MAIN STREET
THE HERITAGE CANADA FOUNDATION

# Structural Glass
## Repair and Replacement

### Introduction

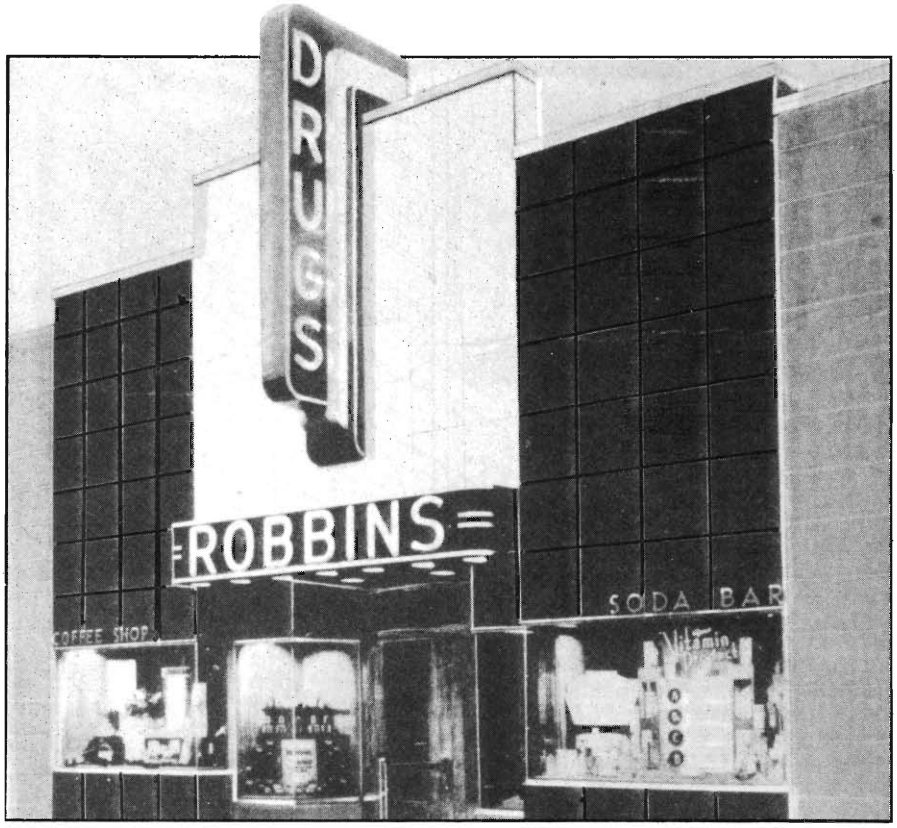
One of the most difficult technical problems concerning storefront preservation is the conservation of structural glass. Popularly known as Carrara Glass (Pittsburgh American Plate Glass), Vitrolite (Libby-Owens-Ford), or Sani Onyx (Mariette Manufacturing Company), this material was used by builders to upgrade storefronts in the reflective, shiny, colourful, and streamlined forms considered modern in the 1920s and 1930s.

Structural glass is an opaque, lime-based material with a polished face and a back roughened for glueing to buildings. It was created as a low-cost substitute for marble, but when its cost rose, it was superceded by tempered hardboard (Masonite or Marlite).

Arguments can be made for keeping structural glass storefronts: 1) They represent an investment in durable materials and fine craftsmanship;
2) As evidence of one of the most dynamic periods of 20th-century design, they are a bold expression of the aspirations of an earlier generation;
3) They contribute to the diverse look and continuity of Main Street; and
4) They are frequently less expensive to repair than to replace.

But retaining these facades is often a hard sell for a Main Street co-ordinator. Some resistance comes because of technical drawbacks structural glass presents:
1. Due to its relatively fragile nature, structural glass is subject to breakage.
2. Deterioration or damage, even if limited to a few panels, often renders a storefront unattractive;
3. Severe deterioration frequently results when an attempt is made to anchor such things as signs and awning supports through the structural glass to the building. Most often, broken panels are found on the lower portions of buildings where they are vulnerable to snow removal equipment, vandalism, etc.
4. Structural glass panels often become detached when the mastic used to fasten them to the building loses its bonding strength.
5. Joint cement sometimes dislocates, allowing moisture to seep behind the panels -- a situation which leads to more serious deterioration. Caulking is often used here as a remedy -- with results that are visually unsatisfactory.

To these material problems can be added others:
1. Since structural glass hasn't been manufactured for the past 20 years, there are few people who have the expertise to work with it. Reliable repair advice is




**Structural glass was popular during the 1930s and 1940s. It added slick, industrial, uniform, streamlined surfaces to buildings such as this drug store in Saint John, N.B.**



$2.00

therefore hard to come by;
2. Many shop owners, even when sensitive to Main Street preservation, overlook the value of structural glass storefronts and their contribution to downtown's diversity; and
3. Some owners want to create a period restoration -- a return to an earlier appearance -- which may or may not have a basis in fact.

Our own generation has created cover-up materials for storefronts, too. Some are refined, designed to promote corporate images; others are tacky do-it-yourself products such as cedar shakes. Slip-cover materials are fair game for removal. But owners should be encouraged to distinguish between superficial slip-covering and the well-designed and well-executed structural glass facades.

## Repair

Where damage to the facade is not too extensive, on-site repair of structural glass is the best option. It is the most economical approach and causes the least disruption to the owner.
Repair should be accompanied by steps to alleviate sources of original distress. Is water being carried down the building facade by inadequate gutters? Are panels properly caulked and bedded at their base? Have supporting shelf angles rusted, requiring replacement and realignment? Are joints open?

It is important, when assessing potential problems, to understand how structural glass has been applied to buildings. Panels were originally fastened to plaster and/or masonry bases by asphaltic mastic daubed in place hot. In addition, most panels are supported by shelf angles (metal clips) which hold bottom edges. Horizontal joints included panel-separating strips of adhesive cork tape, finished with joints cement coloured to suit adjacent panels. Vertical joints required only a single pass of joint cement.

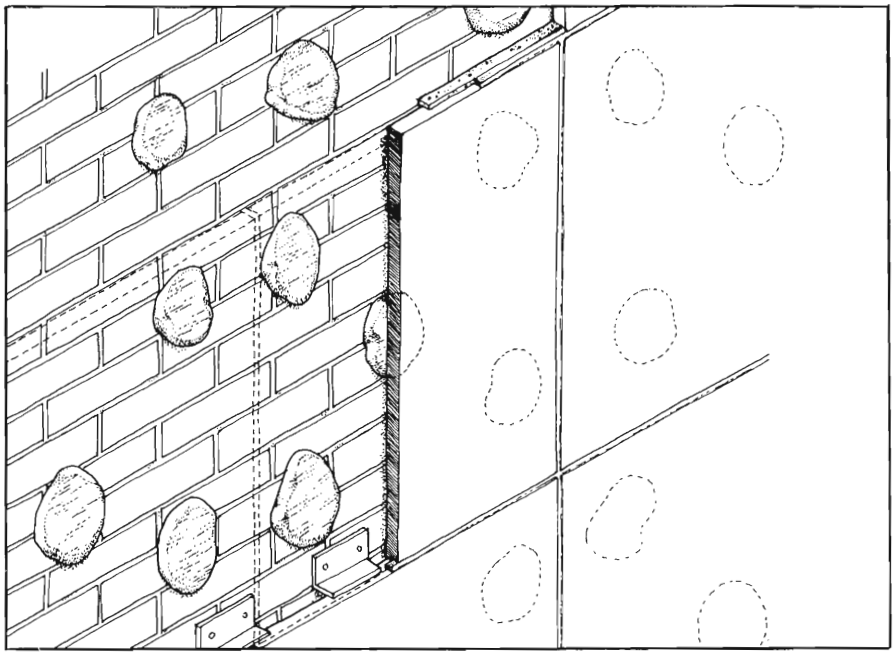
The three most common problems concerning structural glass repair involve joints, mastics, and panels.

1. JOINTS. Cracking or opening of the joint cement permits water to enter and may lead to rusting of anchors and dislocation of panels. Caulking has been used to partially replace cement joints but the results are not satisfactory. Caulking width is difficult to control and colour-matching is a problem.

Where horizontal joints have failed, check to ensure that a 1/16" cork strip (or flexible equivalent) remains in place to separate panels and cushion weight transfer. Replace where necessary with Tuff-Pak tape (a composite cork and rubber adhesive tape) or rubber composition glass setting tape, used for setting auto glass. Tuff-Pak or an equivalent is available at most glass suppliers and glass setting tape at all auto body shops.

Use joint cement to fill open joints between the glass panels. An appropriate product, available at building supply stores, is Poly-Cement (1985 price: $4.20/2 kg). The cement should be mixed with a paint to match the colour of the glass.

Periodic inspection and repair of joints prevent slowly-developing small cracks in the cement from becoming a major problem.



Dinu Bumbaru

**Structural glass was commonly mounted to the substructure using a combination of retaining clips and bitumen daubs after which the joints were filled with colour-matched grout.**

Jerry Dick

**Snow removal equipment and lack of preventative maintenance demonstrate the vulnerability of structural glass at sidewalk level.**

2. MASTICS. The adhesive qualities of asphaltic mastic diminish after a few decades. Reattachement of loose, partly broken, or sound panels (where adhesive may give way) requires dissolution of the old mastic and application of new mastic.

A heat gun is recommended to soften the mastic daubs. This allows the mastic to be cut with a fine, strong wire (an alternative is simply to use a hot wire). Where wire is impractical, some type of prying instrument, preferably soft like wood, can be used. Use suction

cups to hold panels in place while cutting them from the mastic and pulling away the panel.

For readhering panels, best results are obtained with mastic precisely like that popular 50 years ago. It appears to provide better prospects for flexibility and adhesion than do contemporary silicones or butyl adhesives. A possible alternative to asphaltic mastic is a paired mastic known as Urethane E (available at Canada Glass or Speedy Glass for approximately $8.00 per 11 oz. tube). This was used in Nelson B.C. to adhere plexiglass letters to structural glass panels but has not been tested as a method to attach panels to the building.

Asphaltic mastic can still be obtained under the name Palmer Mastic. A Canadian source is Joseph Taylor Inc. with outlets in Toronto and Montreal. A recent price for Palmer Mastic: 1-3 gallons: $35.00/gal;
4-19 gallons $29.25/gal.
The company also stocks mastic applicators or hot cups for heating and applying daubs of mastic (about $160).

3. PANELS. Cracks within panels and/or chipping of the surface of structural glass suggest the need for patching substances. However, since patches may be more noticeable than the cracks they hide, they should be used to solve a physical problem (e.g. is the crack admitting water to the space behind the panel?).

Chipped-out pieces, lost through impact or drilling to secure earlier signs, require some kind of filling.

Another common problem is the eradication of signs etched into structural glass. Provided broken pieces retain good adhesion to the backing surface, it is not recommended that thin cracks be filled.

Panels should be cleaned regularly to minimize the dirt-catching potential of cracks.

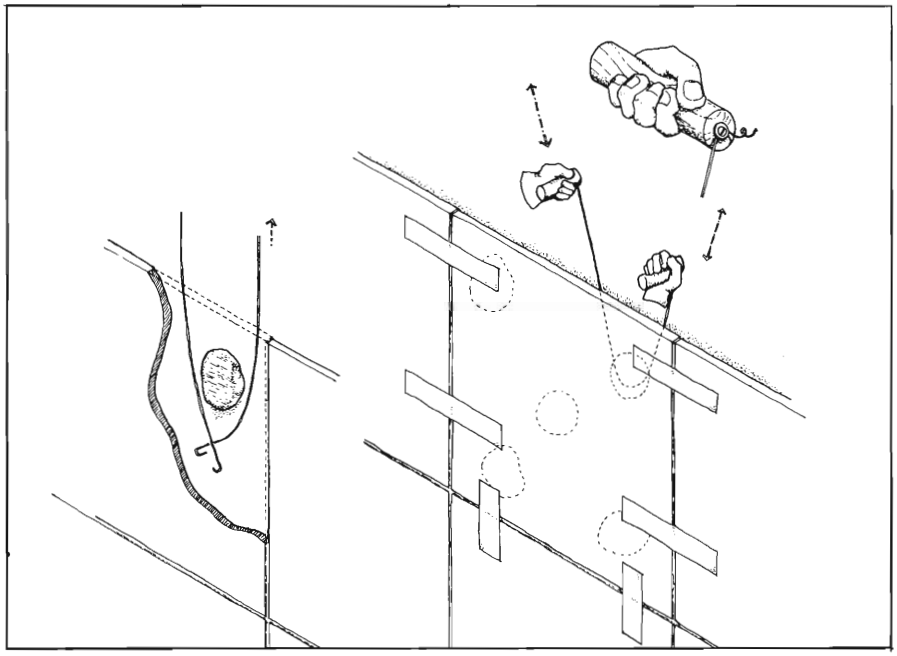
Use a fiberglass filler (Bondo or Polyfibre), available at auto body shops, to fill in wide cracks and holes. A backing should be applied to partly fill the cavity before the filler is introduced. Artist's acrylic paints, available at art supply stores may be used to tint the clear filler to match the panels or applied over the hardened filler.

## Replacement

It is necessary, where panels are badly damaged or missing, to find a replacement. The best solution, of course, is to find replacement panels made of structural glass. Where this is impossible, choose sympathetic alternative materials.

1. Draw on stockpiles of unused structural glass. No known public stockpiles of structral glass exist in Canada. Even if such were known the wide variety of colours and thicknesses manufactured make finding an identical match difficult. It may not be necessary, however, to look far afield to find replacement glass. Small stocks of glass, left when the original glass facade was applied, may be found in the building. Check the attic and cellar of your project building for possible supplies. Also check with local builders who may have stockpiled structural glass in earlier demolitions.

Create your own stockpile as facades are altered or demolished in your community. Main Street Canada keeps tabs on such stockpiles so that resources can be shared.



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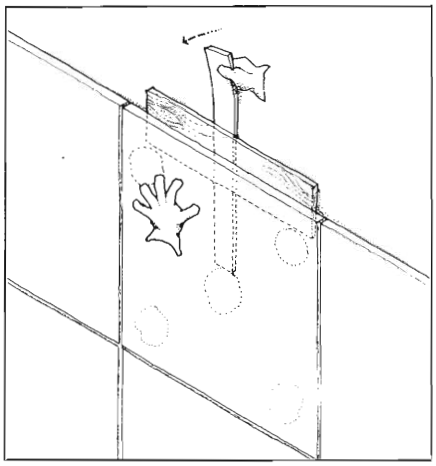
**Damaged panels can sometimes be replaced by panels borrowed from other sources. Use a fine wire to "garrot" the daub fastenings behind the panel. Duct tape can be used to prevent freed panels from falling.**



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**Another approach is to pry loose inadequately-fastened panels using a flat steel pry bar. It is important that the bar be cushioned by a cedar shim or similar buffer.**

2. Move and reuse structural glass panels: Where replacement needs are limited, it may be possible to borrow panels from one spot to help another. In Moose Jaw, Sask., for example, a design called for the removal of the top course of panels on a shop facade to provide raw material for use elsewhere on the facade.

Remove structural glass panels

from either the top or the bottom of the shop front to replace broken or missing panels elsewhere. Since lower panels are often subject to breakage it may be desirable to replace these with another material anyway. You must take great care, however, not to alter the proportions of the facade dramatically.

Remove intact panels of glass from behind signage (where they are not visible) for use elsewhere.

3. Use substitute materials: Where repair is impossible, the appropriate solution may be found within a range of available substitute materials. Two materials that most closely resemble structural glass are spandrel glass and plexiglass. Spandrel glass (Vitrolux by Libby-Owens-Ford and Spandrelite by Pittsburgh Plate Glass) is a heavy plate glass developed for use in commercial buildings in the 1960s and 1970s. It tends to have a metallic hue with reflective qualities different from structural glass.

From a visual standpoint, sheet plastics, commonly known as plexiglass, most closely resemble structural glass. The drawback of sheet plastic is that it is easily scratched and over time will likely lose its glossy finish.

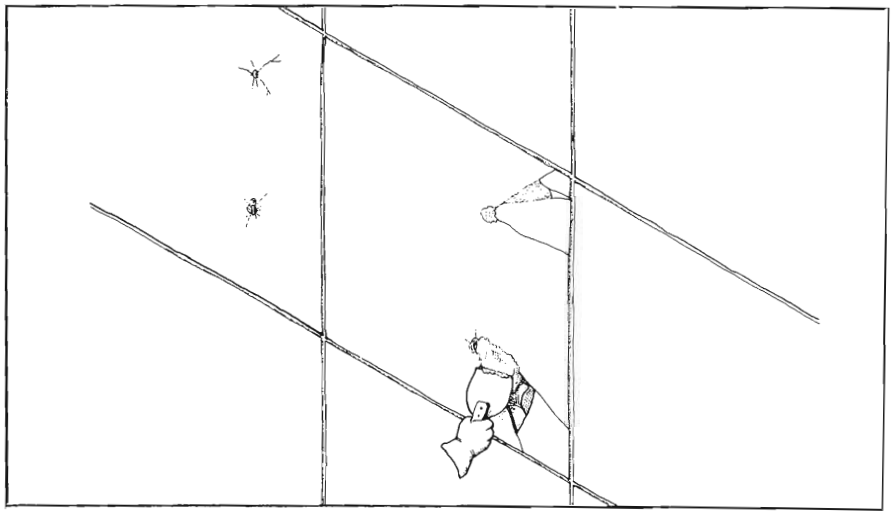
A number of other possible substitutes exist, albeit ones that provide only an approximation of structural glass.

Medium density overlay plywood, known as Crezon, painted with a high-gloss enamel paint and highlighted by 1/2" reveals provides a look consistent with structural glass. This technique was used to build bulkheads at Harold's Army and Navy Store in Corning, N.Y. A similar approach is a smoothly-troweled parging which will receive a high gloss enamel paint. This approach was also employed in Corning.

Spandrel glass is most appropriate where substitution of all structural glass is envisioned, and it is desired to evoke a similar feel and sheen.

Plexiglass, if used externally, is best used at heights above six feet where the likelihood of scratching is reduced.

Materials painted to resemble structural glass are best employed as a total replacement as they provide only an approximation of structural glass. If this approach is used as a partial replacement, careful colour-matching is required. Consult the colour chart in Douglas Yorke's article "Materials Conservation in the 20th Century: The Case for Structural Glass" (see references). In each case, the rule of thumb is to be sensitive when matching or substituting new for old.



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**Small holes from previous sign fastenings can frequently be patched using a filler of automobile body fiberglass compound. Care must be taken to remove excess material from the patched area. A light sanding and enamel spray painting complete the job.**

## Conclusion

Repair is almost always preferable to replacement as it is likely to result in the least damage to the building and to the integrity of the structural glass facade. In most cases it is also more practical with respect to budget, replacement materials, and contractors.

Advice in this technote should not substitute for professional examination. If possible, work with your contractor to resolve problems at the detail level. Be sure to clarify goals in retaining structural glass facades.

## References


Only one primary research source exists: Douglas Yorke's article, "Material Conservation for the Twentieth Century: The Case for Structural Glass," APT (Association for Preservation Technology, Ottawa), Vol. XIII, No. 3, 1981.

2. Preservation Briefs, No. 12 National Parks Service, Washington, D.C.) adapts Yorke's article and adds new material on use of solvents to dissolve mastic, and the use of caulking for patching.

3. The Old House Journal (New York, N.Y., U.S.A., Jan-Feb. 1985) offers a one-page precis drawing on the above sources.

4. A 1981 Preservations Studies thesis by Rita Caviglia examines colour matching for structural glass. Title: "Architecture and Storefronts of the 1930s." Available by writing: The Avery Library, Columbia University, New York, N.Y., 10027.



Main Street Canada is a programme of The Heritage Canada Foundation, P.O. Box 1358, Stn. B, Ottawa, Ontario, K1P 5R4 Tel: (613) 237-1066.

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