Preserving Your Stained Glass Windows
A Resource Guide for Your Stained Glass Project

Provided by
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Forward

We at Associated Crafts have a collective experience of more than 100 years of serving churches. Through the years, we often found that the majority of church staff members had little or no knowledge of stained glass windows. We believe that many churches would have made better decisions regarding how to care and preserve their valuable assets had they possessed the basic knowledge of these beautifully crafted items.

It is our pleasure to provide you with this informative manual in hopes that you gain a better understanding of stained glass windows and have a resource to turn to when it is time to make decisions regarding your own windows. For more information on stained glass windows or to receive information on our studio, please visit our Web site at www.restoreglass.com

Our Mission Statement

Associated Crafts is dedicated to the preservation of America’s stained glass heritage. We believe that through education, we can raise awareness and ultimately preserve these valuable works of art.
History of Associated Crafts

For a quarter of a century, John Phillips, Jr. has worked in the stained glass industry. He was first introduced to the craft from his father John W. Phillips, and has had a passion for it ever since.

In addition to working in his father’s studio, he consulted for other large studios regarding production, sales and software. John Phillips Jr. is dedicated to raising awareness of historic stained glass windows and their preservation.

In 1997, John and his wife Mary founded their company, Associated Crafts. In forming this new company, they brought together some of the most sought after talents in the industry.

The entire Associated Crafts’ staff contributed to the contents and experiences expressed in this book. We thank the following staff members who were key contributors:

**John Phillips Sr., Chairman of Associated Crafts.** John Phillips Sr. has spent more than 35 years assisting churches with their stained glass windows. In addition to educating committees and individuals on their stained glass window projects, he has been very innovative in assisting churches with their fundraising.

**Gregory A. Bayless, Shop Operations for Associated Crafts.** Gregory Bayless’ career first began in all areas of construction. He then honed his skills to finished carpentry and fine woodwork. Using his skills and attention to detail Gregory Bayless began working in the stained glass industry in 1980. He has since worked in all facets of this industry from the construction of new and leaded stained glass windows to releading and repair of historic stained glass windows. Mr. Bayless has also been very instrumental in the development of the protective covering system used throughout the industry today.

**Robert Bohannon, VP of Onsite Restorations Operations of Associated Crafts.** Robert Bohannon has spent 15 years as a wood worker and general contractor before joining the stained glass industry. He first apprenticed in a small stained glass studio and quickly earned the position of VP. He came to Associated Crafts five years ago, bringing extensive onsite restoration skills, training techniques as well as a dedication to excellence.
Fundraising

Over the generations, people have built churches with elaborate architecture featuring beautiful stained glass windows. As with all buildings, time takes its toll on these grand structures and they require constant maintenance to keep up their splendor.

Unfortunately, the populations that support these houses of worship are also changing and often the support needed is not in place to complete the required maintenance. Churches often find they have to be creative in order to meet their financial needs.

We would like to share a few approaches some others have taken to raise money to facilitate their stained glass restoration projects.

Window by window

Several churches have taken the window-by-window approach. They take the overall cost of a project and break it down by square foot per window to establish a cost of repair for each window. Once this cost is established, the church then offers each window to its members.

An interested member or group of members then pledges the amount to cover the work of that particular window. Often the church will present the donor or group of donors with a plaque acknowledging their gift.

There are also instances in which the church will exaggerate these costs per window to achieve more donations to apply to less glamorous projects such as roofing or air conditioning work. This approach has been very successful in raising money for many different maintenance projects by using the visual appeal of stained glass.

As one priest once stated, “I have no problem raising money to take care of our stained glass. However, raising money for fixing the plumbing is almost impossible. This approach alleviated this problem.”

Fundraising specialty items

Some churches have worked with specialty companies to purchase miscellaneous items in bulk, such as sun catchers at a discounted price. The members then offer these items to the public at a retail price, taking the proceeds for use toward the project.
Staging

Another approach is the staging method. In this instance, a church selects a contractor and requests his bid to be broken down to address each specific area. The church then performs each section as they acquire the funds. This works well for active churches that receive regular pledge income. The only disadvantage generally is it costs more to have a company do the work in different stages. There is no quantity discount; often the company has to contend with extra set up and mobilization costs.

Bank and specialty loans

In some situations, churches have taken out loans to facilitate the completion of projects with the knowledge that this will inspire growth and support from their members to rise up and pay off these loans. We have seen many churches take this approach and often when projects are completed, the members are inspired and the church receives increased monthly pledges to sanctify the loans.

Some churches have gone as far as to ask their members to commit to additional monthly payments. There has also been a growing trend of specialty lenders that specifically fund churches. This has received both positive and negative results. It is best to talk to several lenders and read the fine print. Also, be sure there are no pre-payment penalties. Some companies, such as Associated Crafts, may offer some in-house financing. Generally, this is a great option but be sure you understand the terms and it is something your membership can support.

State, Federal, and Private Historical Grants

Years ago, for the many churches that would solicit this type of help, it unfortunately rarely panned out.

However, in the last five or six years, more and more of these grants have come to fruition for several historic churches. Generally, it requires a great deal of work for the applicant and he or she must follow stringent guidelines.

The agency is usually concerned that the church is requesting a project that is to help the building maintain its historical significance or preserve. It is very important that you select a quality company that is versed in historic restoration and preservation. The correct studio can be very advantageous in helping a church secure a grant and choosing the incorrect studio can make it impossible.

Select a studio whose staff is prepared to assist you in your fundraising efforts.
Do- It-Yourself Survey

Unfortunately, for many stained glass studios, including ours, they receive frantic calls from churches whose windows are at critical stages of deterioration and the church has avoided or not understood the problems that occurred until it reached catastrophic levels.

Associated Crafts has designed the following guide for you to view and observe each of your stained glass windows. We have provided you with a format that you can submit to Associated Crafts for review. When completed, this survey can also serve as documentation of each window, which can be very helpful with insurance claims or reproduction in the case of loss.

Before starting, first gather the following items:

25’ tape measure  
Paper and pencil  
Digital camera  
Note cards

Observe

Start at the first window. On a piece of paper, number the window (important), give a brief description and measure the window, rounding off to the nearest half foot.

Interior observations:

- How many pieces of broken out glass are there?  
- Do you see any bowed, sagged or bulged areas?  
- Do you see any light leaks and if so, how many?  
- Do you see any evidence of leakage?  
- Are there any loose or missing brace bars?  
- Are there any brace bars missing?

Exterior observations:

- Is the window covered?  
- Is the frame wood, steel, aluminum or stone?  
- Is the protective covering vented?  
- Is the window in need of painting?  
- Do you see any rotten wood? Is the protective covering clear?  
- Is the protective covering broken?  
- Is there any evidence of the protective covering leaking?
Measure

Round off all measurements to the nearest half-foot. For example, wood that is 32” should be rounded up to three feet. Write the width measurement followed by the height measurement. On large windows, you can measure half the distance and then double it.

Provide a description

You need to identify each window visually. You can use the name of the scene (i.e. Gethsemane or Communion) or the name found in a memorial plate (i.e.: In Honor of John Smith). Another option is to use the area of the church to identify a window (i.e. large balcony window and large altar window).

Take photographs

It is best to take simple digital photos. For interior photos, do not use a flash.

• Take your note card and observe window number one.
• Write the number 1 on the note card, place the card in the right hand corner of the window and take the picture.
• Once you take the photo, review it to make sure it is clear.
• Be sure the index card with the number can be seen clearly in the photo.
• Take exterior photos of each window using the note cards (do this the same way you did for the interior photos).
• For inaccessible windows, hold the appropriate card number in front of you so you can see the card number and window in the picture.

Repeat the above steps for each window, i.e. window two would be number 2 on the card.

Submit documentation

The next page is a form for you to fill out that will provide the proper format for submission to Associated Crafts. We are in the process of providing this form online and eventually you will be able to submit it directly through our Web site. You can either scan or fax the document to (888)801-9551 and e-mail the photographs to info@restoreglass.com. Associated Crafts will prepare and appraise the value of your stained glass windows and pictures on a CD and then return the appraisal and CD back to you. Make sure you keep the CD and appraisal in a safe place for future reference.
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<thead>
<tr>
<th>Window No.</th>
<th>Window Description</th>
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**STAINED GLASS ASSESSMENT FORM**

**Interior Observations**
- Bulging
  - Yes
  - No
- Broken Glass
  - Yes
  - No
- Loose Braces
  - Yes
  - No
- Light Leaks
  - Yes
  - No

**Exterior Observations**
- Protective Covering
  - Yes
  - No
- Evidence of leakage
  - Yes
  - No
- Window Setting
  - Wood
  - Aluminum
  - Steel
  - Stone
- Painting
  - Yes
  - No
- Frame Damage
  - Yes
  - No

**Comments**

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<thead>
<tr>
<th>Window No.</th>
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<tbody>
<tr>
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<td>Good Shepherd</td>
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**Exterior Observations**

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<td>☑ yes</td>
<td>☑ wood</td>
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**Comments**

Sill is rotten

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**Interior Observations**

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**Comments**

Looks in good condition but storm covering is cloudy

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**Interior Observations**

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**Comments**


Protecting Your Stained Glass Asset

For many church members, there is an emotional attachment to the stained glass windows in their places of worship. Members often pass on stories and memories related to the stained glass. Some might remember its gleaming light the day they got married or the inspiration they got from admiring its scene. However, few realize that for many churches, the stained glass is their largest material asset as well as part of their heritage.

Appraisals and insurance

Like individuals, many churches rely on their insurance agent to guide them on their coverage. For some, this approach is found to be devastating. After a catastrophic event, some stained glass studios have assisted in the repair and heard complaints about the coverage that was in place.

Nothing is more disheartening than to see a church suffer a loss and then find out their coverage is inadequate. To prevent this from happening to your church, it is best to get a comprehensive appraisal by a qualified stained glass studio. Many studios or consultants charge a nominal fee for this service. Associated Crafts generally will provide this service free with assistance of the church.

Once the appraisal is complete, you should review your coverage with your insurance provider to verify the windows are covered.

Documentation

The next recommendation is to do a simple documentation of your stained glass. Take an overall photo of each window and then a close up of each section to show the detail. It is also important to measure the window opening, rounding off to the nearest half foot. In many cases of catastrophic loss, windows or parts of windows are destroyed. This information can be useful in their restoration. It would be a good idea to store this information in multiple areas or a safe deposit box.

Maintenance

Some studios have restored projects left undone for years simply because the members did not know where to go for help. It is best select a quality studio to provide you with a condition report.

Most studios will provide this report free of charge. If possible, have several companies prepare the report for you so that you will have other opinions and perspectives on your windows.

For those who want to know if they should add protective covering, we at Associated Crafts always says yes! In most cases, the protected windows are in much better shape then the unprotected windows.
The covering protects the windows from the elements as well as vandalism. Remember to let your insurance company know that your windows are protected and be sure to request a discount on your premiums. Please read the chapter on Protective Covering for further understanding.

Assess each window so that you can catch small problems before they become large ones. Please share this information with as many as possible. The more people aware and educated about this craft, the better their stained glass windows will be protected and preserved.
Selecting a Studio

Everyone wants to know the magical formula to select the correct stained glass studio to complete his or her project. While a studio cannot do this for you, there are ways to sort through the information and make a quality selection.

A common question that the clergy will ask a stained glass studio is “How do I get an apples to apples bid?” Unlike many industries, stained glass is extremely specialized. Often, others do not know the terms and jargon outside the industry. This is what inspired Associated Crafts to write this helpful manual.

The other aspect of this industry is the lack of regulation by the industry. The industry consists of many smaller companies started by craftsmen and artists who took a hobby and changed it into a career. This is certainly admirable but these individuals often do not have the knowledge of all the facets of the business or of stained glass. Professional studios often compete with specifications written by some completely incompetent companies. This is why we diligently work to educate our clients. Often a simple understanding of terms and jargon will allow the church to see the correct scope of work.

Some studios specialize in a certain type of work. For example, a studio that creates a number of new windows will often bid restoration projects as a complete relead. This scope of work fits into their business operations easier. An on-site restoration project may be impossible since they do not have the expertise or the manpower to complete the work that may best serve the client. A studio that does not do new windows may not recommend releading when needed as it can not be easily completed at their facilities.

Both studios make a strong case for their approach but we are left with a confused committee.

The following is a guide to help you ultimately find a studio that passes these guidelines and most importantly, is available and willing to mentor you through this learning curve.

1) Have they been in business more than five years?

If they have, this suggests that they are doing something right to maintain operations as with most businesses. You can verify this information by using state records or checking Dunn & Bradstreet. Remember that sometimes people report information incorrectly, so be very direct and ask the potential studio to explain any items you are uncomfortable with. Be aware that some companies have used variations of names to avoid creditors.

2) Ask the studio to send references over a five-year period of business.

Obviously, companies generally provide only positive references, so it is important to request at least 10 references and check state Web sites regarding contracting in the states they are licensed. Personally pick five references.
randomly and contact these customers. We suggest you contact the most recent church committees, as it may be hard to talk with someone familiar with the project from several years ago. Ask the contact the following questions:

a) Did the company complete the job on time?
b) Did the company and job supervisor communicate with you during the project?
c) Did the crew clean up well and work around your services, etc.?
d) Did the company complete the contract in a skillful manner?
e) Overall, were you satisfied with the project?
f) What type of work did they do? (repair, relead, covering, etc)

From their answers, you should get some idea of consistency and those consistencies should give you an idea of the company’s work and operations.

Stained glass restoration normally does not require state licensing but some states do require certain licensing in order to operate in their state.

It is important that you ask each reference what type of work was performed. This assures that the studio has the skills to provide the church with an unbiased scope of work based on what the church needs instead of what the studio needs to sell.

Churches often are confused by the terminology different studios use. Please ask for an explanation of each specification so you can fully understand and correctly compare each studio.

As with most purchases, you want to have a personal comfort level with the staff of that studio. They should be knowledgeable, eager to help and patient with your questions. Good communication is vital to the success of any project.

**Contract**

Be sure each proposal or contract clearly itemizes each service per window. All materials should be specified and spec sheets provided as available. It is also a good idea to request solid deadlines of completion. Make sure the payment terms are detailed and specific and should never be paid ahead! Always be sure each stage is fully completed and you are satisfied before authorizing payment.

**Guarantee**

All consumers are looking for a solution to their problem and want that solution guaranteed for as long as possible. In the stained glass industry, guarantees can range from zero to 20 years and can cover the entire project or just the workmanship.

In some cases, smaller studios make guarantees that they cannot fulfill because they are not around long enough to honor their guarantee. The best guarantee is to have the work
completed correctly in the first place. Make sure the proper products are used and that the company performed all work in a quality manner. There is little need for a guarantee if the project they completed is done correctly. This material and installation really does not have a high failure rate.

Many churches often assume that any leakage problems are a result of the stained glass. Try to avoid having false hopes, as even uncovered stained glass windows are very rarely the cause of water infiltration into a building. Unfortunately, many contractors take the easy way out and blame it on the windows instead of actually water testing to determine the source of leakage. This situation often leaves church members disappointed to find they spent money to recover the windows to prevent the leakage only to find the source of the leak was actually something else.

In summary, a five to 10 year guarantee against any defective workmanship is proper. A church can also protect itself by inspecting stages of the project and prior to final payment. Most importantly, do not fail to check out the company you contract with. Their record and references will speak volumes about them.

As a pastor or committee member, others have put their confidence in you and in your abilities and stewardship. So honor their confidence in you and do your homework! Remember you get what you pay for and you pay for what you get. Your valuable stained glass windows are no exception!
Repair and Restoration (releading)

The actual work to stained glass is broken down into two categories: repair and restoration (releading). Often a combination of the two may be required.

**Repair:**

Refers to onsite repair work such as broken glass replacement, bulge reduction, and securing of loose braces, etc.

**Restoration:**

Refers to the process of releading. Each window is moved and taken apart piece by piece and then reassembled using new lead and bracing. This process is usually done after the windows have been transported to the studio.

Deciding which scope of repair work to do on the stained glass windows can be a confusing decision for any committee. This information should assist you in making the correct selection for your particular church.

Over the past 20 years, there has been an abundance of self-proclaimed experts promoting highly sophisticated restoration to stained glass windows. These expert consultants have marketed well and raised the awareness of the importance of quality restoration, especially on great works of art like those by Tiffany and Lafarge. Unfortunately, they have not promoted a complete look at restoration and one that would be applicable for most situations presented in America’s churches today.

A church should hire a studio that can educate them on the pros and cons of each scope of work for their church. With this information and knowing their personal obstacles such as growth, budget or relocation, they can make a responsible decision.

Many bidders do not have the rounded skill set to offer their clients a choice. They simply skew their view to reflect what they have to sell instead of what the church needs. For example, Associated Crafts has called on a church that had 20-year-old stained glass windows that a previous competitor said needed a complete relead and diligently tried to convince the church they needed it. Fortunately, with a little direction, common sense prevailed and the church maintained and protected these windows without having to undertake a huge fund drive. In this case, the competitor did not sell covering and on-site repairs that the church needed. Instead of withdrawing from the project, they tried to sell the church something they did not need.

Under normal conditions, you should have your stained glass windows reled when they reach around 100 years old. However, this is only a rule of thumb and circumstances could change this number. To determine if a panel is in need of relead, you can make a few observations. Lead, like all metal, will oxidize and appear to have a
white powdery look. If this oxidation is constant and heavy, the deterioration might be
great.

The joints where lead comes together on each work is finished and secured by soldering.
Due to solder and lead moving at a different rate, there is fatigue that becomes evident by
tearing of the lead next to the soldered areas. If you find this to be a majority situation,
you might consider releading.

Another test is to scratch the lead, which should be soft and pliable. However, if it tears,
it has probably gone through its life cycle. Obviously, the best way to determine the need
for releading is to hire a qualified professional who can perform both methods of testing
and inspect the stained glass on a regular basis. We at Associated Crafts will explain our
findings and answer your questions.

In years gone by, there were several companies that serviced churches all over, doing on-
site repairs and protective covering installation. These companies had no regard to
damages that came from their haphazard skills. On-site restoration as a whole, took a big
hit from these companies due to problems discovered 20 years later due to poor
craftsmanship and many earned a bad reputation. Quality companies, such as Associated
Crafts, with skilled craftsmen use successful techniques that properly restore these
historic pieces.

As with releading, it is important to find a studio that is experienced with both methods to
help determine the best method for your church.

The following is a list of some common repairs done on-site. Also listed are important
points that should help you recognize a knowledgeable stained glass consultant from one
who is not.

**Broken or cracked glass**

To keep the originality intact of a historic window, we recommend replacing only the
broken but not cracked glass. You should view replacement as a last resort. Cracked
pieces that are not missing areas are to be either supported by Dutchman, sealed with
epoxy, or edge glued (in releading). These repairs will support and secure the original
piece.

Perfect matching of replacement pieces can be difficult and not always possible.
However, a knowledgeable studio can acquire a large spectrum of glass from
manufacturers or inventories. Be sure to insist your craftsmen provide you with a close
match. Do not settle for something easy or noticeably different. We can use little
techniques to provide swatches that blend to give you a quality restoration. Test the
craftsmen and ask them what they can do if an exact match is not possible.
Bulging

Another common problem is the bowing or sagging of an area of stained glass. Due to years of exposure, gravity, heat build up, settling and improper bracing, bulging occurs in most stained glass.

To correct this problem, the affected panel needs to be removed from the frame and carefully placed flat on the table. Once the panel is flat, broken joints will need to be soldered. The original bracing may need to be re-secured as well as additional bracing to support the weakened area. If new bracing is installed, it is important that it be the same type as the original bracing and attached in the same method. The same is true for the re-attachment of existing braces. They should use the same method. For restoration purposes, it is important that everything is as original as possible.

Re-securing loose braces

Braces are mostly flat, rectangular or round. We solder the braces directly to the panel or wire them to the panel using copper ties. It is important that the re-securing is achieved using the original method used on the stained glass window.

Adjusting existing ventilators

Existing ventilators that are inoperable or whose operation is rough can be adjusted to operate more freely. Craftsmen will improve the ventilators operation by mechanical adjustment, light grinding or lubrication. Excessive deterioration or warping may make fluid operation impossible. We will make the double-hung ventilators operational by sanding the sash perimeter, reattaching sash weights or replacing sash ropes or chains.

Cleaning the interior of stained glass

Stained glass gets dirty from years of exposure to dust, pollution and candles. You can clean these windows but there is the need for some precaution especially around painted pieces that may not be stable. You can clean the interior surface of the stained glass window by spraying a special liquid cleaning solution on the stained glass window and then wiping the solution off with a soft cloth. Although craftsmen are very thorough in their cleaning procedures, it is impossible to remove heavy lime deposits or paint over spray with this cleaning method. A craftsman can provide other cleaning methods to address these concerns; however, this is usually bid differently. Windows with painted glass need to be tested for stability. The craftsman should be able to determine the correct cleaning method to assure quality results as well as preserving the window.

Recementing

Years of exposure to elements and heat will dry and reduce the cement compound in a stained glass window. It is important to rejuvenate this cement on the exterior, strengthen and waterproof the window. To perform this service on the interior is too messy.
The exterior surface of the stained glass window will have a specially formulated cement compound brushed underneath the lead flanges. Recementing will strengthen and weatherproof the window by replacing the original cement compound, which has loosened or fallen out over the years. This process also does an excellent job cleaning the window.

Be sure that the studio explains each service in detail in your contract and that your studio consultant can answer your question regarding any services to be performed.

**Restoration or Releading**

*Releading overview*

A craftsman will carefully take a rubbing of the panel(s) to be reheaded. Once the rubbing is complete, the panel(s) will be disassembled piece-by-piece and properly cleaned. Craftsmen will then reassemble the stained glass panel using all new lead came and solder. Each panel is cemented on both sides and a proper bracing system is installed before reinstallation. Then they reinstall and properly secure the reheaded panels. The Craftsman then applies a flexible sealant, which allows each panel to expand and contract without any hindrance thus preventing any future damage to the stained glass.

![Taking a rubbing](image)

As you can see from the overview of this service, it is very detailed and labor intensive.
This service, which is more expensive than on-site repairs, should leave you with a new window that has all antique glass.

With the lack of studios that possess the ability to do proper on-site repairs, this method is often way over prescribed. For some windows that were releded by studios not familiar with restoration, they left behind a devalued and ruined set of historic windows.

It is most important that the commissioned studio document the windows so they can be recreated using as much original glass as possible as well as the original lead sizes and profiles.

Again, challenge your prospective studio to state a case for both repair and releading and walk you through the steps and provide the pros and cons of each solution.

Removing Panel to Be Releaded
Releading the window

Soldering the new lead came
Soldering Wire Ties
Recementing
Frame Repair and Repainting

One of the most requested services is the repair and maintenance of stained glass frames or millwork. This is a very important service! Frequently studios are referring to wood but this also relates to steel. Often, companies provide this service as a necessary evil and do not put the effort into this, as they should. Without a quality repair, there cannot be a quality paint job. Without a quality paint job, you cannot have a quality window project. Keep in mind that this is a very visible portion of the overall stained glass project. Make sure your studio is skilled in this aspect of the project.

Preparation

The most important aspects of the project are material and preparations. Use only high-quality paints and choose latex because of its quality coverage and durability.

Most often preparations are simply scraping all loose areas of existing paint. Seal all holes and cracks with long-lasting acrylic latex. The first coat should be a stain-killing primer such as Bin or Kilz brands. Two finish coats of high-quality paint should follow the primer. It is important to use quality brands such as Sherwin Williams or Pratt and Lambert. There is no such a thing as a bargain when it comes to paint costs.

It is important to apply painting on the frame and not the surrounding substrate or the stained glass. This is the difference between an amateur application and that of a professional.

Steel frames

Use rust inhibitive primers and paints and be sure to prepare the surface properly, as suggested by the product’s manufacturer.

Primer option of Clear Penetrating epoxy Sealer (CPES) for wood

CPES is an epoxy sealer used on rotting wood, impregnating the wood rather than coating it, arresting fungi and bacteria growth. CPES creates a stronger yet flexible piece of wood that fungi will not penetrate. This is often a good option for heavily weathered frames and you would use this INSTEAD of the Kilz brand primer.

Millwork repair

A craftsman should repair or replace the damaged millwork if contracted. The craftsmen will remove all or part of the damaged millwork and blend new material or similar type and profile into the damaged areas. The repair piece will be secured, puttied and finished. If the Millwork is beyond the contracted scope of work, the studio should inform the church. Often Associated Crafts will make an allowance for millwork repair since the actual fair bid cannot be determined until we access the windows.
In many cases when a company bids for millwork prior to access, they assume more work will be needed and usually end up over charging the church. However, bids taken after access tend to be more accurate and fair. Sometimes a company will quote a pre-determined time and material rate, including it in the contract, to handle this extra work.

Paint the prepared frame with tinted primer
New Frames and Ventilators

New window clients usually request the installation of new frames and ventilators, but studios also receive requests for these services in some remodels.

Most frequently, studios construct new frames out of aluminum. They often use aluminum since it is maintenance free and generally less expensive than using wood or steel.

The following is a list and description of some commonly used products within the stained glass industry:

**Aluminum ventilators**

This is a special custom-fit ventilation unit used to replace existing vents or can be used for new construction to provide ventilation. The new ventilators provide a weatherproof seal and fluid operation. They also use these vents in some repair projects when a church needs to add ventilation or replace a damaged ventilator. The one drawback to aluminum vents is that they are expensive and often require the studio to cut down the existing windows to fit this large profile. This is important in cases where there are high-quality historic windows. Studios use the new ventilators in both single and double-glazed profiles.

**Steel ventilators**

Studios generally used these ventilators in restoration projects since most windows that have ventilators use steel. This allows the studio to replace a deteriorated vent with one of a similar profile to restore the window to its original condition.

**New aluminum frames**

Each new frame is custom fit and made of high-quality aluminum. The new frames are secured with clipped or welded joints. Each frame provides an excellent glazing situation with snap-on beds to secure each glazing material and a dead air space to allow proper insulation. Frames come in four standard colors: white, bronze, aluminum and limestone. The standard frame finish is baked-on enamel, which will not peel or fade. Once installed, they will be virtually maintenance free. Associated Crafts uses three types of frames:

*Double-glazed:* This frame is designed to house both the stained glass as well as the protective covering.

*Single glazed:* This frame holds only one glazing material.

*Thermos barrier:* These frames will hold both the stained glass as well as the protective
covering. This framing has a built-in plastic barrier, which slows down the transfer of heat or cold to the inside of the frame, virtually eliminating condensation on the interior of the frame.

**Wood frame**

On rare occasions, clients ask or we propose to replace entire frames. Generally, clients request this in restoration projects so that the studio can match the historical framing. Studios also use them in high-end new installations, when the church wants to use wood to create a particular look.

**Steel frame**

This is used for restoration projects to keep the frame original.

Aluminum frame with ventilation in the cavity and ¼” acrylic covering
New Windows

There are a few different types of art glass used in churches today.

Faceted Glass:

Consists of approximately one-inch thick dalles of glass cut by hand and broken over an anvil. These pieces of glass are placed in a pattern on a table and a form is set around the perimeter of the panel. Sandy material called granules, are sprinkled between the pieces of glass. The next step is to pour a two-part epoxy resin between the pieces of glass. We then sprinkle another layer of granules over the epoxy resin. Once the epoxy sets, it results in a very strong load-bearing panel. Studios mainly use faceted glass for less complex designs. Faceted glass windows have a higher material costs but require significantly less labor, often making it a more cost effective solution. Faceted glass does not require a protective covering when installed and requires very little maintenance.

Leaded Stained Glass:

Windows with little or no painted work are another type of stained glass art that studios commonly use. Leaded glass with little painted work is less labor intensive than fully hand painted stained glass windows. A Studio can design this medium to match most budgets and tastes. (See Step by step – leaded and painted construction)

Fully Hand Painted Stained Glass Windows:

These are constructed the same as all leaded glass except that an artist will hand paint each piece of stained glass then fire the piece in a kiln to adhere the paint to the glass. Painting allows the artist to create levels of detail not possible with the other new window methods. This process is very time consuming; requires a very talented artist; and is a more costly method then the others.

Whether you are constructing a new building or renovating an old one, keeping within a budget is always a concern. It is important to select a stained glass studio that has the versatility to present a variety of designs that are fitting to the church’s architecture and symbolic desires. Correctly designed windows can be achieved using any of the different types of stained glass available and your church should be given examples of each.

Many quality studios will present prior examples of work that may not be specific to your project. They will usually ask that you hire their company first before providing specific renderings of your church. It is up to the church committee to decide after interviews and reviewing prior examples as well as conducting background checks, if the studios they are considering are competent and easy to work with.

Once they select the studio they want to work with, the studios’ artist will provide the church with specific renderings for their approval. It is important for the committee to
review these renderings and only accept them if they are completely satisfied. This art form makes a large impact on any worship space. Take the time to be sure your selection is something that will satisfy you and your committee for generations to come. In non-painted windows, you should receive a small example of the glass to be used.

The executing artist is gifted and experienced and you need to allow them to complete the creation with some freedom of selection. Too often a great artist was handicapped due to the many influences by the committee, which can often hamper the overall project.

It is important to consider a stained glass studio that is versed in all areas of stained glass. For example, a stained glass studio that performs many restoration projects has great insight to the construction, bracing and installation of new windows. Through restoration experience, they have learned what works best long-term and what does not. Unfortunately, some beautiful new window creations that have been braced and installed improperly caused expensive repairs for the church long before it is appropriate.

**Step by step – leaded and painted construction**

The stained glass studio and its staff will meet with the committee to discuss the theme, design and coloring schemes of their client’s project. The studios artist will develop a thumbnail sketch or rendering or each window. The studio presents this rendering to the committee for their approval. Once approved, the studio turns the rendering into a full-scale cartoon. The cartoon is a full-size drawing depicting every piece of glass and lead came they will use. This drawing will be the exact size of the window and they should present it to the church committee for their review. This cartoon will not represent color but will show proportion of the design. This is a good checking point for the church prior to construction.

After the church approves the full-scale rendering, the artist will select the glass the studio will use. The artist then codes each piece of glass selected onto the cartoon. The stained glass craftsmen will then cut each type of glass to match the cartoon. If the windows need painted, they will give the painted pieces back to the artist, who then hand paints each piece and then fires it in a kiln so the paint will permanently adhere to the stained glass. The painted pieces are then returned to the craftsmen who will then assemble the window using lead came to custom build the window. When it is complete, the craftsmen will solder each lead joint thus making the stained glass panel one solid piece. They then send the panel to an area for cementing.

The craftsmen then brushes specially formulated cement compound over the panel working it under the flanges of the lead came. Next, they clean the excess cement off leaving cement under the lead came. This cement compound will weatherproof and help strengthen the stained glass window. The panel then dries flat for 48 hours while the
They brace the panel on the interior surface to add extra support. This bracing system is designed in place according to the stained glass craftsmen who recognizes areas of weakness in the design. It is important that they add braces to provide maximum support with minimum intervention to the stained glass artwork.

Once they complete the stained glass panels, they transport the windows to the stained glass job site for installation into the new or existing frames. We find our clients are served better if we provide their general contractor with framing specifications and installation requirements. This approach avoids unnecessary costs and scheduling problems for the church and general contractor. In some remolding situations, this approach is ineffective. In others, the stained glass studio should be responsible for the modification of the existing frames to accept the new stained glass panels correctly. The church needs to review the framing fully with their stained glass studio prior to making this decision.

The stained glass windows should be divided into panels of approximately 12 square feet. In some installations, this might not be possible. Each panel is installed so it supports its own weight and the bracing is adequate for the size of the panel.

It is best that the studio installs the stained glass after the remodel is complete. It is best to install the stained glass windows prior to the installation of the carpet, flooring and pews. If not, others working in the building could potentially break or damage the windows.

When installing new panels into a new double-glazed frame, the studio should shimmy the panels with setting blocks then secure with snap-on aluminum beads. If the exterior of the window has protective covering, then the stained glass is not sealed or caulked into place. We like to use black foam weather-stripping, which provides a clean perimeter line.
and holds the panel vertically into the aluminum channel against the backstop. This is the best type of installation, when applicable, because it allows others to remove the panels for easy cleaning or maintenance thus reducing potential damage to them.

If the windows do not have an exterior protective covering, it is necessary to secure the panel with glazing tacks or screws and stops. Once secured, you should seal a panel on the exterior perimeter and interior perimeter with a compatible caulk. For some clients, studios used incompatible silicones in their installations that chemically reacted and caused lead deterioration over a few years. We do not recommend a non-flexible caulking such as dap glazing, as this will not allow any movement of the stained glass panel thus creating the potential for premature bulging.

On a new installation that has protective covering, we recommend venting the windows from the exterior. If it is not possible to vent from the exterior, then you need to vent the interior. If the protective covering is insulation glass with a thermo broke frame, no venting is necessary.

Below are examples of stained glass designs- styles of windows.

![Faceted with symbol](image-url)
Hand Painted Simple background with Hand Painted Figure
Example of a Simple Leaded Design with Painted Symbol
Some Examples of Commonly Used Symbols

Simon Peter  
James the Elder  
John  

Andrew  
Phillip  
James the Younger
Matthew
Bartholomew
Thomas

Symbol for Matthew
Symbol for Mark
Symbol for Luke

Symbol for John
The Lamb of God
The Robe and the Stones
Serpent being thrown Into the fire

Into the fire
New Window Information Request Form

Church Name: __________________ Phone:__________ Church Web site:________________________

Contact Name: _________________ Phone:__________ Contact E-mail:_______________________

Address: ______________________ City: __________ State: _____ Zip: ___________

Total Number of Windows:____________________

Approx. Size:____ Width _____Height    Shape:____________________

Quaintly of this shape and size:____________________

Approx. Size:____ Width _____Height    Shape:____________________

Quaintly of this shape and size:____________________

Approx. Size:____ Width _____Height    Shape:____________________

Quaintly of this shape and size:____________________

Approx. Size:____ Width _____Height    Shape:____________________

Quaintly of this shape and size:____________________

What Style of Art Work: _____ Symbols _____ Figures _____Abstract______ Pattern

What Style of Design:______ Traditional _____Contemporary_______ Other

What Colors are you interested in:_______________________________________________

Do you want the new windows installed:_________________________________________

Please submit this information and Associated Crafts staff of stained glass experts will prepare you a quotation for your new stained glass windows. This submission in no way obligates you.

Submit by E-mail: info@restoreglass.com fax: 888-801-9551
By Mail: 2487 S. Gilbert Rd. Suite 106-451, Gilbert, AZ 85295
Protective Covering

Just think how wonderful it would be once your stained glass windows were installed or maintained that they simply stayed in pristine condition. That would mean little heat or air conditioning loss through them, no vandalism, or element damage. Unfortunately, that is not going to happen and that is why you need to preserve them by properly installing protective glazing. PROPERLY is the key word. Improper installation can create more damage than protection.

Proper installation includes sufficient dead air space, venting, choice of material, frame and millwork repair, type and setting of divider bars, as well as application of the correct type of sealant.

Things to avoid

Unfortunately, regular glazing company installers do not understand the installation from the perspective of stained glass, which is our ultimate goal. A glass house rarely performs a proper installation versus a stained glass studio. The pricing may be appealing but remember you get what you pay for.

Sealant:

The sealant must be a non-acidic cure or it will not react with the lead correctly and will quickly deteriorate it. Sealants must be able to adhere to a variety of surfaces, including metal, glass, plastic and masonry. For years, companies were sealing plastics with straight silicone, not realizing that within a year, the seal would break allowing water to penetrate the covering systems. This leakage continued for years creating severe damage to the windows and their frames.

Non-vented installation:

Some in the industry today advocate not using any venting in their protective covering installations. However, the majority of studios recommend venting.

The only non-vented installation we considered should be on new construction only. If there were a thermo barrier frame and a seal protective unit of insulated glass, do not vent that installation. Otherwise, venting is best.

Venting certainly decreases heat build up and promotes airflow that helps dry and reduce any condensation. With quality vents and innovative installation techniques, the installation is attractive. There are few drawbacks to venting; however, heat build-up and condensation (leakage) can cause damage to un-vented windows.

There are three different choices for venting:
1) Most popular - the glazing material has strategically placed holes to insert vent plugs.
2) Vent through the aluminum framing itself providing the client with a discreet installation.
3) Vented framing is another option and recently, some have introduced a couple versions into the market. One is effective but large and not pleasant to look at and the other is attractive but not as effective.

Until a studio comes up with a better design, it is best to choose the first or second method. As a rule of thumb, venting should be ¼ square of space per every one square foot of covering and they should always install at the bottom and top to create airflow from top to bottom. The venting portion of a protective glazing system is important so be sure to address all areas.

Bending

The main draw back to the installation of protective covering has always been its appeal. Visually many studios installations have not been attractive.

To correct this lack of appeal some in the industry have adopted the method of bending the divider bars to closely match the existing millwork. This provides the client with an improved look on the exterior of the building. I would recommend this process in all applicable application.

This is a skilled process and will help you determine a skilled studio that is competent in exterior glazing. (See Photo)
Foam Backer Rod

Sealant

Snap on Bead

1 3/16"

Non Corrosive Anchors

Foam Backer Rod

Setting Block

Tee Bar

Glazing Material

Screened Vent Plug

5/8"

Panming if used

SILL

Panning if used

NOT TO SCALE
The following is a description of protective covering items:

**Screened vent plug:** An Associated Crafts specialist will install a 3/8” breather tube or 1” screened louvers, depending on the glazing situation. This venting system is necessary to reduce heat build up and reduce potential for condensation, thus preserving the stained glass. Generally when selecting the breather tubes, they are for venting through the framing for situations where we use glass-glazing material.

**Non-corrosive anchors:** The type of existing substrate determines the type of anchoring we use. When attaching to wood, we use stainless steel wood screws. When attaching to masonry, we use treated Tap-Con® fasteners. In situations where attachment to the side of the opening is needed instead of the rear, as shown in the detail, we simply change the position of the fasteners from the back rail of the frame to the side rail of the framing.

**Sealant:** It is important to use a silicone-based, non-acidic cure caulk that will adhere to the variety of substrates such as wood, steel, glass, plastic, aluminum and masonry. Associated Crafts recommends the use of either GE Silpruf®, CRL95C or Dow Corning 795 sealant. These two sealants are the only ones we have found that meet all the necessary requirements. The sealant also comes in colors that will match the aluminum framing color.

**Backer rod:** This round foam material serves two purposes. First, it spaces the glazing material evenly against the back of the framing channel. Secondly, it helps create the perfect hourglass profile of the sealant joint. The hourglass profile maximizes the expansion and contraction movements of the sealant while allowing the strongest seal possible.

**Glazing material:** This may be one of several materials used in the industry such as XL Lexan, acrylic, flote glass, and laminated glass. Materials are generally 1/4” thick.

**Setting block:** This is a rubber block designed to hold the weight of the glazing material and prevent surface contact with the aluminum framing. This is especially important when using glass.

**Panning or cladding:** This is the process of wrapping exposed wood with flat aluminum coil stock to make the surface maintenance free. Associated Crafts specialists will custom fit and bend this material to closely match the contour of the existing millwork being covered. This process is not standard in the glazing system and only used as specified.

**T-Bar:** A T-shaped aluminum bar that divides glazing panels and transfers the weight of the panels to the jambs.

**Perimeter bar:** An F-shaped aluminum bar that is used at the perimeter of the application where it is only necessary to receive a glazing panel from one side.
**What type of protective covering?**

Associated Crafts craftsmen are skilled in installing several types of protective covering. To assist you in deciding which type of covering is best for your project, please refer to the table below or call your Associated Crafts representative.

<table>
<thead>
<tr>
<th>Description</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼” Acrylic</td>
<td>Break resistant and non-yellowing. Inexpensive.</td>
<td>Made of plastic, can scratch easily and shows deflection.</td>
</tr>
<tr>
<td>3/16” Lexan</td>
<td>Virtually unbreakable, guaranteed not to yellow for 10 years by GE. Lightweight.</td>
<td>Scratches easily and shows a lot of deflection. More expensive and will eventually yellow.</td>
</tr>
<tr>
<td>¼” Lexan</td>
<td>Virtually unbreakable, guaranteed not to yellow for 10 years by GE. Lightweight.</td>
<td>Scratches easily and shows less deflection than 3/16” Lexan. More expensive and will eventually yellow.</td>
</tr>
<tr>
<td>¼” Flote Glass</td>
<td>Washable and looks better than plastic (less deflection). Durable for a glass product.</td>
<td>Breakable, heavy and more expensive.</td>
</tr>
<tr>
<td>¼” Laminated Glass</td>
<td>Washable, looks better than plastic (less deflection). Provides a safety feature.</td>
<td>Very expensive and durability is less than flote glass. Is hard to work with.</td>
</tr>
<tr>
<td>¼” Tempered Glass</td>
<td>Provides a safety feature.</td>
<td>More expensive than other safety glass products and has no advantages. Associated Crafts does not recommend this product.</td>
</tr>
</tbody>
</table>
Glossary

**Brace Bars:** A reinforcing bar (usually flat or round in shape) that is used to support the stained glass panel thus preventing bulging. Most often these braces are installed in the interior of stained glass windows.

**Broken Painted and Stained Glass Replacement:** Maintaining the originality is a high priority but in some cases, replacing the glass is the only choice. Generally, a window needs to be replaced if a piece of glass has a hole in it, is completely broken out or has multiple cracks.

**Bulging:** A bulge is a section of the window that has become so weak that the lead and the glass bow in or out. If this condition is allowed to remain unchecked, it will break the glass and the lead joints. Eventually the whole section is in danger of falling out.

**Cartoon:** The full-scale drawing for a window or panel, from which the individual pieces of a stained-glass window are sized to cut. The cartoon is also used as a guide when the window is leaded up.

**Cement:** A special liquid compound used to weatherproof new windows. It is also used to maintain old windows (re-cementing). Also see description of Re-cementing.

**Clear Penetrating Epoxy Sealer (CPES):** An epoxy sealer that is used on rotting wood. CPES impregnates the wood rather than coating it, arresting fungi and bacteria growth. CPES creates a stronger yet flexible piece of wood that fungi will not penetrate.

**Cracked Glass (Repairing):** Maintaining the originality is an important part of a proper restoration. Glass that is stable with no missing pieces is considered cracked not broken.

**Faceted Glass:** Faceted glass windows are constructed from 1" thick slabs of stained glass called Dallies. Dallies are cut to fit the artist’s cartoon using a glasscutter, a chipping hammer and an anvil. In some cases a special saw is used on intricate cuts. After all these pieces of glass are cut a sand material called granules are sprinkled between the pieces of glass. Once the granules are spread, a liquid epoxy resin is poured between the pieces of glass. Finally, granules are spread over top of the epoxy. Given time to set up, the epoxy will harden leaving a very durable and strong art glass panel.

**Insulated Glass:** Two sheets of glass joined together by a spacer. Insulated glass acts as a barrier against internal and external noise as well as the elements.

**Laminated Glass:** A clear plastic sheet laminated between two sheets of glasses (i.e., a car windshield).

**Lead Came:** The grooved metal that surrounds each piece or glass in the window to hold the glass in place and to complement the design of the window.
**Leaded Glass:** Refers to any combination of glass design, which is fabricated using a web of lead came. Each new stained glass window is built using all new lead came. The size and type of lead came is chosen on the basis on design and structural requirements.

**Lexan (XL):** Polycarbonate sheet that is virtually unbreakable and lightweight. This product has been specially coated to avoid yellowing and is effective for high vandalism areas and for protection of valuable windows.

**Lucite (SAR):** Acrylic sheet that is coated to resist scratching.

**New Aluminum Frames:** Each new frame is custom fit and made of high quality aluminum. The new frames are secured with clipped or welded joints. Each frame provides an excellent glazing situation with snap on beds to secure each glazing material and a dead air space to allow proper insulation. Frames come in four standard colors: white, bronze, aluminum, and limestone. The standard frame finish is baked on enamel that will not peel or fade. The installation of these frames will allow you to enjoy a quality installation that will be virtually maintenance free.

Three types of frames:

*Double-glazed:* This frame is designed to house both the stained glass as well as the protective covering.

*Single-glazed:* This frame holds only one glazing material.

*Thermos Barrier:* These frames will hold both the stained glass as well as the protective covering. This framing has a built-in plastic barrier, which slows down the transfer of heat or cold to the inside of the frame, virtually eliminating condensation on the interior of the frame.

**Painted Glass:** Painted glass is stained glass painted and fired in a kiln to a temperature of 1,200 degrees so the paint can fuse into the glass.

**Panning or Cladding:** It is the process of wrapping exposed wood with flat aluminum coil stock to make one maintenance free surface.

**Perimeter Bar:** An F-shaped metal bar, usually composed of aluminum, which serves as the perimeter frame for protective glazing.

**Plate Glass:** Machine-made glass that has been ground and polished so that it is free of flaws and distortions. It is usually at least 1/4 inch thick and is used primarily for bevels, mirrors and large store windows. Until the early twentieth century, polished plate was optically much clearer than standard window glass.

**Plexiglas (1/4):** ¼-inch thick poly-acrylic glazing sheet. Plexiglas is 60 times more break-resistant than glass.
**Recentering:** The exterior surface of the stained glass window will have a specially formulated cement compound brushed underneath the lead flanges. Recentering will strengthen and weatherproof the window by replacing the original cement compound, which has loosened or fallen out over the years. This process also does an excellent job cleaning the window.

**Rendering:** A thumbnail sketch. This is usually a color sketch of the proposed window(s).

**Resecuring Loose Braces:** Loose brace bars will be resecured by either resoldering the broken joint or installing a new wire tie. Braces that are damaged or bent will be replaced with a new steel brace.

**Releading:** Craftsmen will carefully take a rubbing of the panel(s) to be releaded. Once the rubbing is complete, the panel(s) will be disassembled piece-by-piece and properly cleaned. Craftsmen will then reassemble the stained glass panel using all new lead came and solder. Each panel will be cemented on both sides and a proper bracing system installed before reinstallation. The relead panels will be reinstalled and properly secured. A flexible sealant will be applied allowing each panel to expand and contract without any hindrance thus preventing any future damage to the stained glass.

**Silpruf®:** A silicone-based caulk made by General Electric. This sealant adheres to many different surfaces making it an ideal caulk for our installation.

**Solder:** A mixture of tin and lead, which for glass workers is manufactured to melt around 400 degrees Fahrenheit. After leading up, all the came of a mosaic window are joined with a thin layer of solder (this is referred to as sweating the lead joints).

**Stained Glass:** Traditionally, leaded mosaic windows of colored glass that have also been painted and fired, with or without the additional application of silver stain. The term has come to represent any mosaic window, with or without paint or stain, composed of glass that is colored or clear.

**T-Bar:** A T-shaped steel or aluminum bar that divides the stained glass or exterior glazing panels and transfers the weight of the panels to the jambs.

**Ventilators Aluminum:** Special custom-fit ventilation unit to replace detached vents or in new construction, these provide weatherproof seal and fluid operation.

**Venting of Protective Covering:** Either 3/8” breather tube or 1” screened louver, depending on glazing situation. This venting system is necessary to reduce heat build up and reduce potential for condensation, thus preserving the stained glass windows.