Assessing the Damage;
Strategies for Approaching the Conservation of Fire-damaged Stained Glass

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INTRODUCTION

The conservation of fire-damaged stained glass can be a challenging task. Windows can exhibit a range of thermal, mechanical, and even chemical damage thanks to compounding issues of deterioration. Throughout the twentieth and twenty-first century, multiple approaches have been used to address the preservation of fire-damaged windows. The aim of this research is to provide a summary of possible conditions, analysis techniques, and known treatment options for fire-damaged nineteenth to twentieth century opalescent stained glass in order to provide a resource for developing a thorough approach to their conservation.

MAIN SOURCES OF DAMAGE

- High temperatures
- Quenching
- Firefighting efforts
- Post-exposure to environment

CONDITIONS

- Surface soiling
- Discoloration
- Possible devitrification
- Crazing
- Breaks (impact + thermal)
- Loss
- Crizziling
- Melted, burnt, distorted matrix
- Damage to frame
- Damage to building

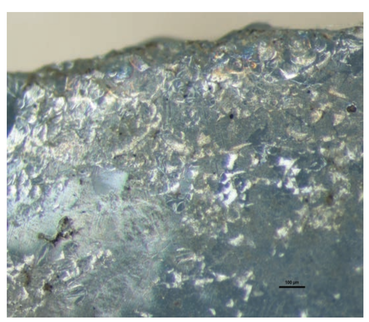
Panel 4B

"Ascension Window", J & R Lamb Studio ca. 1912. Brooklyn, NY. ext. following a structure fire in 2016. Image courtsey of Bovard Studio, Inc.

ANALYSIS TECHNIQUES

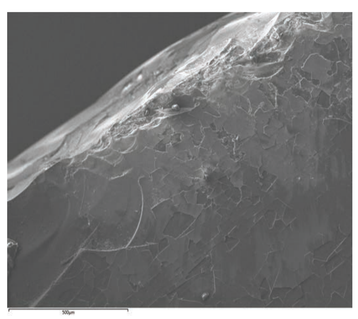
Initial examination of sample 5S shows internal crazing. Yellow accretion on right side known to be adhesive residue from tape.

Photo taken using Canon Rebel T6



Stereo microscope photomicrograph (x63) of sample 5S shows a fine network of surface cracks and irridesence.

Photomicrograph taken using Nikon SMZ 800 stereomicroscope



SEM image (x90) of sample 5S shows layers of fine surface cracks and areas of flaking glass.

Photomicrograph taken using JEOL 6490 Low-vacuum SEM

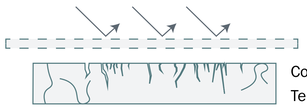
In addition to observations made with the unaided eye, conditions can be further identified and distinguisged via instrumental analysis. In practice, a stereomicroscope allowed the author to capture stereomicrographs of previously unidentified conditions, such as crizziling. Examination of the same sample using a scanning electron microscope further confirmed the presence of delaminating layers of glass. Cross-section analysis was performed on sacrificial samples to determine the extent to which conditions descended into the bulk of the glass.

REVIEW OF TREATMENT OPTIONS

Consolidation: The application of an adhesive across affected areas of the glass surface. The material is absorbed by surface cracks with the goal of improving cohesion and adhering friable elements. A fine tissue layer can be incorporated for additional, temporary stability. Concerns exist over the technique's ability to fully address conditions and long-term stability for panels returning to the building envelope.

Break Repairs and Loss Compensation: An adhesive, either epoxy resin or silicone-based, can be used to perform edge gluing. Copper foil can also be used to reassemble broken pieces of glass. Epoxy resin fills for areas of loss ≤ 1.5 in^2 can be considered for panels kept in an interior environment. For windows returning to the building envelope, an in-kind replacement or custom fused glass fill secured with copper foil is generally recommended for areas of loss.

Plating: A damaged piece of glass is backed by one or sandwiched between two pieces of thin, clear glass, cut to match the outline of the original piece. The edges are sealed before being releaded with the glass layers placed in the same lead channel. There are potential issues of feasibilty for tiered windows that already contain plates. Additional issues include the infiltration of moisture and creation of a static weathering environment.



Controlled Environment: The object is either placed in an indoor climatized environment or a microenvironment is created in situ using protective glazing. Studies have shown the benefits of an isothermal glazing system, as well as the need for proper materials, installation, and ventillation.

CONCLUSIONS

What is included in a successful treatment plan depends on each unique object, the material involved, current condition, and future use. While no conservation-appropriate treatment option can eliminate certain conditions like crazing or devitrification, a combination of treatment options can be selected that best address all identified conditions. Finally, there is a recognized need for stewards of art glass to document their windows and coordinate with first responders prior to an emergency. The creation of an inclusive emergency response plan and early intervention by a conservator post-fire are both crucial steps towards the preservation of fire-damaged stained glass.

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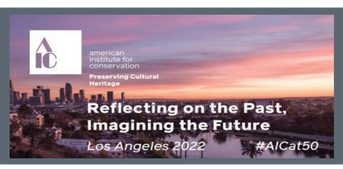

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