



HOLY
WELL
GLASS



**Winchester Cathedral,
Conservation of Presbytery
Clerestory Windows NII-NV,
SII-SV, & EI**

October 2015 - October 2017.

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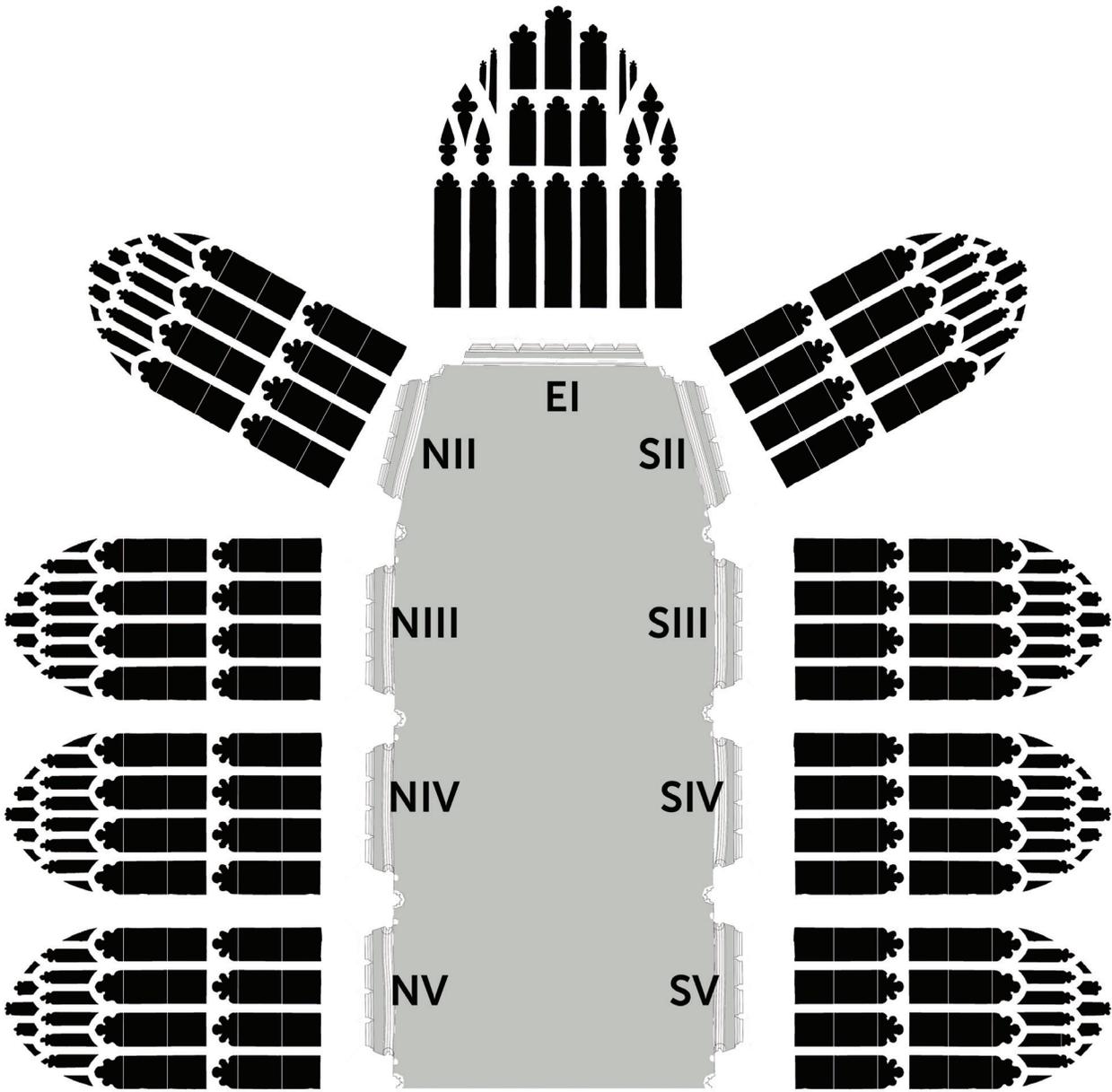
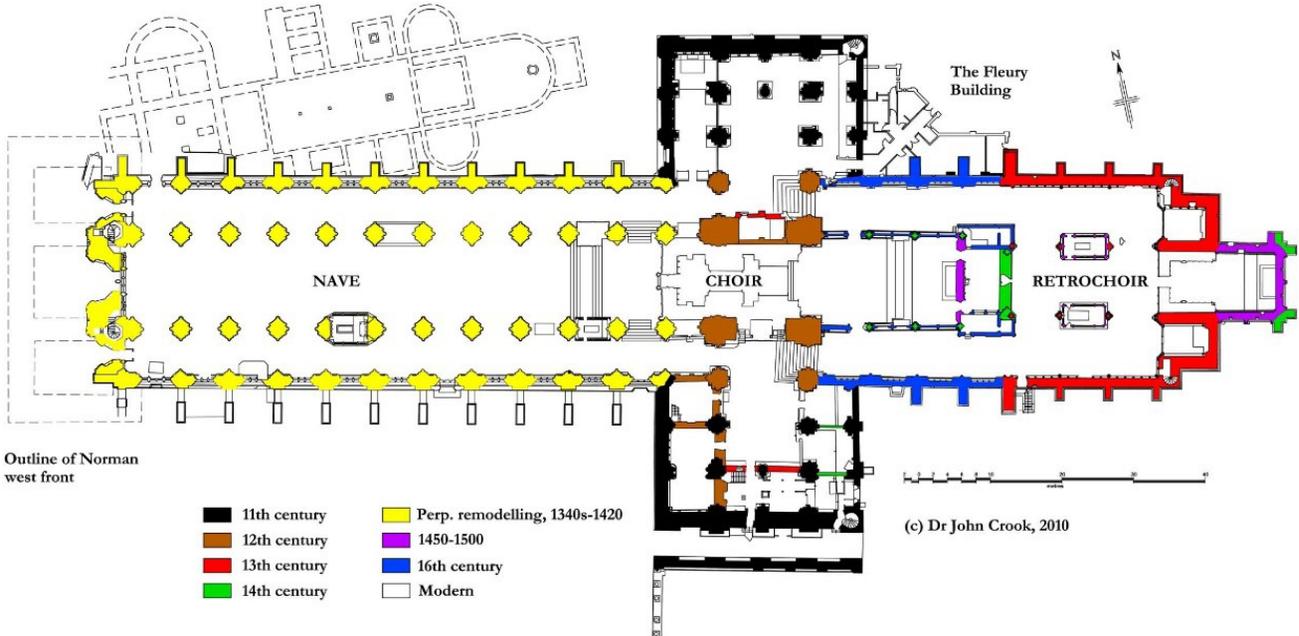
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Outline of Old Minster, the Anglo-Saxon Cathedral





1.1. INTRODUCTION

Winchester Cathedral, Conservation of Presbytery Clerestory Windows NII-NV, SII-SV, & EI
This document concerns the conservation of the eight large windows to the north and south elevations of the presbytery clerestory, and the Great East Window. Works included the installation of a bespoke ventilated environmental protective glazing system. Works carried out between October 2015 and October 2017. All windows are marked on the diagrams employing the CVMA annotation system.

1.2. SIGNIFICANCE & HISTORICAL CONTEXT

Summary

The high level presbytery stained glass at Winchester Cathedral is nationally important and includes glass of the highest quality; it houses works of 15th century art to the north and south elevations transferred here from the Nave, from the circle of arguably the greatest medieval glazier, Thomas Glazier of Oxford, and his son John Glazier. These are significant remains of the original medieval and late medieval glazing of the cathedral, which have not been restored or conserved for many years. This early scheme was sponsored by William of Wykeham, who was Bishop of Winchester, Lord Chancellor of England, and the founder of New College Oxford and Winchester College. The east window is the work of Flemish glaziers associated with major commissions, including royal commissions in the early 16th century, and commissioned by Bishop Fox. The influence of the distinguished patrons of the building and its glazing, and the architectural progression of the cathedral sponsored by them is significant.

Stylistic description

The 15th century stained glass in the main lights of windows NII, NIII, SII, and SIII, hail from a period of pictorially sophisticated English glass painting. There are figures standing in architectural niches in the main lights, with borders with demi-figures and lions. The traceries have Seraphim standing on wheels. There is a substantial use of white glass, forming much of the architectural canopies, borders and tiled plinths, upon which the central figures stand. This is complimented by the use of yellow silver stain to decorate hair, clothing, headwear, and architecture. Pot metals, which have solid colour throughout, are evident in the blue and red glasses, whilst much of the red glass is 'flashed'. Both main light figures and tracery angels on wheels are set against contrasting blue or red backgrounds. The later 16th century Bishop Fox period glass has much less white glass, and has a larger colour palette.

The glass painting technique has dense trace lines, and half-tones achieved by stippling the wet glass paint to modulate the light. The 16th century glass paint is of a light rusty colour when seen in reflected light, whereas the earlier 15th century glass is a darker brown tone. Thin broad washes of this pigment provide subtle shading effects, whereas the intricacies of the design are painted with a darker line work. The silver-stain is applied on the external surface.

1.3. FORMAT OF THE WINDOWS

The scheme comprises 4 x four-light windows on each side of the Choir Presbytery Clerestory, and the great east window. The north and south windows are divided by a single transom into 8 main lights. (Main lights average sizes: upper tier 31 inches (787.5mm) x 108 inches (2743mm) lower tier 31 inches (787.5mm) x 100 inches (2540mm). Each window has 9 tracery elements and 4 eyelets. The great east window has 7 main lights with trefoil heads; it has 28 tracery elements and associated eyelets.

1.4. STATEMENT OF SIGNIFICANCE

**Prepared by Anna Eavis: Head of archives English Heritage, Project Director CVMA.
Prepared before conservation with access to scaffolding.**

1 Summary of Significance

The choir clerestory glass is of exceptional significance, which is summarised as follows:

- It is pivotal to our understanding of developments in late-medieval glass-painting and design, and particularly of the role played by Oxford-based glaziers in the 15th century and of Flemish immigrant glass-painters around 1500
- It is a rare example of episcopal patronage spanning more than a century; part of an extraordinarily coherent architectural and artistic scheme, indicative of a sustained respect for episcopal precedent
- It includes glass commissioned by two outstanding patrons of the arts - William of Wykeham and Richard Fox - both of whom were responsible for promoting innovative and influential stained glass designers/glass-painters
- It includes stained glass of the highest quality
- The east window is an important example of a sympathetic - if extensive - mid-19thC restoration.

2 Group 1 (NII): nave clerestory glazing, 1404 - c1426

The remains of four figures of saints standing within architectural niches were moved here from the nave clerestory, perhaps as part of a general re-ordering of the stained glass in the 17th century. The glass, although very fragmentary, is of exceptionally high quality and was probably commissioned from Thomas Glazier between 1404 and 1426 by the executors of William of Wykeham, who bequeathed 500 marks for the glazing of the nave, which he had extensively remodelled. In addition to the material now in NII, a few fragmentary remains now in the nave aisle, clerestory and west windows, show that the original scheme included figures of saints standing under canopied niches. These were surmounted by feathered angels in the principal tracery lights and splendid foliate designs in the lesser traceries, an arrangement closely paralleled in the side windows of the chapel at Winchester College.

Wykeham had sponsored a continuous programme of building works during his 37 years as Bishop of Winchester, including the construction of his colleges in Oxford and Winchester, extensive refurbishment of six of his episcopal residences and the major rebuild of the cathedral nave. He assembled a highly accomplished team to manage and undertake his projects, including Thomas, the Oxford-based glazier who produced windows for New College (1380s), Winchester College (1393)



and for the episcopal residences at Highclere (1394) and Wolvesey Palace (1390s).

After Wykeham's death in 1404 Thomas' workshop continued to flourish, undertaking commissions for a series of high status patrons at St Mary's Church (1409), Durham College (1417-19), the remains of which are now in the Old Library at Trinity College, and at Merton College (1420s). Thomas had a son – probably John – who took over the workshop after his father's death in c1426, producing windows for Archbishop Chichele at All Souls' College in 1441. Thomas' work at Winchester College appears to have been innovatory in its adoption of new approaches to glass-painting and composition. These perhaps owed something to the presence of Herebright of Cologne, a German painter, on Wykeham's payroll, but were essentially part of a new artistic trend which was Europe-wide. The style – known to art historians as International Gothic – is characterised by the sophisticated modelling of facial features and of drapery folds, using finely graduated washes, stipples and paint-lines to realise soft, three-dimensional effects. Its adoption by Thomas at Winchester College is the earliest significant surviving example of its application in English medieval stained glass. It relates closely to introduction of the style to other kinds of painting, including the Wilton Diptych, made for Richard II in the 1390s.

Even allowing for the distortions produced by the very poor survivals of 15th-century English stained glass, Thomas' oeuvre seems to have been enormously influential, paralleled only by the work of his contemporary John Thornton in Coventry and York. His and Thornton's approaches to painting, figure composition, colour palette and architectural framing became models for stained glass makers throughout the fifteenth century.

It is almost certain that Thomas's workshop carried out all or part of the nave glazing for Wykeham's executors, presumably between 1404 and his own death in around 1426. The finely painted and modelled faces of the figures in NII are stylistically very close to those originally made by Thomas for the east window of Winchester College (now in Thurbern's Chantry) in the 1390s. There are also parallels with his figures (eg. of the Virgin) at Merton College, now in the east window there, but originally made for the north transept in the 1420s.

There are differences in style between the NII figures and some of the fragments preserved in the nave, suggesting that more than one hand was involved in the painting. The decorative grounds and architectural frames of the Winchester clerestory figures, although very fragmentary, relate to those made for the side windows at Winchester College (19th-century copies of which are now in the chapel; three of the originals survive at the V&A) and share some characteristics with the later work at All Souls. There are also broader design parallels – the presence of pairs of small figures within the frame for example – with architectural motifs in the west choir clerestory glazing at York Minster (1404-18) and the St William Window, also at York (c1414). Both of the York schemes relate to work by John Thornton, the other major proponent of the International Style in English stained glass at this time.

Significance

The Winchester nave clerestory glass now in NII is thus an exceptionally important survival, providing evidence of the work of one of England's greatest medieval stained glass workshops and its critical role in the development of new approaches to monumental glass-painting, techniques and design during the early 15th century. Its current location in the choir clerestory, where its height makes it difficult to photograph, has limited the extent of scrutiny by art historians, with the result that little has been added to Le Couteur's account. The opportunity, afforded by a programme of conservation, to record it properly, would enable its detailed study in the context of:

- the other remains of the nave scheme, enabling a better understanding of Thomas' workshop practice;
- other work by or related to Thomas and his son's workshops, especially at Winchester, Trinity and All Souls' colleges, and the mid-15th-century choir clerestory glazing at Winchester Cathedral;
- work by or associated with John Thornton in York and Coventry
- other major 15th-century glazing schemes, notably that at Great Malvern Priory, recently the subject of a PhD by Heather Gilderdale Scott

3. Group 2 (NIII, NIV, NV, SII, SIII, SIV): choir clerestory glazing c1440s

In the main lights are the remains of at least 12 figures of prophets and saints, standing within architectural niches on tiled pavements. Above, in the tracery lights, are rows of seraphim standing on wheels, surmounted by demi-figures of feathered angels.

The date and patronage of this group is undocumented. The presence of the arms of the See of Winchester in NIV may indicate episcopal patronage and stylistic parallels with glazing at All Souls' College, Oxford points to a date in the second quarter of the 15th century. This suggests that the glass was installed during the episcopate – and perhaps at the behest – of Cardinal Beaufort, who initiated a major campaign to liturgically re-order the east end of the cathedral.

Analysis of the glass is limited by its fragmentary condition, and by variable degrees (in some places severe) of paint loss, especially in the south windows, and corrosion (particularly of some of the flashed rubies). Enough survives to suggest an original scheme of 12 prophets in the north windows, probably arranged in the upper main lights of windows NIII, NIV and NV. They may have been paired with apostles, either in the lower lights of the same windows, or in the corresponding lights of the windows opposite on the south side. The use of monumental standing figures in clerestory glazing (and particularly of Old Testament personages) had a very long lineage, occurring in schemes as early as the 11th century. Wykeham had used prophets in the upper register of the north windows at New College, Oxford and, in combination with figures of apostles, in the side windows at Winchester College. The display of angels in the tracery lights – another well-established convention (see for example the late 14th-century nave glazing at Wells Cathedral) – continued the scheme used in Wykeham's nave windows. Wykeham's schemes at both his colleges used angels in the tracery lights of almost all their side windows.

The cathedral prophets bear a broad resemblance – in design and composition, rather than in the painting style, which is freer and literally more 'broad-brush' – to those at Winchester College. The canopy work has affinities with that surviving at All Souls' College, Oxford (c1441), particularly in the details of the lions which appear midway up the shafts, and the turreted canopy tops. The distinctive many-petalled flowers on blue glass in NIII, 1c, are similar to motifs found in the decorative grounds of the east wall glazing in the All Souls' antechapel. As the All Souls' glass is credited to John Glazier, it is possible that the same workshop undertook the choir clerestory glazing at Winchester Cathedral, perhaps re-using and adapting designs originally used by Thomas Glazier for Winchester College.

NOTE: There is, in SII, 3b, a small prophet's head with murrey cap, which is too small in scale to belong to the clerestory scheme, appearing closer in size and style to the prophets in the Jesse Tree window at Winchester College (c1393). Conservation would offer an opportunity to test this theory properly, comparing scale, style and glass type with survivals of the College window.

Significance

Of the choir clerestory glazing this highly important group is perhaps the least well understood, partly because its inaccessibility and poor condition have made it difficult to study, but also because the development of 15th-century glass-painting is in itself a relatively new research area. Recent work by Heather Gilderdale Scott and Tim Ayers on the 15th – century glass at Great Malvern and Merton College respectively, and ongoing research being undertaken in tandem with the York Glaziers Trust's conservation of the St William and East windows at York Minster, provide – for the first time – a much better context for our understanding of the Winchester glass. The possibility that it was undertaken by a workshop run by Thomas Glazier's son requires exploration, as does the relationship of the glass to the contemporary schemes at All Souls, Great Malvern and York Minster; also of interest is the extent to which the scheme effectively completes – iconographically – an initiative begun by Wykeham in his glazing of the nave.

4. Group 3 (I, NII, SII): Richard Fox's glazing c1509-1515

Glass commissioned by Bishop Richard Fox survives in the east window and, to a lesser extent, in windows NII and SII. The glass was commissioned by Fox as part of a scheme to enhance and re-roof the presbytery, thereby completing the work of successive bishops to refurbish the central vessel of the cathedral. In addition to the three choir clerestory windows, Fox also funded glass for the windows of the choir aisles. The clerestory glass may have been executed as early as 1509, when the

high vault appears to have been completed and scaffolding was still in place. Like his predecessors, Fox's building work included the construction of his chantry chapel. The presbytery was thus the setting for his own commemoration, as well as for the liturgy of the High Altar; the iconography of the vault and stained glass should be seen in both contexts.

East window

Although substantial portions of Fox's glass remains, it is not all in situ, and much was re-fired and repainted as part of the 1852 restoration. The lowest and middle register of lights include much original material, but several – if not all – of the standing figures are unlikely to belong to the east window and probably originated in the easternmost choir clerestory windows. The six angels in the tracery-lights are in situ. Two play trumpets, while the other four hold shields, each bearing Fox's arms impaled with the arms of one of the sees held by him (Exeter, Bath & Wells, Durham and Winchester). Two inscriptions of Fox's motto – *Est Deo Gracia* – are in their original position, as are the two kinds of scourge, both emblems of the Passion. The figures of the Virgin Mary and John the Baptist, although heavily restored, are original. The figure of Christ is entirely 19th-century.

The subject of the surviving in situ east window glass suggests that the original iconography asserted the relationship between Christ's Passion and His Second Coming, while simultaneously commemorating Bishop Fox. The two trumpeting angels signal the end of the world, as in the 14th-century choir clerestory east window at Wells Cathedral, where a figure of Christ in Judgement presided over scenes of resurrection and - closer to home - in the east window of Winchester College. The 19th-century restorer's creation of Christ as Judge is undoubtedly correct, placing him between the intercessory figures of the Virgin and Baptist. Close by are emblems of the Passion (the two types of scourge in G1 and G2) and Fox's own arms ('Azure, a Pelican or'), both alluding to the hope of salvation offered by the Crucifixion. Fox's arms were intrinsically salvatic; the image of the golden pelican evoked 'The Pelican in its Piety', which fed its young on blood drawn from its own breast, and thus represented Christ's own sacrifice and the salvation offered by the Eucharist. Fox had adopted this well-established religious image as his own emblem, using it both in this abbreviated form (i.e. without its young) on his arms and in its full form (i.e. with its young) elsewhere. The bosses of the eastern bay of Fox's presbytery vault include the Pelican and a series of symbols of the Passion; those in the east window are to be read as part of a coherent scheme, providing an appropriate setting for the Eucharist and for the commemoration of the bishop.

It seems likely, given the iconographic emphasis on Judgement, that the window contained an image of a 'Doom' or general resurrection, perhaps in the three lights currently filled by cut-down figures. It may also have featured an image of the Crucifixion, although the presence of a figure of the crucified Christ on the Great Screen may have made this unnecessary. The possibility that standing figures filled the main lights, however, cannot be ruled out without further research.

NII and SII

NII retains the remains of canopy tops in the heads of its main lights, indicative of the architectural niches which must have framed standing figures, most probably of saints and prophets, some of which are now in the east window. Fragments of similar canopies can be found in SII. The main lights were probably filled with images of standing figures under canopies, including some or all of those now in the east window. The presence of prophets with scrolls in the east window suggests a pairing of prophets and apostles in a credal series. The tracery lights of NII contain Fox's motto, his Arms as Bishop of Winchester and a series of seraphim. It is likely that this arrangement was mirrored in the tracery lights of SII opposite. The historicised form of the seraphim – in contrast to the contemporary style of the east window angels – is especially interesting; they are designed to conform with and complete the sequence of angels already occupying the other choir clerestory tracery lights, a series which ran the entire length of the central vessel of the church, from the west end of the nave to the presbytery.

Patron and Glazier

Fox was a cosmopolitan patron of the arts and of English humanism. He – along with other high status members of the secular clergy – sponsored the work of Flemish immigrant glass-painters who brought with them a new pictorial style which embodied the Renaissance principles of

Netherlandish panel painting. A close aide of Henry VII, Fox may have influenced the appointment of the Flemish artist Barnard Flower as King's Glazier in 1505. One of the king's executors, Fox probably commissioned the glazing of Henry VII's chapel at Westminster Abbey, almost certainly undertaken by Flower (c1509-11), and he also directed the first phase of glazing at King's College, Cambridge (c1515), again carried out by Flower. It is not possible to say whether Flower was also involved at Winchester, but Fox's clerestory windows share elements with the Henry VII chapel glazing, including the design of the shield-bearing angels, and of one of the canopies in the main lights, as well as a general appetite for the display of emblems and badges. Similarities of design (e.g. angels, canopy heads, the presence of mottoes and heraldic badges) can also be found at St Mary's, Fairford (c1500 – 1515) and at St George's, Windsor (c1506), both of which have been associated by various writers with Barnard Flower.

Significance

The ensemble relating to Fox's patronage is exceptionally important, forming part of a corpus of 16th-century glazing, broadly Renaissance in style and emanating from a Netherlandish aesthetic, which includes the glazing of King's College, Cambridge; Henry VII's Chapel, Westminster Abbey; St George's Chapel, Windsor; St Mary's Church, Fairford. Conservation would afford an opportunity to study the glass in the context of these schemes and others (including the surviving glass at St Nicholas, Hillesden and the lost schemes of Lambeth Palace and St Margaret's Westminster, for example), enabling consideration of the following:

- the iconography of the original scheme
- the relationship of the clerestory scheme to that in the nave aisles
- authorship and workshop practice
- the role of the early Tudor secular clergy in promulgating the use of Flemish artists

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Angela Smith: *The Life and Building Activity of Bishop Fox c1448-1528* (PhD, Warburg Institute 1988)



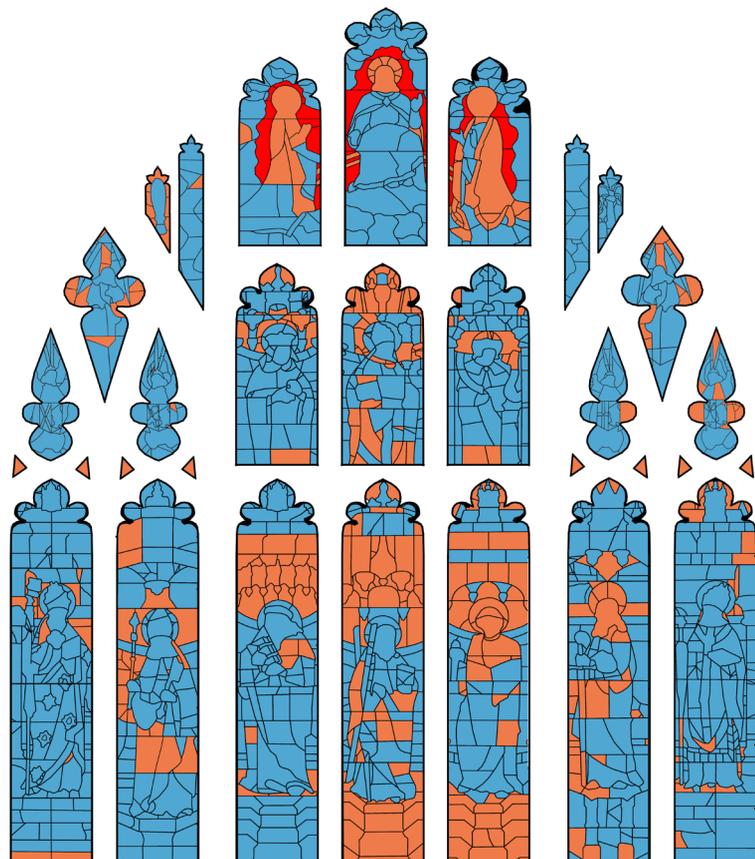
Detail from East window

- Destruction, removal and reordering of the glass during the 16th century Reformation period, and the 17th century Civil War period.
- Different styles of glass insertions in the presbytery clerestory windows indicate a 17th century period of heavy intervention and re-ordering of the scheme, including re-leading. For example, fragments of Carolean glass, almost certainly from north transept window nXI were led into a number of panels. (Other sections of this window survive in the Deanery).
- Historic stained glass in SII and SIII, was lime-washed to protect a painting on display within the Cathedral, by lessening the amount of light- prior to 1801.
- 1852 - Baillie restoration works to the East Window, including re-leading.
- 1903 - Acided sheet glass infills, inserted to stained glass on the north and south elevations suggest substantial re-leading.

Presbytery Clerestory East Window and associated glass

From evidence gathered as part of this project it is clear that this window contains much more substantial remains of its original early 16th century glass than previously thought. Much of the original glass has been displaced, although it is probable that the six angels in the tracery are still in their original position. Most, if not all of the standing figures are not original to the window, and probably originated in the easternmost choir clerestory windows. Fragments of standing figures original to NII are now in the East Window, and fragments of accompanying canopies can be found in SII. Although we cannot be certain it is most likely that some damage, or removal of glass occurred through iconoclasm, either during the Reformation in the 16th Century or the English Civil War in the 17th Century. This window was heavily restored in 1852 by Edward Baillie (1812 – 1856), when much of the glass was re-fired and/or repainted. Clues in the physical nature of the panels also indicate two other different styles of painted glass apart from Baillie, and therefore three different periods of intervention can be identified. All of Window NII tracery section, plus scattered fragments in Window SII are from the Bishop Fox era re-ordering.

Key:



1.6. GENERAL CONDITION OF WINDOWS-SUMMARY

The horizontal divisions of the windows are overlapped, which is an unusual and archaic detail. The exception is the lower plain glazed portion on Window SII which has conventional horizontal divisions with wider leads saddled on to lower panels.

Each window has its own specific problems. SII and SIII displayed very serious issues of paint deterioration and paint loss, identified with an historic over-painting.

The fragmentary nature of Window SV, with insertions of several different periods, required a broad range of treatment options.

There were many cracks in the glass, some relatively simple, some complex, which required the establishment of a hierarchy of repair types.

There was widespread and serious corrosion of the glass surface, both internally and externally, with the exception of surviving trefoil heads of lights to the north elevation. These simply contain greater amounts of modern insertions, not susceptible to corrosion. Often, particularly externally the pattern of corrosion markedly followed the paint lines, conversely in other areas the corrosion was not evident on the painted and silver-stained sections. Some glass pieces, particularly the coloured glasses had a completely obscured and non-glassy surface, due to blanket corrosion. White surface accretions, mainly gypsum, indicated familiar processes of degradation in high potash glass. Loss of red flash, from corrosion of the flash layer, revealing the clear glass beneath was evident in isolated areas.

Some particularly fractured and severely deteriorated glass has suffered from low lime disease (LLGD) e.g. the missing glass damage in the foot of the figure in NIII panel 4b.

The clear/tinted cylinder glass to the plain quarry glazing showed varying degrees of surface pitting. Many windows, particularly on the north side and east window had large deposits of pigeon guano on the glass surface and tracery stone work. Isolated black paint residue was often visible adjacent to ferramenta due to careless re-decoration. Remedial putty repairs were found on exterior surfaces, either covering a crack in the glass by mimicking a lead line, or plugging a hole in the glass. Both internal and external surfaces were very dusty and dirty.

The glass paint has been affected in different degrees across the windows. Marked paint loss had occurred in Windows SII and SIII particularly. SII had extreme and widespread loss of paint detail. Surviving paint was delicate, and the legibility of the image had been seriously compromised. Both SII and SIII had been previously painted with a coating of a lime based material, brushed across the surface. This was carried out to prevent light levels falling upon an oil painting in the presbytery in the 19th century. Over time, moisture, combined with chemical reaction with emissions from 19th century coke fired stoves, operating for many years burning large volumes of cheap grade gas coke, led to a severe deterioration of the original medieval paint on the glass surface.

Generally the painted detail to the north elevation was significantly more stable. For example, the painted detail to window NII main lights, which were relocated from the nave to the clerestory in the 17th century was in fairly good condition.

The condition of the leadwork was mixed. Some moderate to severe bowing of panels was evident in areas, deflection from the original vertical between 15-30mm. There was widespread dilapidation of the lead in Window NIII, in both the tracery and the main lights, whereas Window NII displayed only isolated panels that were in such poor condition. Some sections of leadwork and historic glass appeared jumbled, particularly the lower portions of main lights NII, SII, and SIII. There were some distracting repair leads running through a number of main features such as heads of figures, detracting from the original visual intention. Leaded light cement could be seen leaching out from the edges of the lead on many panels, remaining cement was brittle and powdery.

Solder joints were generally sound, but deformed lead work coincided with cracked solder joints.

Most ties were copper, some of which already had failed and broken away from supporting ironwork.

Panels displayed many plain 'white' previous insertions in acid sheet glass, which drew the eye to the losses in the composition rather than blending into the background.

The ferramenta on the south side was fitted internally, the north side fitted externally. The external north side ferramenta appears to be very ancient, the internal ferramenta of the south side later, but still ancient. On the south side there are five horizontal lug bars per light, and a single stanchion. The bars are slightly rusted, but retain crisp edges. The stanchions fit tightly into the lugs when compared to the north side bars, which are corroded with loosely fitting stanchions. Some lug bars have expanded and caused cracks to the mullions, caused by rust-jacking against the hard cement mortar

in the bar pockets in the stone. Some of the bars were secured in the stone work with molten lead. On the north side there are four horizontal lug bars per light and a single stanchion, probably ancient. The stanchions fit very loosely into the lugs. There are oak inserts between the stanchion and stained glass, painted black (possibly 19th century), and similar to those found on the great west window prior to recent restoration.

Stonework – There was some erosion of stone, and loss of mortar from the glazing groove. Internally there was regular water ingress on both the north and south elevations which had run down the internal surface of the glass as well as the stone over a long period, evidenced by heavy staining of the stone work.

The condition of the mortar was mixed, but generally in poor condition, falling away in areas. Some mortar was very soft lime based, and some was very hard Portland cement.

2. PRINCIPLES OF CONSERVATION

2.1. Conservation Approach

Prior to conservation it was acknowledged that the windows were in poor condition and in need of urgent attention. A detailed method statement was formulated (See Appendix 1). Holy Well Glass have taken on a phased programme of repair, based on the international conservation principles of minimum necessary intervention. It can be summarised as 'As much as necessary: as little as possible'. The primary charters that underpin the concept of minimum intervention, and which have been adhered to in this programme of conservation works are the CVMA Guidelines for Conservation, the Burra Charter, and the SPAB Manifesto. Within this general principle, the Christian context of the window is of primary importance in the conservation philosophy. Prior to works carried out, as well as a detailed examination of the window by Holy Well Glass, there have been collaborative investigative works carried out by a team of specialists, including the architect, art historians, the cathedral archaeologist, and specialists in environmental monitoring, as well as consultations with the FAC (Fabric Advisory Committee) and the CFCE (Churches Fabric Commission for England), all of which have combined to inform the conservation approach.

2.2. Conservation Objectives

Stained Glass

- To take measures to conserve original material at risk of loss
- Provide an environment for the stained glass that will greatly retard the mechanisms of decay that are affecting it
- Provide sufficiently stable lead work to keep the stained glass secure whilst ensuring that the glass is not put at risk of damage by weakness in the lead matrix
- To remove surface deposits which are potentially harmful to glass and painted detail

Ferramenta

- To conserve original material
- To identify types and develop methodology for conservation of all ferramenta bars
- To protect surrounding stonework from future damage due to expansion of ferrous bars.

2.3. Environmental Monitoring

In February 2014 Holy Well Glass was commissioned to manufacture and install a test installation of environmental protective glazing to one north side window NIII (Light d, panels 4-6), and one south side SIII (Light b, panels 4-8), which involved environmental monitoring by Tobit Curteis Associates. (See Appendix 2). This confirmed the efficacy of the test systems, and the decision was taken to install internally ventilated environmental glazing to the historic stained glass in the presbytery clerestory (with the exception of the tracery section in NII and a selected number of panels on the East Window, which were conserved in-situ and therefore have been vented externally).



2.4. Conservation trials/ technical investigations

It was decided that the conservation approach would be formulated specifically for these windows and their particular conservation needs and ethical problems. To formulate the policy, areas from window SIII and NIII, and the East Window, were subject to in-situ examination and cleaning trials, discussed with the cathedral architect.

These windows were selected as they contained a wide range of glass paint degradation, corrosion of the glass body and lead matrix condition. (See Appendix 3 cleaning trials). Pre and post-conservation documents were developed as part of this process.

The investigations allowed the development of the Detailed Method Statement which underpinned the conservation process. (See Appendix 1).

2.5. General summary of works

The conservation of Windows NII, NIII, NIV, and NV , and windows SII, SIII, SIV, and SV , involved removal of the stained glass and plain quarry glazed panels from site and removal to the workshop for repair. Conservation works were carried out to the medieval stained glass, and the plain glazed quarries were cleaned, conserved and re-leaded. All associated ferramenta was also removed for conservation works. The conservation of the East Window, involved in-situ cleaning and repairs. Distinct conservation approaches were adopted for the 15th and 16th century glass.

A bespoke ventilated environmental glazing system was introduced, new leaded-lights to primary lead lines of stained glass were manufactured and framed for this purpose.

The programme of works was carried out in the following phases and this record reflects that programme:

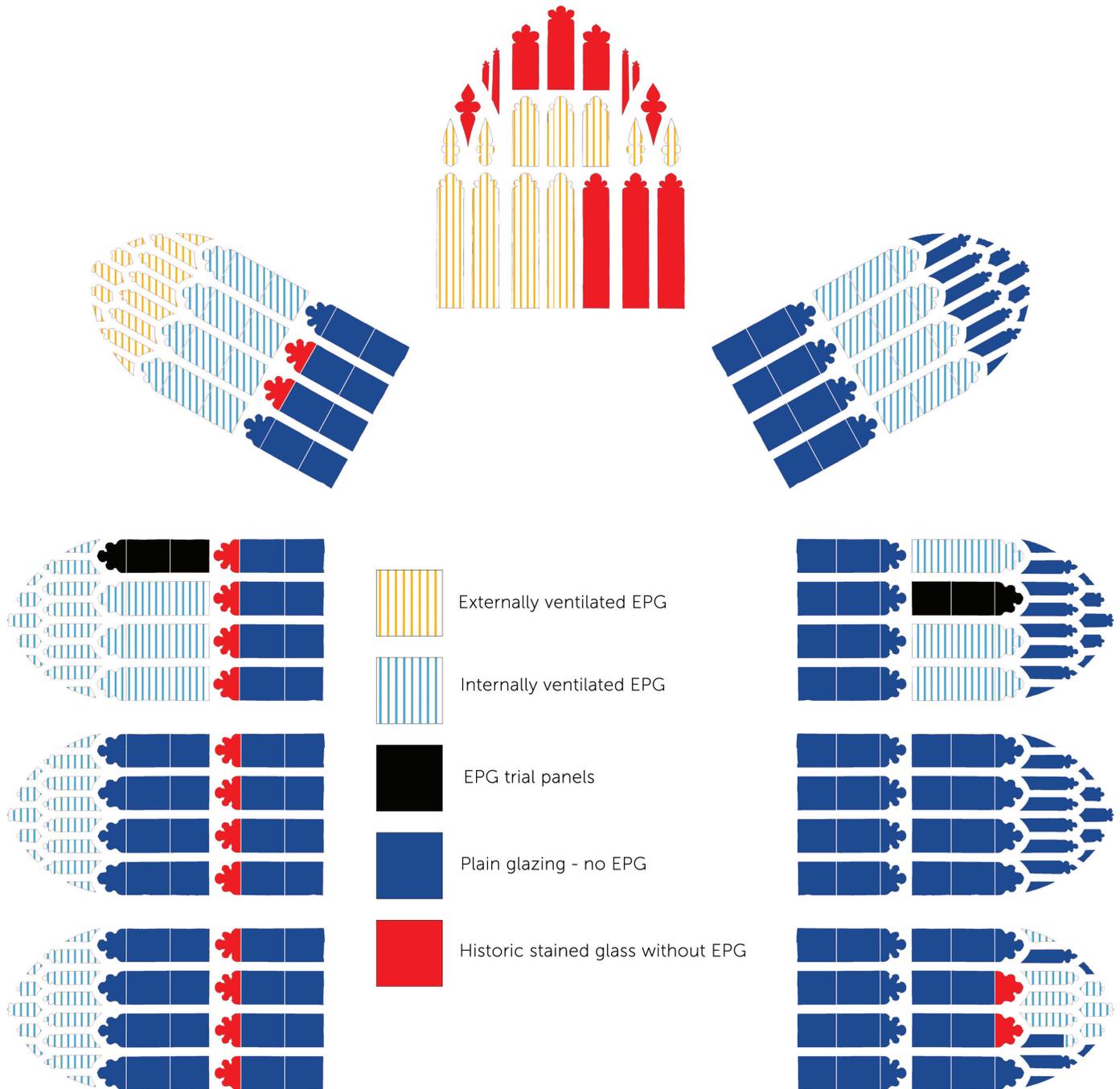
- Phase 1: Window SIV & SV
- Phase 2: Window NIV & NV
- Phase 3: Window NIII & NII
- Phase 4: Window SIII & SII
- Phase 5: Window I Great East Window

Protective hoardings were installed around the building for each phase of works to prevent weather ingress, prevent dust contamination internally, and to make the building secure.

(Lower light b of SIII was removed for the duration of the project to accommodate a general access door).

2.6. ENVIRONMENTAL PROTECTIVE GLAZING SYSTEM

Winchester Cathedral Presbytery Clerestory Environmental Protective Glazing





All windows have been vented internally, with the exception of the tracery section in NII, and the East Window, which have been vented externally. Ventilation has been achieved by raising selected panels for base vents, and tilting individual pieces of glass for top vents.. For Windows NII and NIII the external ferramenta is retained by mounting it upon the external glazing system T-bars. Two bespoke designs have been used to frame the glass for the main lights and the more complex tracery sections. They have been designed, manufactured, and installed as follows:

New External Glazing Screen

- Cutline drawn for new leaded light glazing using rubbings taken from original stained glass during previous conservation, and site measurements and templates.
- New leaded lights constructed on cutline with approx. 70% of stained glass lead lines, using 1/4 "flat internal leads with a 1/2" perimeter lead, and made with a mix of plain float and Lamberts restoration glass 60:40 ratio.
- For the East Window a simple planar treatment of single sheet horticultural glass was used.
- Lights are divided horizontally to coincide with original stained glass panel divisions.
- New exterior glazing screen cemented in the traditional manner. Leaded light cement made to the following recipe: 2 white spirit, 1 boiled linseed oil, 5% gold size, calcium carbonate and lamp black pigment

Main light supporting frames

- The individual exterior glazing panels are supported on bronze T-bars.
- T bars secured to masonry with bronze wall brackets fixed with non-ferrous screws into plastic plugs. Detailed measurements taken for the main lights including bar positions.
- Each leaded panel has a bronze perimeter frame (10 x12 x 2mm) with pressed corner brackets secured with countersunk stainless steel rivets.
- Glazed panels sealed to frames using black silicone sealant.
- Thin lead skirting soldered to frame edge to create a seal to the stonework when fixed.
- Bronze pins drop through machined holes in the T-bar to secure the panels when fitted.
- Lead sill condensation trays designed, manufactured, and fitted immediately below the main light base panels.

Tracery Frames

- Detailed templates were taken of the stonework. Templates were digitally scanned and created as a DXF file.
- 4.75mm thick flat sheet bronze was water-jet-cut to the template size.
- Frames chemically patinated.
- Frame fitted inside the leaded light panel perimeter lead.
- Panels sealed to frames using black silicone sealant.
- Lead skirting soldered to frame perimeter to create a seal to the stonework when fixing.
- Fixed on site with bronze fixing tabs with non-ferrous screws into plastic plugs.



3. THE CONSERVATION RECORD

3.1. REPAIR METHODS AND CONSERVATION POLICY, PHASES 1-5

Please see individual panel treatment records for details. Unless otherwise stated the following points apply to all windows.

On-site

All panels labelled employing CVMA system applying low tack tape on unpainted areas of glass. All stained glass panels removed by carefully chipping away perimeter mortar with tungsten chisel. Cut copper ties to allow removal of panels. Exposed stonework pockets around ferramenta bars. For SII & SIII detached layers were retained by in-situ treatment with Cyclododecan to allow safe removal and transportation, and for tests to be carried out in the workshop to explore consolidation methods for the painted detail.

In the workshop

- Three rubbings of each stained glass panel were prepared.
- All the panels were digitally photographed, including before and after pictures, processes, site work etc. Images and conservation diagrams are stored as JPEGs and are included in the digital copy of this conservation report.
- After close observation a pre conservation condition document was completed for each panel. This comprised of glass condition types, corrosion, glass breaks, glaziers marks, dimensions, surface material, paint condition, lead profiles, and conservation proposal based on parameters set in the method statement. All was discussed with the architect before conservation works began whereupon a conservation policy for each panel and phase of work was established.

Dismantling

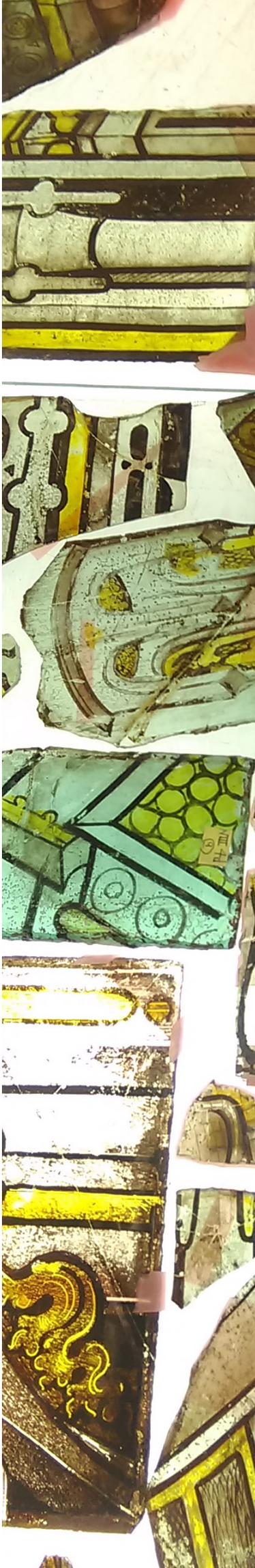
As much lead as possible was conserved, and cracked and broken lead/solder joints re-soldered. Removal of lead only considered where the lead was structurally poor. Isolated dismantling for access to main details with disruptive repair leads such as hands and faces was required. Where structural stability was in doubt, panels were totally or partially re- leaded due to extremely inaccessible location of windows for future works.

Cleaning

- Glass was cleaned, either in-situ or in its dismantled state, with 50:50 ratio ethanol and de-ionised water solution. Monitored with digital binocular microscope.
- Algae or lichen treated with spray diffuser, employed two applications of pure ethanol 24 hours apart.
- Areas of particularly extensive pigeon droppings (to external side) removed with 10% solution of ammonium carbonate, then washed with de-ionised water until universal indicator paper showed a neutral PH.
- The removal of lime-wash layer to SII and SIII, favoured where possible. Mechanical removal of loose deposits was carried out, as large detached flakes threatened adjacent painted detail. A three- tier cleaning policy was implemented; unpainted glass, painted but stable glass, and painted and unstable glass. The first two stages were cleaned as above, but painted and unstable glass was not cleaned.

Historic glass fabric

- All ancient glass kept.
- No attempt was made to re-order the stained glass.
- Reversed glass (with painted detail on the outside) turned around if shape allowed.
- Glass transferred within window, particularly where this allowed ancient fabric to be retained. For example, section of earlier repair glass removed from a face which was to be repaired might be re-positioned, replacing a piece of plain glass.



Cracked glass

- Where possible single stable breaks in well supported areas were left untreated.
- String leads favoured for single/double cracks in unobtrusive areas.
- Copper foil edge-bonds employed to fix single/double breaks in quarry glass, and in stained glass heads of lights that were not to be fitted with protective glazing.
- Resin (Araldite 20:20) used for complex breaks in exceptional areas to restore legibility and iconographic clarity. Assessed on a case-by-case basis.
- Resin infills (araldite 20:20) for gaps in glass, colour tinted to match the glass body.
- There was no resin edge bonding of new material to old.
- Missing glass, glass with LLGD (low lime glass deterioration) that was too fragile for resin edge bonding, or visually disturbing later insertions, were replaced on a case-by-case basis and in consultation with the cathedral architect. New inserts painted with kiln fired glass paint for durability- clearly date marked.
- One backing plate used to reinforce lost painted detail, to face of panel A3 in NIII, using fired glass paint pigments on 1mm optical glass. Some fragile sections of LLGD glass, leaded separately, and mounted on the surface of the panel to minimise stress to the glass.

Leadwork and puttying

- Leads replaced like for like. Thin (1/8 inch flat section) string leads used for repairs.
- Slender strap leads employed for broken glass within lead where panel not dismantled.
- Panels/repairs oldered using 60:40 lead/tin solder.
- Any broken or missing solder/lead joints were cleaned to bright metal and re-soldered.
- Panels with EPG were hand putted with linseed oil putty mixed with black pigment, sufficient to stabilise glass within the lead, on the external side only. Medieval panels without EPG were hand putted on both sides with linseed oil putty mixed with black pigment to make weather-tight.

Vents

- Top and base vents were introduced, where possible modern sections of glass were selected for vents. Vents were positioned at base and apex where less visible from the ground, and canted at an angle to make as unobtrusive as possible.
- Due to panels overlapping, it was possible to achieve base vents by slightly re-positioning the panels. The lowest panel was supported by a bronze U-channel set into the glazing groove.
- The tracery vents have been achieved by carefully removing areas of perimeter pointing at the bases of the traceries to allow air flow, and by removing pieces of glass at the top of each tracery, and setting slightly inside the original plane in a discrete lead frame attached using copper ties. The rationale for this is that there was a risk of halation from removed mortar higher in the lights, which was avoided by the introduction of the alternative type of vent.

East window and NII tracery have been externally ventilated as this glass was conserved in-situ.

Stained glass heads to lower tiers have not been protectively glazed as per the specification.

Ferramenta

- Main light bars removed, lightly shot blasted, tipped with stainless steel grade 316, redecorated with primer, and two top coats of rust-inhibiting paint system.
- Later tracery section ferramenta round bars replaced with new bronze bars.



3.2. POST CONSERVATION CONDITION, AND RECOMMENDATION FOR FUTURE CARE

The works were carried out employing minimum necessary intervention. All interventions are concisely described in the conservation record.

Post conservation, the initial aims of the programme were achieved:

- The glass- stained glass and plain quarry glazing was cleaned and repaired.
- All of the leaded panels are structurally sound, having been re-leaded, firmly tied to supporting ironwork with new copper ties, and neatly pointed into the glazing groove with lime mortar.
- The painted medieval glass panels were not cemented to weatherproof, as they are externally protected. The rationale behind this is that future conservation which may involve dismantling panels, will be far less traumatic for the historic glass.
- The supporting ferramenta and tie bars have all been removed, tipped with stainless steel, lightly shot blasted, decorated with high performance paint system and re-set into their pockets in the stone with lime mortar.
- The historic stained glass identified as requiring Environmental Protective Glazing had EPG fitted. The EPG system, designed specifically for the project, was tested and verified over a 12 month period by an external specialist. The system applied closely matches the test installation. This will ensure optimum environmental conditions for the vulnerable stained glass.

Recommendations for future care:

- The windows should be inspected as far as possible during quinquennial inspections by the cathedral architect.
- The external EPG panels should be removed, and cleaned, and the interspace cleaned at ten year intervals, supervised by a specialist stained glass conservator.
- The EPG should not be removed at any future date, as the medieval stained glass is structurally sound, but not cemented to weather proof.
- Archive and make the conservation record easily available to future conservators to ensure an understanding of the conservation history.

3.3. DETAILS OF HISTORIC, ARTISTIC OR TECHNICAL IMPORTANCE REVEALED DURING CONSERVATION WORK

- A large number of medieval and later glaziers marks were identified and recorded.
- An important survival of 16th century lead, lead ties and lime mortar was recorded and conserved to the traceries of window NII.
- The finger print of a medieval glass painter was recorded to window SII, panel 5d.
- A male head (Window NII, panel A3) was identified as much older than the Thomas Glazier period, probably early 14th C.

Positions of Glaziers Marks

