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G L A S S C O M P A N Y

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February 15, 2010
1st Congregational Church
Fourth Street
Manistee, MI 49660

To Whom It May Concern:

As many stained glass windows increase in age, we find an increasing need for their repair. This can be caused by simple exposure to the elements, vandalism or many other assorted reasons. Simple oxidation may be enough to cause this need. The greater the degree of oxidation, the more brittle the channel becomes and the more likely it will crack. When this occurs, the domino effect begins, and other problems take place. Even stained glass which is well structured, reinforced, and has a strong leading concept, will require attention after a certain amount of time. This time period is normally 70 to 100 years. Inspection of leaded glass is recommended every 20 to 30 years. If we suspect windows are in need of restoration, a visual and physical inspection should be undertaken and a written report submitted.

Three indications of deterioration which result in the need for restoration are buckling, cracked solder joints and dislodging of glass from the lead channel. The first stage, buckling, is usually the result of any combination of causes; too tight a fit within the rebate, with insufficient allowances for expansion and contraction; inadequate reinforcement; a weak leading concept of, for example, repetitive parallel lines (especially true of horizontal or diagonal lines); and loss of support, either through frame deterioration or loss of contact with stress bars.

At times, minor buckling can be slowed for a short period. This is done with the addition of bars to reinforce the area. However, the bars cannot be adequately installed in a vertical position and is, at best, a stop gap procedure. As buckling continues, it is prone to loosening putty and cement. It also causes the breaking of solder joints. At this time buckling accelerates, as does the overall movement of the panel. When this occurs, attention and consideration of repair is warranted. The next stage, which proceeds total collapse, if not addressed, is the un-housing of glass. At this point, the necessity for attention is immediate.

Bulges cannot be adequately corrected with the window in place. The panel must be removed and repaired professionally.

At this point, I would like to touch on a problem many windows suffer from, in-situ (in place) repairs. This has been and most likely will continue to be a distressing problem. It occurs when repairs are made to a window while still in place. In most instances these

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repairs do considerable damage to the structural integrity of the entire window. This is due mainly to the inability to replace glass and lead to the original size and condition. The soldering and cementing required cannot be done properly in this position. The only time any professional will undertake a procedure such as this is if the institution cannot financially handle the proper repair and it is a case of protection from the elements. And the proper procedure must be accomplished with in a short period of time after the in place repair is finished.

There are two proper methods used on broken panels. One is repair and the other is restoration. Restoration differs from repair most significantly in its philosophy. Repair emphasizes maintenance to slow deterioration. Generally, aesthetic judgments are secondary in repair work. Decisions to replace broken glass or retain them are not addressed with the same discrimination. Restoration emphasizes structural stability. However, aesthetic determinations are of equal importance in the support of the original work. The more important the work, the more critical the decisions surrounding it. We restore to both preserve and maintain the finest in stained glass.

Many of the windows at 1st Congregational are in need of attention. In the following documents, I will outline the areas of concern and provide a breakdown of procedures along with an estimated cost. We would be happy to answer any questions. Thank you for your consideration.

Sincerely;



Tom Blackburn

Thursday, March 27, 2003

First Congregational Church
United Church of Christ
412 Fourth Street
Manistee, MI 49660

The following quote and evaluation is for the Church only. I have included a floor plan with all the windows labeled and numbered in their appropriate location. There are also individual window layouts with divisions and dimensions. Our quote includes removal, restoration and reinstallation. This report covers three main areas. First, we will determine the present condition of the stained glass windows. Second, provide guidelines and recommended procedures for the proper restoration of these windows. Third, develop a cost for the procedures and suggest a program to accomplish those goals suggested in the report. By prioritizing the work, the moneys available to the Church can be spent wisely. Our goal with this report is not to tell the committee what to do with your windows, but to educate the committee so they can make an informed decision regarding the welfare of the art glass.

Areas of Survey

Narthex	Windows #1 - #7
Nave	Windows #8 - #12
Transepts	Windows #13 - #17 & #18 - #22
Balcony	Window #23

Parameters of Work

Removals - Includes the tarping of the area of work, erection of scaffold or support for work surface, and cleanup of work area. Stabilizing each window section for transport to the studio. Care will be taken not to damage the building, trees, plants or property of the Church. The openings in the frames will be boarded unless there is protective glazing on the opening. All blocking materials will be securely fastened and caulked to prevent infiltration.

Restoration of Leaded Glass – Includes either full or partial re-leading of the windows involved in this project. It is important to maintain the original support system, from both a historic and aesthetic standpoint as well as for structural reasons. In some instances improvements need to be incorporated for the betterment of the system. The key to any support system is to make sure that the bars or rods engage the perimeter framework. The treatment of the broken glass is critical. There are many cracked or broken pieces of glass now in the windows. If they are simply discarded and replaced "*the best match I could find*" The artistic integrity of the windows is spoiled. The glass must be accurately matched or one of several acceptable techniques of edge gluing used. All windows involved in the restoration will be re-cemented with waterproofing putty.

The glass surfaces will be cleaned and the metal matrix buffed and polished to the original patina. Any broken kiln fired glass will be replaced with properly painted replacement pieces or properly edge glued.

Reinstall - Includes the same basic conditions as removal. The panels should be set into a flexible, polyurethane caulk system. The windows must be correctly sized to fit the openings. This means that the windows should be 1/8" to 3/16" smaller than the full opening on all sides. The surrounding property should be cleaned of all dirt and trash concerned with the installation.

General Description

First Congregational Church is fabricated of brick and stone with an underlying frame construction. The building was built was completed in 1892 and took five years to build. All of the stained glass is set into a wood sash. The stained glass windows of the church are a wonderful example of turn of the century art glass. The windows were added at different periods of time. Most of the windows were designed and built as memorials at the turn of the century.

The windows of the church are a mixture of single layer with painted detail, figures, scenes or medallions, single layer unpainted and multi-layer pictorial windows. The glass used is a wonderful rich palette of imported mouth blown antique glass, domestic opalescent and cathedral glass and cast or formed drapery glass.

The method of painting includes the use of trace and matte paints with additions of silver stain. Etched flash glass is used in many areas with paint added to enhance shading or detail. We also note the use of various enamels to induce color in other areas of the painted details.

The multilayer windows are made with opalescent glass. This style of glass is a true American Invention. Opalescent glass was first developed and patented by John Lafarge in 1879. Louis Comfort Tiffany also held several patents for opalescent glass. These two American artists were driven by their desire use glass in creating beautiful scenes without painting.

The designs and styles of the windows in the church reflect the Victorian and the Art Nouveau periods. There was a transition that took place during this time period and it is interesting to see some of the changes in theory reflected in the styles of glass.

First Congregational United Church of Christ

Window Survey

In this survey we will deal with several factors affecting the stained glass windows. We have physically and visually inspected the windows to determine their present condition. The protective glazing has been inspected and will be discussed. The proper procedures for restoring the windows are also part of our survey. The following is an explanation of the areas of inspection.

Deterioration

The general deterioration of these windows is a direct result of many conditions.

Deflection is seen as bowing, buckling and rolling of the panel surface. The severity is noted in the degree the window is out of column. Deflection is present in great many of the windows.

The reasons for this are:

1. Oxidation of the lead channel. This is caused in part by the protective glazing system.
2. There is a loss of attachment between the stress rods and the windows.
3. The panels fitting too tightly into its frame. This inhibits the ability of the panel to expand and contract within a flat plane.
4. The use of a hard setting sealant. This inhibits the ability of the panel to expand within a flat plane.
5. The use of lead came that has a flat profile. They have thin flanges and are more subject to bending.
6. The use of a soft alloy to fabricate the lead. These are subject to more bending than those that contain higher amounts of tin and antimony.

Broken Glass. There are numerous pieces of cracked and broken glass throughout the windows. They are caused by:

1. Deflection. The window bends beyond the strength of the glass.
2. Impact. This can be as simple as poor methods for opening and closing ventilators, natural elements or vandalism over the years.

Dirt. There is a great accumulation of dirt on all surfaces of the glass. This is a combination of soot from the furnace, candle smoke and other air borne contaminants. The dirt mixes with the petrochemical components and forms varnish like substances that adhere to the glass. These substances can absorb moisture from the air. Local concentrations of moisture on the windows can result in deterioration of paint or metal.

The negative effects of dirt are obvious. The removal of this dirt will result in a brighter window.

Metal Fatigue. Leaded glass windows are designed to move when under the stress of wind, expansion and contraction. The constant flexing eventually results in failure after long periods of time. The evidence of this failure can be seen in the lead came. This is noted by broken solder joints and cracking or fissures in the lead surface. The broken solder joints can be repaired. The more serious are the cracks. They are evidence that the came may need to be replaced. Broken solder joints and cracks are seen throughout the windows of the church.

Ill-Advised Prior Repairs. This damage is the result of either ill-advised or poorly done work. I doubt that this damage was consciously done, but rather it is the result of the limited knowledge and in-experience of the repair people. The skills and knowledge to execute the proper repairs is

not easily found. They are somewhat different than those used in the construction of new leaded windows. It is critical that a professional be hired to undertake any future repairs.

One of the most serious problem is the method and installation of the protective glazing system. This has increased the deterioration of the windows.

The support rods appear to be losing their attachment to the surrounding framework. The wires holding the window to rods are also very weak. This is due to simple oxidation of the copper wire stock. Some flat bars were added at a later date. These bars lack the proper attachment to the surrounding framework and lead channel.

Protective Glazing. The most destructive force acting on the windows is the heat gain from the sun. The present protective system is installed improperly. The glazing is not vented. Therefore the air column that is trapped between the protective glazing and the stained glass is being heated to between 150 and 170 degrees. This has several negative effects.

1. The heat is transferred to the window and maximizes the effects of expansion and contraction.
2. As the air column heats up, it expands, forcing the window to bow to the interior.
3. The increased temperature of the lead makes it softer and more susceptible to bending.
4. Condensation forms in the inner space. This increases the effects of oxidation and deterioration of the windows. It also deteriorated the wood sills of the frames.

First Congregational United Church of Christ

Window Survey

Specific Conditions

In this section, the specific deficiencies found during the physical inspection of the windows will be addressed. Each window will be numbered according to the attached map of the building.

NARTHEX

WINDOW #	1
TYPE	Lancet - Rectangular
LOCATION	West Elevation
SIZE	19-1/2" x 64"
DESCRIPTION	Sorenson Window - recent addition
CONDITION	The window is installed backwards in the opening. The stress bars should always be installed to the interior of the building. On the exterior they are open to the elements and source of moisture trapping. There is some broken glass but the window is solid. Unusual combination of rods and flat bars used in the stress system. Perhaps this window replaced another that was heavily deteriorated.
RECOMMENDED ACTION	The panel is solid and can wait for any repair work.

WINDOW #	2, 3, 5 & 6 and #4
TYPE	lancet with radius top
LOCATION	West Elevation
SIZE	32-3/4" x 91-7/8"

DESCRIPTION / CONDITION 2,3,5, 6 were installed in 1950 and #4 in 1901. 2,3,4,5 are a contemporary version of the original Victorian design #4 installed in the church. There is also some muted kiln fired painting done to shade the glass further in the contemporary version. Also note the modified French curves with hard details from the black tracery paint and shading. Original Victorian panels had very showy colorations and accents to represent the leaves, vines and flora. Each of the windows has a full painted medallion of symbolic nature.

Windows 2 & 3 are very firm and have little breakage of glass. The channel also has little oxidation present on the inside. I would expect that the exterior has an increased degree of oxidation due to the unventilated protective glazing. The stress bars are well attached to the window. The ends of the bars have no contact

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with the wood sash due to clipped ends. The whole installation was poorly done. Simply adding a trim piece of wood as a glass stop would have allowed the bars to be supported by the sash. This will take weight off the bottom of the window and stop any future deflection.

Windows #5 & #6 show signs of deflection. This will be a problem in the future. It also appears that all of the windows originally had rod and wire stress systems. You can see some of the holes in the side of the sash covered up. There are also signs of old solder joints where wires would have been soldered in place. It is too bad that took place. The bars are such a poor replacement due to being done in place. This was most likely done during 1987 repair work.

Window #4 is one of the early installations (1901). You can see the change in the Victorian design even at this time. The vine, leaf and flora are much more realistic. However the glass cutting is extremely difficult and craftsmanship evident. This window is done in opalescent glass with kiln fired medallion. Glass manufactures such as Kokomo and Wissmach were making glass from the 1860's and supplied most of the studios in the US. The Chicago and New York areas was a destination for studios from Europe. Great works of art glass were being made. Lafarge and Tiffany also used a great deal of the glass made by these two manufactures. This window is in poor condition. During the 1987 repair the original rod and wire system was changed for a poor flat bar system that has failed. The bars are loose and unsupported. There are many broken solder joints. The grout has dried and fallen out to the point that holes can be seen through the window. /the entire window is loose and somewhat unstable. There is also considerable glass breakage due primarily to the window moving from lack of support. The lead channel is heavily deteriorated on both the inside and most likely more so on the exterior.

The unventilated protective glazing has taken its toll on this and all the windows of the church. The condensation, heat gain and wind load have increased deterioration to the windows as well as the wood sashes.

RECOMMENDED ACTION I would consider installing wood stops to all of the windows. This will go a long ways toward stabilizing the windows for the future. I would also recommend using a flex trim from the spring line around the radius. This will save time and money. Window #4 needs to be removed, fully restored meaning re-leaded, and reinstalled. There may be wood sash damage that will be determined at the time of removal.

COST OF RESTORATION	Window #4	\$4,100.00
	Wood Stops	\$1,250.00

- Paint not included

REPLACEMENT VALUE	Window #2,3,5,6	\$6,350.00 / ea.
	Window #4	<u>\$7,875.00</u>
	Total Value	\$33,275.00

WINDOW # 7
 TYPE Lancet - Rectangular
 LOCATION NE Corner Elevation
 SIZE 25-1/2" x 48-1/4"

DESCRIPTION This is a good example of many windows from the early turn of the century. They represent the transition from Victorian Era. This is also an example of a simplified design for an area of the church that would not be demanding of a complex design. Certainly not for the more prominent areas of the church. This is unusual because it is out of character for the windows of the church. Strange to find it all by itself. I would have expected to see more of this type of design in the lower levels and perhaps the clock tower. Overall it does not seem to fit the look of the rest of the church windows.

CONDITION The window is very unstable and weak in general. There is a good deal of broken solder joints. Almost total loss of grout and heavy oxidation. The window rattles and moves to the touch. There is some glass breakage with open daylight areas. It is also installed backwards with the stress bars to the exterior.

RECOMMENDED ACTION The panel should be removed, re-leaded and re-installed properly. .

COST OF RESTORATION \$1,200.00

REPLACEMENT VALUE \$1,500.00

WINDOW # 8
 TYPE Triple Lancet – Radius Top
 LOCATION North Elevation
 SIZE 91" x 101"
 91" x 70" Dia

DESCRIPTION This is the Weaver Window originally commissioned in 1898 and installed in 1900. This is one of the windows attributed to the Tiffany Studios. I will not speculate on the design or manufacture of this window. Suffice to say that this is an extremely fine example of stained glass done at a high level of expertise. The use of multi, drapery glass, painted flesh and varying profiles and sizes of channel certainly makes a strong case for Tiffany studios if not a studio such as Lafarge producing this window.

CONDITION

The window is in questionable condition. The window has been worked on extensively at some point in time. I also noted that the surrounding woodwork has been cut up considerably. This in itself tells me that there was a removal done after the original installation. Perhaps some work on the frame was done at that time. There is also a good deal of glazing compound added in areas of the window to span gaps. This may be due to difference in size between the frame and the glass panels on installation. The size of the window sections appear to be way beyond the accepted parameters. It is also the only window not broken up into three separate vertical sections. It has one horizontal aluminum divider. This does very little to support the weight of the window due to the length of the span. The use of aluminum certainly means the window came out after the original install. I ask – Could this window have been divided into three originally? It also appears to have been re-grouted at the same time.

The radius transom section has a heavy bar group added to the window. This was not original to the window. This section is also too large by present day standards for one panel. This section has areas of heavy deflection or bowing. It must have been very difficult to move and put in place.

There is considerable broken glass. This is not unusual when considering the stress from the weight alone. There is a heavy accumulation of dirt and grime on the surface as well as between the layers of the window. I can imagine how dark the window has become due to the layers of dirt and grime present. After proper restoration this window will be 2 to 3 times as bright. What a difference that would be to the overall effect of this window and the sanctuary in general.

Unventilated protective glazing has caused heavy damage to the lead channel matrix. The issue I foresee is when the lead channel breaks loose from the heavy support bars. It will first break more glass, then more gaps will appear and finally the window will begin to fold over.

RECOMMENDED ACTION

The window is 111 years of age. It is in need of total restoration. By total restoration I mean remove, divide and support the window properly including totally re-leading, Then re-install to a restored frame system.

COST OF RESTORATION \$28,500.00

- Historic provenance will increase the restoration cost proportionately.

REPLACEMENT VALUE \$75,000.00

- This is a restored value as historic stained glass. If the Tiffany provenance can be verified the value increases to 6 figures.

WINDOW # 9, 10, 11 & 12

TYPE Triple Lancet – Radius Top

LOCATION North Elevation #9
South Elevation #10, #11 & #12

SIZE 91” x 101”
91” x 70” Dia.

DESCRIPTION

These four panels date from 1898. These are all wonderful examples of Victorian Art Glass. You will note that the windows share a similar framed border. They all share a wonderful outside framed border effect. This does a wonderful job of setting the depth for the scenery in three panels and the beautiful blue budded cross. Each uses the very Victorian French curves to represent the flowing vine, leaves and flora within the border. There are slightly different embellishments such as faceted jewels and roundels of varying colors. Glass is used is slightly different but complementary. The border glass is textured with a strong ripple effect that gives a wonderful sparkling brilliance to the windows. Three of the windows have fully painted scenes done in trace, matt and enamels. The fourth window has a fully leaded cross made up of blue faceted jewels and amber glass set in a ray pattern within the border element. This panel also has two wonderful painted inserts done with rich enamels in a very realistic floral design.

CONDITION

#9 – Nelson Memorial – This window has the original rod and wire stress system. Flat steel bars were added most likely in 1987. This was done in place and most likely to forestall deflection in the window. There is a good deal of heavy deflection present at this time. There is also a great deal of grout loss. This is a direct result of heat gain from the protective glazing. I have also noted a great deal of broken solder joints, cracks and fissures and oxidation on the interior. I will assume that the exterior side is in worse condition due to the protective glazing. I also noted heavy silicone buildup on the T-bars. This is an indication that there is a moisture problem from condensation. All of the painting appears to be in good condition but highly unstable. It is not well attached to the glass surface. This is representative of the uneven firing in the kilns of the day. Areas of low to high heat within the same oven causes under firing and therefore poor adhesion to the glass surface.

#10 – Blacker Memorial – This panel is very similar to #9 perhaps more deteriorated. This may be just because of the southerly position of the window. There is moderate to heavy deflection. Noted rolling at the base of the window. This indicates a loss of support allowing the weight of the window to settle on the bottom. This window also has the original rod and wire stress system. The copper wires in this style system oxidize and grow thin which decreases their strength. There is a heavy use of enamels in this window. Since this type of paint requires a low firing temperature the paint can be somewhat unstable. Some paint has deteriorated along the lead lines. This is an indication that condensation has leached through the window where grout has fallen out. I have also noted several poor in place repairs. I believe that the piece is installed backwards. The painted side is always installed to the interior. Also areas of glass breakage that could be from poor support, impact and heat gain due to protective glazing.

#11 – Sailing Memorial – Many of the same deficiencies of the other windows. This has the original rod and wire stress system in place along with additional flat bars from the same 1987 repairs. All of these were done in place and thus are suspect because of difficult position to get good solid solder joints. There appears to be very little support for the weight of the window as shown by the rolling of the window at the base. Deflection is present in several areas of the window. There is an area of glass breakage in the middle left background. Some smaller areas

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throughout the window. Donor plate repaired with painted piece that is poorly done and installed to the exterior. Very wrong.

#12 – Nuttall Memorial – Again very similar condition. Original rod and wire support with added flat bars. It appears that someone tried to re-grouted this window probably in 1987. That is a poor decision. The rubbing and back scrubbing that is need to in fill and then clean excess grout off does more damage to the window. The pressure tends to break solder joints and even glass at times. Also the cleaning of the window is poorly done and actually makes the window look dirtier. The window is very weak with the center being worst.

RECOMMENDED ACTION All of these panels are from the same era and age. They exhibit the same deficiencies. There is only one solution total restoration. By total restoration I mean remove, divide and support the window properly including totally re-leading, Then re-install to a restored frame system.

COST OF RESTORATION \$18,750.00 / ea.

REPLACEMENT VALUE \$37,450.00 / ea.

WINDOW # 13, 14, 15, 16, 17

TYPE Single Lancet #13 - #16 top & Bottom
Rose Window #17

LOCATION South Transept

SIZE 55" x 70" top
55" x 75" bottom
144" Dia.

DESCRIPTION These eight panels and the rose window date from the late 1890's. The windows are set in two rows of four panels with the rose above the group. These are all wonderful examples of Victorian Art Glass. There are two windows in the upper row (#16 and #13) that are from the Michigan Building at the Columbian Exposition of Chicago in 1893. The balance of the windows are high Victorian. All of the remaining windows share a common broken background with numerous faceted jewels at lead unions. Each uses the very Victorian French curves along the outside to again represent the flowing vine, leaves and flora within the border. The glass used in the background is opalescent with a ripple texture. It is chosen to go from dark to light throughout the backgrounds. One of the windows has a beautiful hand painted and kiln fired portrait in memorial of the Billings daughter. The rose window is an elaborate geometric with a floral adaptation as the central design. The center is a collection of various red faceted jewels that is absolutely brilliant in the sun shine.

CONDITION these windows all have the same original rod and wire stress system. There are some broken pieces of glass throughout the group of windows. There are additional flat steel bars added in place to stabilize the windows.

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There are also some areas of deflection. This is not unusual in windows with repetitive broken backgrounds. Typically they exhibit more breakage due to the large number of pointed corners. The use of the jewels softens this effect as well as add a brilliance synonymous with the Victorian Era. There is also a great deal of grout loss. I noted areas of solder joint breakage in all the windows. There is a heavy accumulation of dirt and grime on the surface of all the windows. The windows are in fair to poor condition. I did not have the opportunity to closely inspect this rose window. I did get an opportunity to inspect the other rose window during an earlier repair. I believe that this window is in a similar condition perhaps worse due to the Southern exposure. This makes the window suspect in all areas. Please note the description of window #22.

RECOMMENDED ACTION All of these panels are from the same era and age. They exhibit the same deficiencies. There is only one solution total restoration. By total restoration I mean remove, divide and support the window properly including totally re-leading, Then re-install to a restored frame system.

COST OF RESTORATION \$6,300.00 / ea. #13 & #16 top

REPLACEMENT VALUE \$12,500.00 / ea.

COST OF RESTORATION \$5,000.00 #15 top

REPLACEMENT VALUE \$8,500.00

COST OF RESTORATION \$4,800.00 / ea. #14 top & #13 - #16 bottom

REPLACEMENT VALUE \$8,000.00 / ea.

COST OF RESTORATION \$21,250.00 . #17

REPLACEMENT VALUE \$37,450.00

WINDOW # 18, 19, 20, 21, 22

TYPE Single Lancet #18 - #21 top & Bottom
Rose Window #22

LOCATION North Transept

SIZE 55" x 70" top
55" x 75" bottom
144" Dia.

DESCRIPTION These eight panels and the rose window date from the late 1890's to the turn of the century. The windows are set in two rows of four panels

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with the rose above the group. This group of windows is also a wonderful example of Victorian Art Glass. Unlike the South Transept, this group of 7 windows is a totally unified design element. The design also consists of a broken background with faceted jewels at the lead unions. Each uses the very Victorian French curves along the outside to again represent the flowing vine, leaves and flora within the border. The glass used in the background is opalescent with a ripple texture. At this point the windows become different. The glass used in the North Transept has a more neutral background. This does put emphasis on the design elements such as the jewels and the French curves. They are done in deeper more brilliant glass that seems to pop out of the background. I love these two sets of windows each has its own identity but also seems to be like brothers or sisters in the same family. The rose window is an extension of the lower windows. It differentiates itself from the South side in the center medallion. The center is made up of a central fully painted medallion done in trace matt and enamel paints. The perimeter is a border of tightly arranged French curves again used as vine and leaf adaptations. Around this are set a series of wonderful amber faceted jewels. They lend a wonderful Victorian sparkle to the center of the window and tend to highlight the medallion.

CONDITION these windows all have the same original rod and wire stress system. There is broken glass in many areas of the windows. There are some additional flat steel bars added in place to stabilize the windows. There are also some areas of deflection. This is not unusual in windows with repetitive broken backgrounds. Typically they exhibit more breakage due to the large number of pointed corners. The use of the jewels softens this effect as well as add a brilliance synonymous with the Victorian Era. There is also a great deal of grout loss. I noted areas of solder joint breakage in all the windows. There is a heavy accumulation of dirt and grime on the surface of all the windows. The lower windows and vents are in poor condition. I have to assume that the top panels are similar in condition. Overall the group of windows is weak in structure from the sash and frame to horizontal dividers.

I had the opportunity to look closely at these windows during a repair of #22. I found a tremendous deterioration of the lead matrix. The structure was inherently weak throughout the entire window. The truly disturbing issue was the condition of the wood sash. We found that the lower third of the sash had a great deal of dry rot. This is from the unventilated protective glazing and a covering that leaked to the interior.

RECOMMENDED ACTION All of these panels are from the same era and age. They exhibit the same deficiencies. There is only one solution total restoration. By total restoration I mean remove, divide and support the window properly including totally re-leading, Then re-install to a restored frame system.

COST OF RESTORATION	\$3,650.00 / ea. #18 - #21 top
REPLACEMENT VALUE	\$6,500.00 / ea.
COST OF RESTORATION	\$4,000.00 / ea. #18 - #21 bottom
REPLACEMENT VALUE	\$7,000.00 / ea.

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COST OF RESTORATION	\$19,775.00	. #22
REPLACEMENT VALUE	\$30,000.00	
WINDOW #	23	
TYPE	Triple Lancet -- Radius Top	
LOCATION	West Elevation - Balcony	
SIZE	166" x 225"	

DESCRIPTION This is the Peters Memorial Window installed in 1900. This is one of the windows attributed to the Tiffany Studios. I will not speculate on the design or manufacture of this window. Suffice to say that this is a magnificent stained glass window done at a high level of expertise. The use of multiple layers, drapery glass, painted flesh and varying profiles and sizes of channel certainly makes a strong case for Tiffany studios if not a studio such as Lafarge producing this window.

CONDITION The window is in questionable condition. The window has had some work done during its lifetime. I do not believe that it has ever been out of its framework totally. The window is massive in size. This size has created a great deal of stress from weight alone on the various sections of the framework. The original frame is a steel structure that divides the window into nine separate panels. The middle sections are rather large and beyond accepted parameters. I noted that many additional stress bars were added at some point. Many of which appear to be raw untinned steel. This can be noted by the high degree of oxidation present. The additional bars were added to try and shore up the structural system. There is really no more room for bars anywhere on the window. The bars tend to be poorly attached due to the fact that they were done in place. It is difficult to solder correctly in the vertical position. All stress bars should be imbedded or attached to the perimeter frame. This adds tremendous structure to the overall window. Each bar is supposed to do two things. First it is to hold up some of the weight of the window off the succeeding sections below. They are also supposed to reinforce the windows ability to stay in a vertical plane. The stress bars on this window have no perimeter attachment that I can see. The width of the center panels and to a lesser degree the side panels, means the bars are overly long. This tends to allow the bars to deflect or bow down from the weight of the window. This in turn causes great damage over time. There is a good deal of glass breakage and I assume much of this is from the support issues. There is also a good deal of glazing compound added in areas of the window to either cover gaps or breakage or water leaks. This may be due to difference in size between the frame and the glass panels on installation or shifting of the sections from loss of support. There is a heavy accumulation of dirt and grime on the surface as well as between the layers of the window. I can imagine how dark the window has become due to the layers of dirt and grime present. After proper restoration this window will be 2 to 3 times as bright. What a difference that would be to the overall effect of this window and the sanctuary in general.

The unventilated protective glazing has caused heavy damage to the lead channel matrix. It is difficult to tell the actual degree of deterioration without removing the exterior glazing. I have to believe that the lead matrix is heavily damaged. The issue with this window is the same as #8, when the lead channel breaks loose from the heavy support bars. It will first break more glass, then more gaps will appear and finally the window will begin to fold over.

RECOMMENDED ACTION The window is 111 years of age. It is in need of total restoration. By total restoration I mean remove, divide and support the window properly including totally re-leading, Then re-install to a restored frame system. The restoration of the frame system is important. I also think that the wood sash will need to be restored due to condensation. I would also give some thought to perhaps adding a division to the frame work. This would have to be done with the esthetics of the design in mind. The stress system needs to be redesigned to become attached properly to the side of the steel framework. It also needs some vertical support to the horizontal bars.

COST OF RESTORATION \$48,000.00

- Historic provenance will increase the restoration cost proportionately.

REPLACEMENT VALUE \$127,500 to \$191,250

- This is a restored value as historic stained glass. If the Tiffany provenance can be verified the value increases perhaps to 7 figures .

PROTECTIVE GLAZING. As stated earlier, the protective glazing system was poorly designed and executed. The system detracts from the elegant and artistic architecture of the exterior. In addition, the forces that are working to deteriorate the windows have been increased by the system. The present system is actually more destructive than protective. This problem is a high priority.

It is my opinion that the protective glazing is unnecessary on many of the windows. The only purpose for installing it would be to protect the windows from vandals or other damage of an impact type. It is a misconception that protective glazing protects stained glass from deterioration. It is also incorrect that air pollution and acid rain attach the windows. This is only true for glass fabricated prior to 1820, because the chemical composition of this glass is less stable, due in part to the inconsistent manufacturing process. A third misconception is a savings in heating cost for the building. It is true that properly installed protective glazing may save some heat it is the payback on the investment that must be carefully assessed. During a recent federally funded study, it was found that the payback period was much longer than churches expected. The worst case study was 1800 years for a church in Phoenix, Arizona. The best case study in Michigan was for the Upper Peninsula The payback was determined to be 45 years. Some of the windows of the church may be so deteriorated, that the removal of the present system

may result in water infiltration or unfortunate damage to the windows due to wind or storm activity. I would recommend that the covering remain in place until the windows are restored. At that time they can be removed. Some of the coverings are in poor condition and are liable to become unattached. If the restoration program is long term then it may be wise to fit ventilators to many of the coverings. This can be done with circular, louvered and screened inserts from the Franklin Louver Co. Installation is fairly simple with poly carbonate panels. We would be happy to quote this or perhaps even instruct the church in the proper procedure.

Summary The windows of the church are 100 to 110 years old. The lead channel matrix of the windows is deteriorated. There is a high degree of breakage and structural degradation. It is my experience that the windows are in need of re-leading. Anything short of that is a waste of the churches money. I believe that the windows will fall apart during removal if they are not properly stabilized with restoration tape and transported with backer boards.

It is time to restore the windows. I would put a 2 to 5 year restoration program in effect. The restoration would restore the windows life expectancy to 100 years.

The protective glazing system needs consideration. I would recommend removing the existing system once the windows are restored and reinstalled. Please see the attachment regarding protective glazing. If the church feels that the windows need protection from vandalism or some other form of physical damage then you have two options. The first is to replace the existing system with a new ventilated poly carbonate system. I would also install the protective in the proper rebate. This will show more of the architectural details of the building. This new system would increase the windows visibility from the exterior and enhance the effect of the building. The second option is to ventilate the existing annealed glass and reinstall to the openings.

The restoration of the windows would include the total re-leading of the windows. We would replace the lead channel with the appropriate restoration grade lead alloy. Furthermore the size and profile of the lead channel would be maintained. One exception may be the use of the flat profile. It is proven that a round profile will resist bending and or deflection considerably more. If the church would approve this change we would use the round profile. We would recommend the use of a steel T-bar horizontal member for any changes necessary to the stacking of windows. This will reduce the weight supported by the wires and rods as well as the lower sections of each window. The steel T-bars would be imbedded and attached to the side members of the surrounding wood frame. This will impart additional strength to the entire window. We would also replace any poorly matching and obviously faded glass. Any broken donor plates or medallions will also be duplicated. Any historic glass unable to be replaced will be edge glued in the proper manner. During installation new black powder coated steel rods or steel flat bars will be imbedded in the wood and steel frames. The windows will be bedded and caulked in place with the proper neutral cure sealant. On the interior the wires soldered to the windows will be tinned 14 gauge copper wire. These wires will be twisted around the corresponding rods until snug and then trimmed evenly and bent in line with the rod.

P R | S T I N E
GLASS COMPANY

Please review the contents of this report. We would be happy to meet with you and your committee to answer any questions. We would also be happy to put together a projected schedule to meet the expectations of the church.

P R | S T I N E
G L A S S C O M P A N Y

975 Cherry SE - Grand Rapids, Mi 49506 - (616) 454-2092 Fax - 454-8230

RESTORATION COST AND REMOVAL OF PROTECTIVE

NARTHEX		RESTORATION	REPLACEMENT
Sorenson	#1 West	HOLD	
Chamberlain	#2	HOLD	6,350.00
B & B Barnes	#3	HOLD	6,350.00
Perry	#4	4,100.00	7,875.00
		1,250.00 stops	
Vincent	#5	HOLD	6,350.00
White	#6	HOLD	6,350.00
Bible	#7	1,200.00	1,500.00
NAVE			
Weaver	#8 North	28,500.00	75,000.00 (\$350.000)
Nelson	#9	18,750.00	37,450.00
Blacker	#10 South	18,750.00	37,450.00
Sailing	#11	18,750.003	37,450.00
Nutall	#12	18,750.00	37,450.00
TRANSEPTS			
W. Mich. Building	#13T&B South	11,100.00	20,500.00
	#14T&B	9,600.00	12,800.00
Billings	#15T&B	9,800.00	13,000.00
Mich. Building	#16T&B	11,100.00	14,300.00
Barnes	#17	21,250.00	37,450.00
	#18T&B North	7,600.00	13,500.00
	#19	7,600.00	13,500.00
	#20	7,600.00	13,500.00
	#21	7,600.00	13,500.00
Doval	#22	19,775.00	30,000.00
BALCONY			
Peters	#23	48,000.00	127,500.00 - 191,250.00
TOTAL		\$271,075.00	\$569,125.00 - \$632,875.00

DAMAGED WOOD FRAMES AND SASHES

We cannot truly determine which windows may have damaged areas until the glass is removed. At that time we can determine if replacement or restoration is needed. In most instances treatment would be needed at the sills and other areas where water may pond or be trapped.