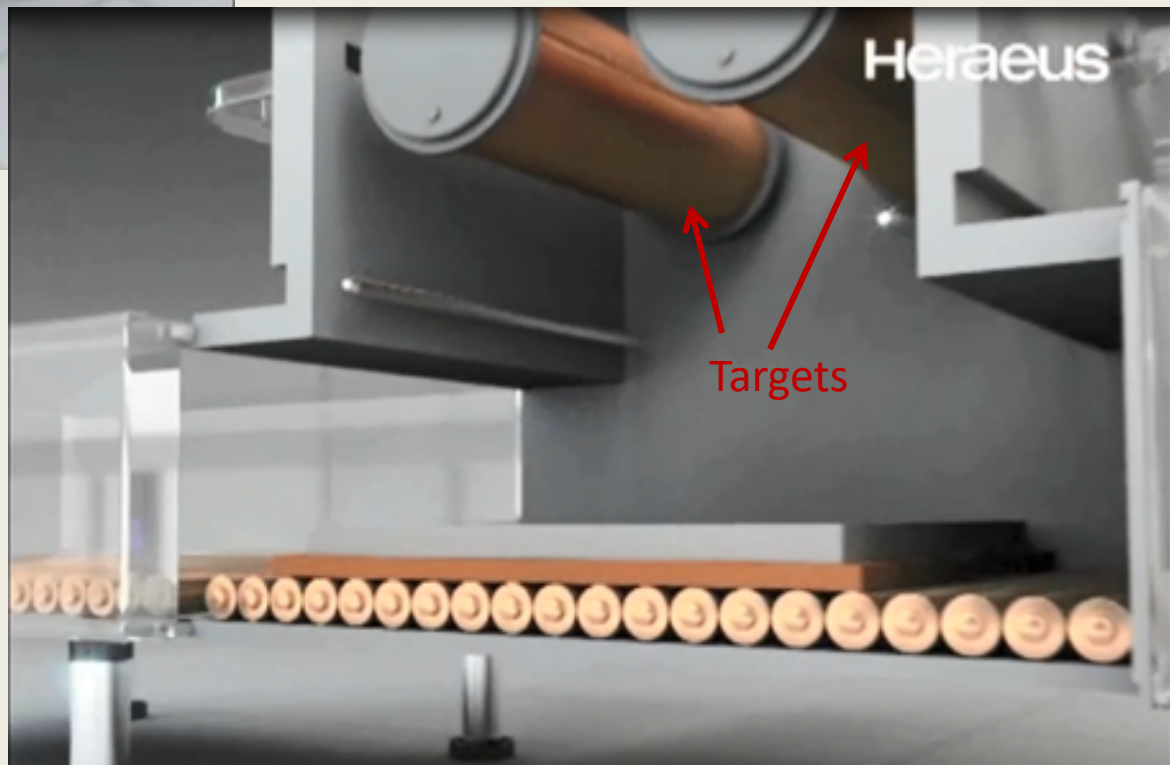


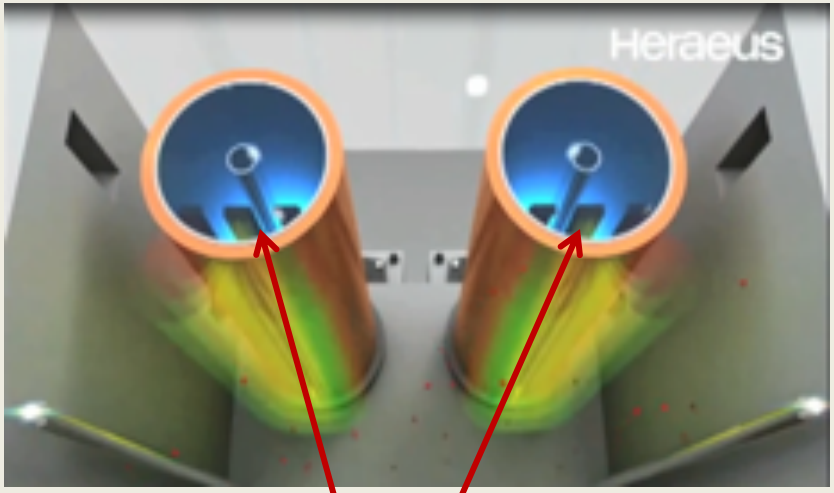
Various steps are involved in the sputter coating process



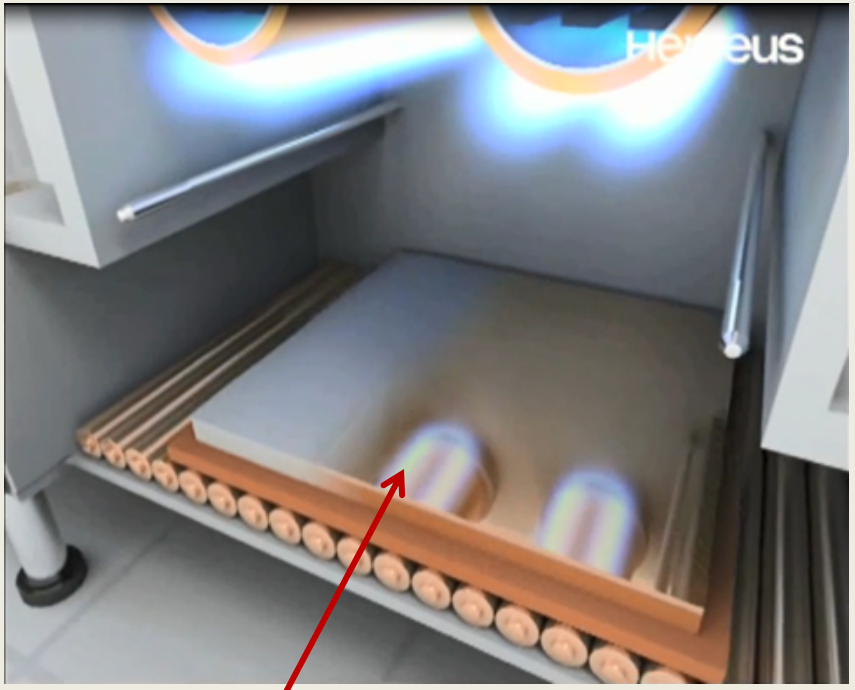
Example of a “coating stack” of various metal oxides on an acrylic substrate that was pre-coated for hardness


Heraeus
Glazing

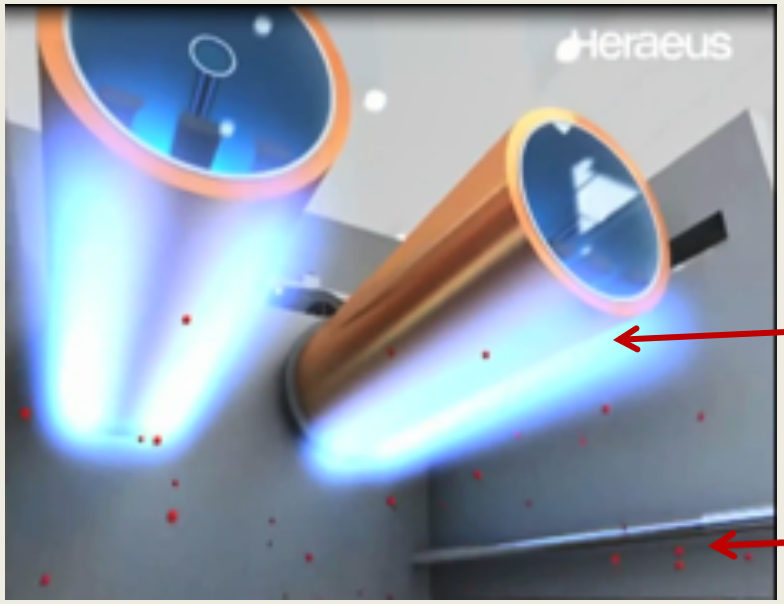

Heraeus
Targets



Magnets with water for cooling are inside targets

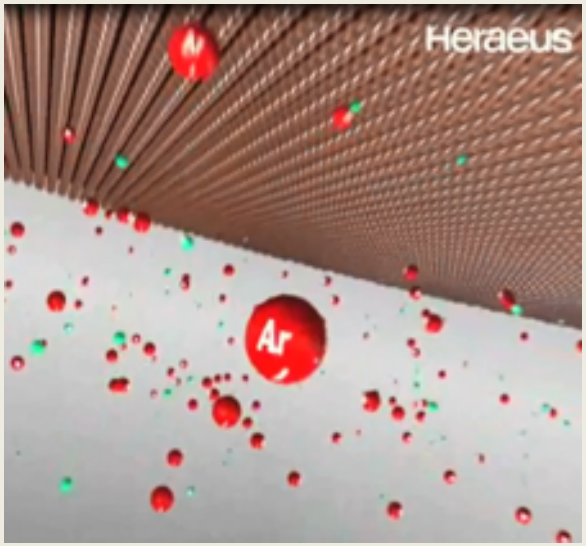


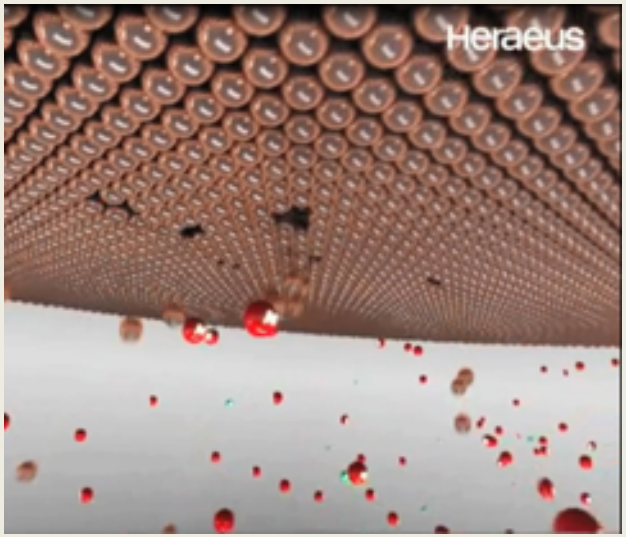
Glazing in chamber with targets above



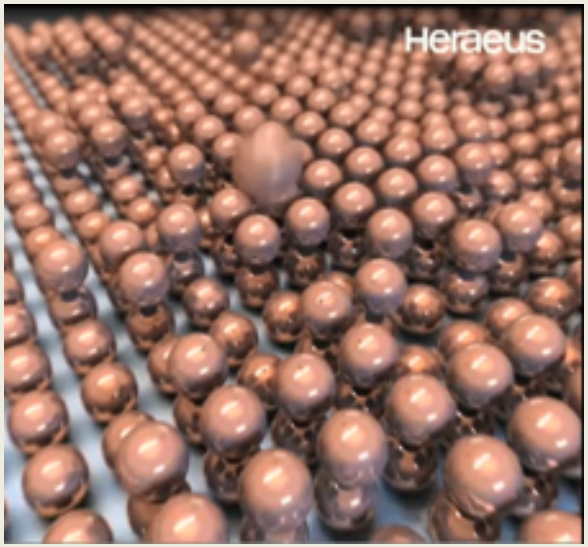
Plasma formed with electric current

Argon gas is pumped into the chamber





Magnified view of the target surface, showing metal atoms and Argon gas as it hits the target.



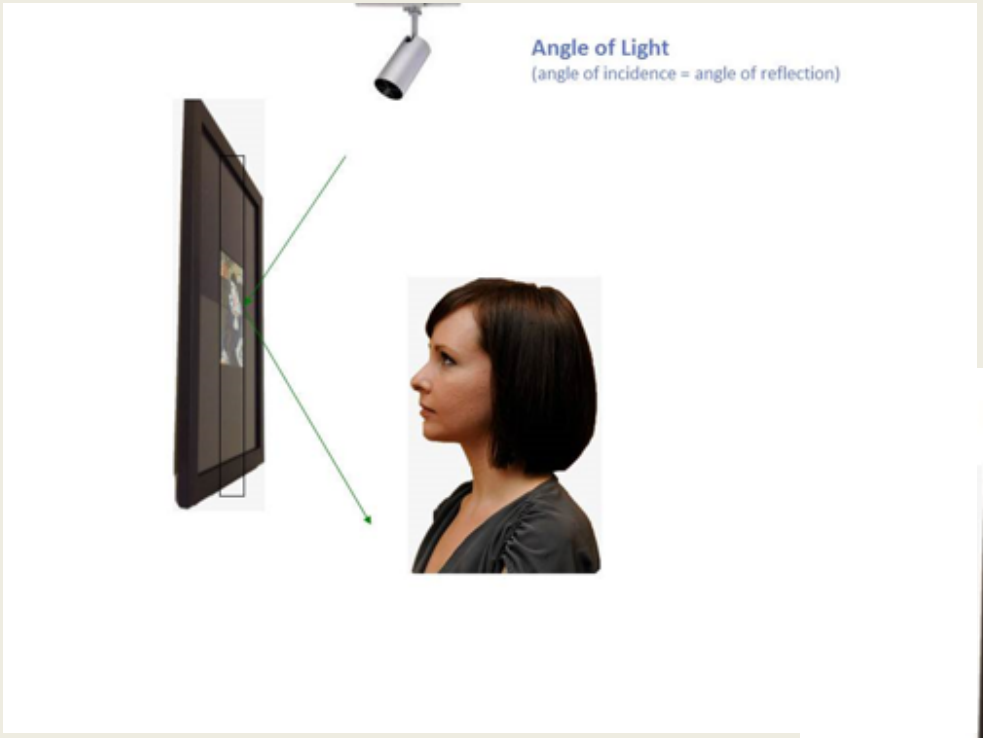
The metal atoms as they fall and rest on the glazing surface.

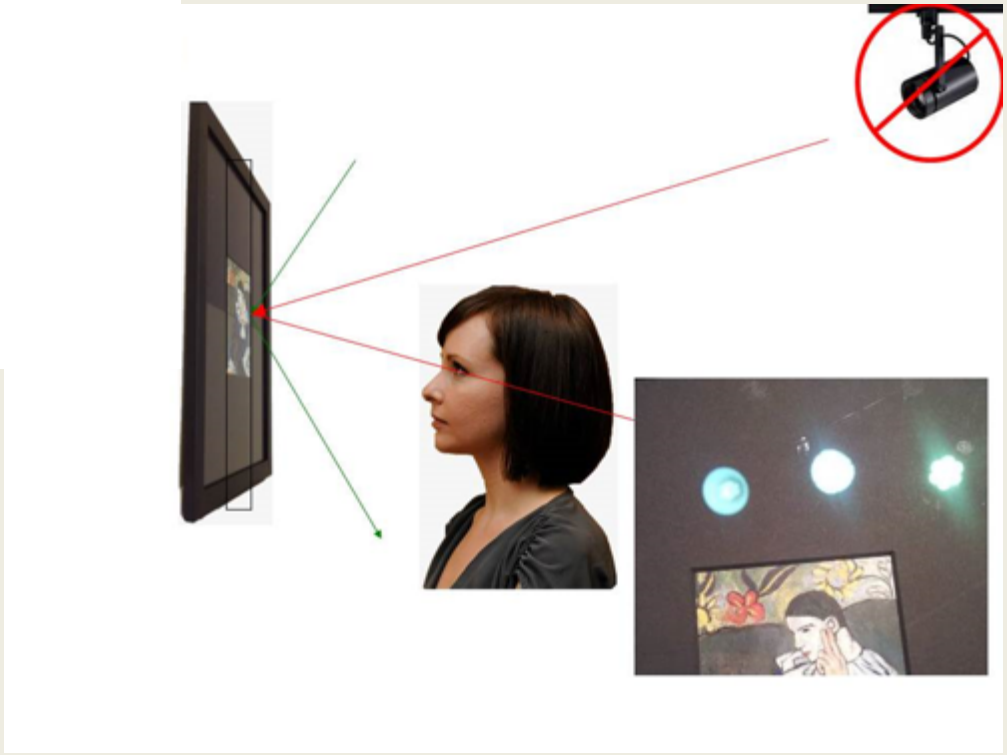
Effects of Lighting on Anti-Reflective Glazing

Properties of Light

- Angle
- Diffusion
- Intensity
- Color/Temperature

Optimizing anti-reflective properties: Angle of light





Budgets

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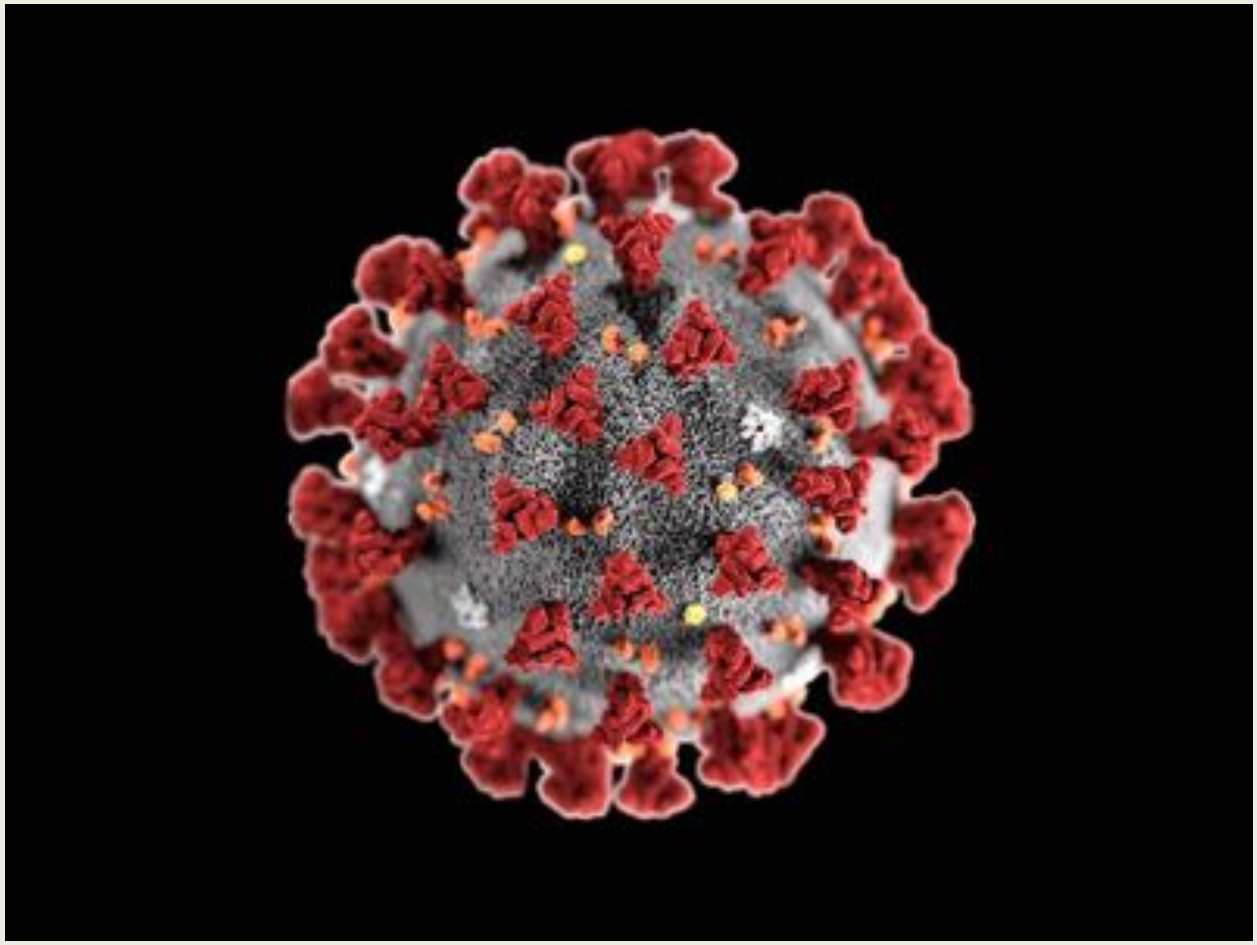
Cleaning Protocol



commons.wikimedia.org

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.

Photo by Yadin Larochette

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

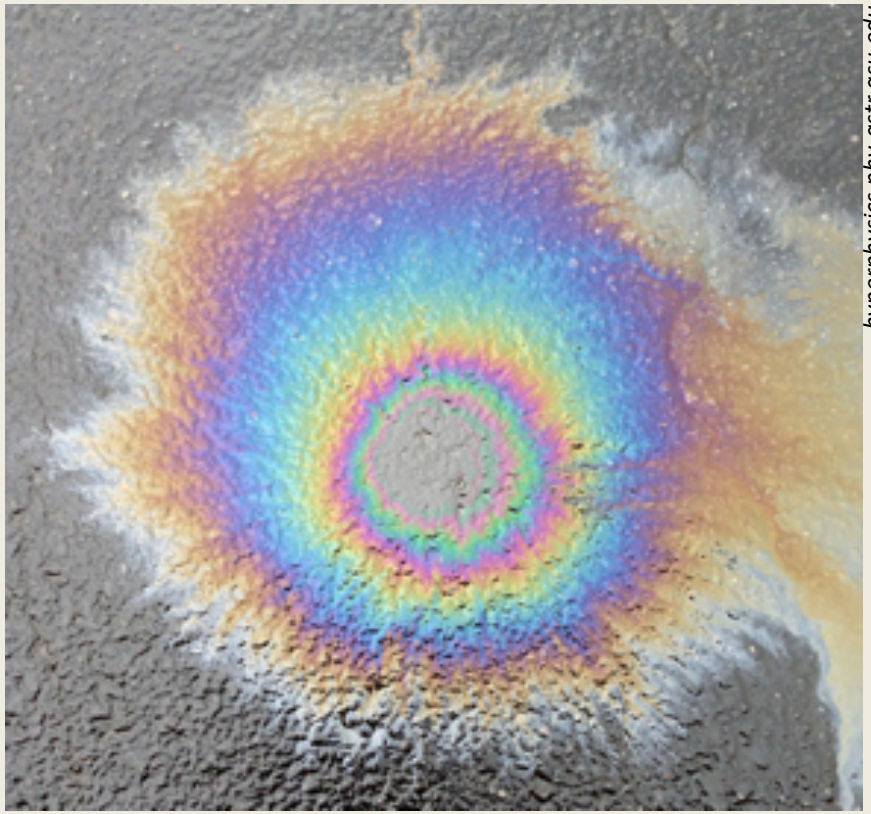
Steps:

- 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?



hyperphysics.phy-astr.gsu.edu

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.

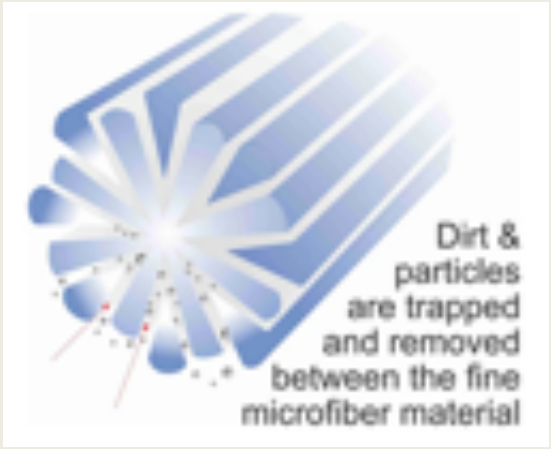
Cleaning Regular Acrylic

- 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



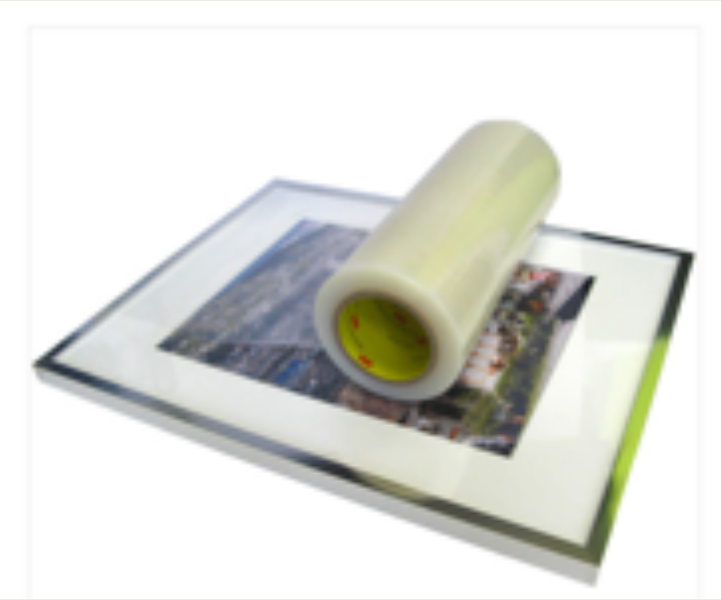
Shipping

sohocrates.com

degrootfineart.com

Glass Skin: DO NOT USE on anti-reflective glazing

(unless you're willing to risk damaging the glass)



Storage

archplastics.com


Thank you!
Questions?
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