CHALMERS UNITED CHURCH
Kingston, Ontario

Erected in 1889-91 for a United Church of Canada congregation, the Chalmers United Church is a handsome structure, designed by Gillen and Gillen, and constructed from local limestone. Among its most striking features are the stained glass windows (artist unknown) on the north and south facades. Each set of tripartite windows consist of a 9 x 24' center portion, flanked by 5 x 20' wing sections on both sides. The center portion depicts scenes from the New Testament; the side windows feature geometric designs. All of the windows were fabricated at the time the church was built.

Repair Problem

Over time the windows had suffered severely on the southern facade of the church, which is exposed to sun and constant strong winds blowing in from nearby Lake Ontario (see figure 1). This wind not only carries dust and dirt, but also has a high moisture content. Because of weathering and the lack of regular maintenance, the wooden frames which secured the stain glass panels had gradually deteriorated. The decay finally became so acute that by 1982 the windows were in imminent danger of collapsing. The parishioners at that point had no choice but to arrange for the urgent repair of the windows.

The original plan formulated by the parish was to remove the large windows from the openings, frame and all, and ship them to a stained glass manufacturer's plant for repairs. There the leaded stained glass panels would have been removed from the deteriorated wood frame; then new mullions would have been fabricated and the glass reset in this new frame.

To design and supervise the work, the church hired architect Wilfred B. Sorenson. After reviewing the situation, the architect realized that following the usual repair procedures, as proposed by the parish, would not be the best way to tackle this job. Not only was the cost estimate quite high, but also there was a very real danger that the fragile stained glass panels would be damaged during removal and transportation. In addition, the large openings left on the wall while the windows were away for repair would have presented another major problem; costly temporary closures would have been required to withstand winter weather.

Repair Solution

After studying the options available, the architect decided to restore the windows, in situ, thereby avoiding the risk of Historic wooden windows should be repaired rather than replaced whenever possible.
of damage during removal and transportation. Instead of making new mullions, the decayed frame was reinforced in an unusual manner, using a method developed by Paul Stumms, the consulting engineer for the project. The method involved the use of epoxy consolidates along with steel reinforcement rods (see figure 2). To permit the wood to take place undisturbed by the weather, a "cocoon" formed out of vinyl sheet was attached to the temporary bracing installed to stabilize the windows while the restoration work was underway (see figure 3).

**Sash Repair**

The first step in the restoration process was the careful removal of the remains of old paint on the wood frame. This exposed the true extent of the deterioration. In some areas, as much as 40-50% of the wood had been lost. The wooden parts of the window frame that were found to be crumbling were saturated and consolidated with a commercially available liquid epoxy. Next, a 1/2" wide groove was cut into the mullions on opposite faces to receive a steel reinforcement rod. The depth of this groove ranged from 3/4" to 1 1/4", depending on the location. This delicate exercise was carried out with utmost care. After some experimentation was carried out on scrap wood, a hand-held electric router was adapted for the job. Special rollers were installed to guide the rotating cut-

![Cross section of the historic mullion showing the manner in which the pre-formed steel reinforcing bars were inserted in order to strengthen the windows. The grooves that were cut for the steel bars were filled with an epoxy compound.](image)

![Details of the mullions as the strengthening process was carried out. Left: The grooves had to be carefully cut both because of the deteriorated condition of the wood and due to the relative thinness of the outer edge of the mullion. Right: Reinforcing bars are positioned in the grooves prior to being encased in an epoxy compound.](image)

![A vinyl cocoon placed over the windows allowed the repair work to be carried out even in inclement weather.](image)

![Once the old paint had been carefully removed, grooves were cut in the mullions using an electric router fitted with special guides rollers.](image)

![The steel in epoxy. The epoxy used for this project — the high-modulus, thermoplastic Sikadur gel in which some Union Carbide phenolic microballoons had been added for more firmness and improved workability — had the consistency of a stiff paste. This mixture had the advantage of remaining in position and retaining its shape wherever it was placed. If a fluid epoxy had been used on these vertical windows, special molds would have had to be fabricated and positioned to prevent the liquid from spilling out before it hardened. After this paste epoxy cured, it achieved a strong adhesive bond with the wood of the mullions and the reinforcing steel bars, creating a sturdy composite window frame.](image)
paste like modeling clay. Skillful hands of the craftman sculpted fill-ins which blended perfectly into the curvature of the wooden mullions. After the epoxy paste hardened, only the color was different from the wood; the shape and the texture were the same. To complete the work, the windows were then primed and painted (see figure 6).

**Evaluation**

This method not only restored the church windows without any breakage of the precious stained glass, but also retained as much of the original fabric of the wooden frame as possible. Fortunately the frames were wide enough to permit the installation of reinforcing rods. Problems associated with placing a new frame into a usually deformed old opening were avoided. In addition to preserving the original architectural components, this method was successful in terms of church operations and budget. Since the windows were not removed, the functioning of the church was not disturbed during restoration, and the repair of the windows in situ was achieved at a cost 25% less than that of just fabricating a new frame.

![Figure 6. Repairing the historic frames resulted in a 25% savings over fabrication of new ones. The work included paint removal, reinforcing of the mullions, consolidation of the deteriorated wood, and repainting.](image)

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**PROJECT DATA:**

**Building:**
Chalmers United Church
Kingston, Ontario
Canada

**Project Date:** 1983

**Architect:**
Wilfred B. Sorensen
Kingston, Ontario
Canada

**Consulting Engineer:**
Paul Stunes, P.Eng.
Parks Canada
Ottawa, Ontario
Canada

**Contractor:**
Whitby Gather
Kingston, Ontario
Canada

**Materials:**

Epoxy Paste: high-modulus, thixotropic
Siakur Gel with Union Carbide's phenolic microballoons added

Epoxy Consolidant: Sika's liquid
Colma-Dur epoxy
Sika Chemical of Canada, Ltd.,
Point Claire, Quebec, Canada or
Sika Chemical Corp.
P.O. Box 297
Lyndhurst, New York

**Project Cost:** $11,000.00

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PRESERVATION TECH NOTES are designed to provide practical information on practice and innovative techniques for successfully maintaining and preserving cultural resources. All techniques and practices described herein conform to the established National Park Service policies, procedures, and standards. This Tech Note was prepared pursuant to the National Historic Preservation Act Amendments of 1980, which direct the Secretary of the Interior to develop and make available to government agencies and individuals information concerning professional methods and techniques for the preservation of historic properties.

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