THE CATHEDRAL STUDIOS

St Mary the Virgin Church Hastingleigh

nVI

Final Report on the conservation of the historic stained glass

Email info@thecathedralstudios.com
Telephone 01227 865 265

ICON ACCREDITED MEMBER

THE CATHEDRAL STUDIOS

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nVI

Front cover image:
St Mary the Virgin Church, Hastingleigh, window nVI before (left) and after (right) photos

THE CATHEDRAL STUDIOS

St Mary the Virgin Church Hastingleigh

nVI

Technical Information

1. **Survey:** Carried out by Léonie Seliger in 2024

2. **Overview**

   2.1. **Size:** 2150mm x 415mm

   2.2. **Number of panels:** 3

3. **Removal**

   3.1. **Date:** November 2024

   3.2. **Removed by:** David Griffiths and Alison Eaton

4. **Studiowork:**

   4.1. **Conservators:** Isabelle Davies

   4.2. **Photographers:** Sarah Fellows and Isabelle Davies

   4.3. **Conservation reports:** Printed hard copies are archived in The Cathedral Studios. Digital versions are stored on the central server of The Chapter of Canterbury. Copies of individual reports enclosed in Appendix A.

5. **Reinstallation**

   5.1. **Date:** April 2025

   5.2. **Ventilation:** Internal

   5.3. **Protective Glazing**

   - **Design:** Leaded laminate glass panels, divided at panel divisions
   - **Installed by:** David Griffiths, Isabelle Davies and Aiden Bell-Smith
   - **Ferramenta:** Ferramenta treated by zinc-spraying and addition of stainless steel tips before painting, and reinstalled to provide support.

   5.4. **Stained Glass:**

   - **Support:** Individual panels placed within U-section bronze frames, brass t-section bars, and tied to brass bars fixed to the frames.
   - **Manufactured by:** David Griffiths, Aiden Bell-Smith and Isabelle Davies
   - **Installed by:** David Griffiths, Aiden Bell-Smith and Isabelle Davies

6. Photographic documentation:

6.1. Black & White Photography:

- In studio of individual panels- before and after conservation

Negatives archived in The Cathedral Studios, Canterbury

6.2. Digital Photography:

- In situ before removal
- In studio of individual panels- before and after conservation
- During conservation
- In situ after installation

Thumbnail images are in Appendix B. A copy of all these images is stored on the central server of The Chapter of Canterbury.

7. Catalogue of Material used:

7.1. On site:

- **Removal:**
  - Temporary boarding with 6mm marine ply.
  - Supplied by: East Kent Timber, Howfield Farm, Howfield Lane, Chartham, Canterbury, Kent CT4 7HQ
- **Final Installation:**
  - **Protective Glazing:**
  - **Glass:** 6mm laminate glass
  - Supplied by: Crackin' Glass, Mill Road, Canterbury, CT2 0AG
  - **Lead:** Mommer 15mm and 12mm flat
  - Supplied by: Kansa Craft, The Flour Mill, Wath Road, Elsecar, Nr. Barnsley, South Yorkshire, S74 8HW
  - **Solder:** 60/40 Blowpipe solder
  - Supplied by: AIM Solder (UK) Ltd, Units 2/3 Sedgewick Road, North Luton Industrial Estate, Luton, Beds, LU4 9D
  - **Fixing:**
  - **Mortar:** 1 part lime putty, 0.5 parts stone dust, 2.5 parts sharp sand and 0.5 parts soft sand Westerham B
  - Mixed by: The Cathedral Studios, Canterbury Cathedral
  - **Ferramenta:** Zinc spray and stainless steel tips
  - Supplied by: Nailbourne Forge Limited, Unit 6 Builders Square, Littlebourne, Canterbury, CT3 1XU

- **Ferramenta paint:** Rust-oleum CombiPrimer Tack-coat and Rust-oleum CombiColor Original RAL 9005 Satin
- Supplied by: Brewers Decorator Centres, Maynard Road, Wincheap Industrial Estate, Canterbury, CT1 3RJ
- **Stained Glass:**
- **Frames, main lights:** Manganese Bronze MB4 U section channel ½" x ½" x 1/16"
- Supplied by: Barley Studio, Church Balk, Dunnington, York, YO19 5LH
- **Frames, shaped sections:** Manganese Bronze MB4 U section channel 12mm x 6mm x 2mm
- Supplied by: Barley Studio, Church Balk, Dunnington, York, YO19 5LH
- **T sections:** 1/2" base x 1/2" leg x 1/16" thick tee Brass CZ121
- Supplied by: Smiths Metal Centre Ltd, 7 Argyll Road, Dukes Park Industrial Estate, East Springfield, Chelmsford, Essex, CM2 6PY
- **Bars for framed panels:** 3/8" x 3/8" rectangular section brass CZ121
- Supplied by: Metals 4U Ltd, Armitage Works, Sandbeck Way, Sandbeck Industrial Estate, Wetherby, West Yorkshire, LS22 7DN
- **Lead flashing for framed panels:** ¼" lead tape
- Supplied by: Heaps, Arnold and Heaps Ltd, Quintec Court, Barbot Hall Industrial Estate, Rotherham, South Yorkshire, S61 4RN
- **Tabs for framed panels:** Phosphorus bronze 12mm strip
- Supplied by: Smiths Metal Centre Ltd, 7 Argyll Road, Dukes Park Industrial Estate, East Springfield, Chelmsford, Essex, CM2 6PY
- **Solder:** 60/40 Blowpipe solder
- Supplied by: AIM Solder (UK) Ltd, Units 2/3 Sedgewick Road, North Luton Industrial Estate, Luton, Beds, LU4 9DT
- **Patination:** Curator Antiquing Fluid- Brown
- Supplied by: Horological Solvents Ltd, Barnside, 194 Wellington Road, Bury, Lancs, BL9 9AH
- **Fixing:**
- **Support brackets :** Brass custom made support brackets
- Supplied by: Fabweld Metalworks, Unit 2, Marlborough Road, Deal, Kent, CT14 9LE

- **Hardware for support brackets:** Stainless steel counter sunk screw
- Supplied by: Screwfix, 3 Cotton Road, Canterbury, Kent, CT1 3RB
- **Hardware for framed panels:** 8x1 bronze round woodscrews
- Supplied by: Seaware Ltd, Unit 8b, Kernick Industrial Estate, Penryn, Cornwall, TR10 9EP
- **Lead cills:** Code 4 sheet lead, 4mm thick
- Supplied by: Jewson, 509 Canterbury Riverdale, Riverdale Road, Canterbury, Kent, CT1 1TG

7.2. In the Studio:

- **Conservation:**
  - **Glass fracture supports:**
  - **Wire:** Tinned copper wire, various gauges
  - Supplied by**:** JPR Electronics Ltd, Unit 4, Circle Business Centre, Blackburn Road, Dunstable, Beds, LU5 5DD
  - **Glass Bonding:** Paraloid B72
  - Supplied by: Conservation Resources UK Ltd, Building 345, Heyford Park, Upper Heyford, Bicester, Oxon, OX25 5HA
  - **Glass Bonding and lacuna filling:** Elkem CAF™ 3 and Elkem CAF™ 33 Black silicone
  - Supplied by: Silmid, Unit 1 & 2 Roman Park, Roman Way, Coleshill, Birmingham, B46 1HG
  - **Putty**: Glazing linseed oil putty darkened with FeII Iron Oxide
  - **Solder:** 60/40 Blowpipe solder
  - Supplied by: AIM Solder(UK) Ltd, Units 2/3 Sedgewick Road, North Luton Industrial Estate, Luton, Beds, LU4 9DT
  - **Patination:** Provetro® Patina black
  - Supplied by: Pearsons Glass Ltd, 32 Wellington Park, Dunes Way, Liverpool, L5 9RJ
- **Photography:**
  - **Film:** Black & White, Ilford Delta 100 Pro
  - Supplied by: Wex Photo Video, Unit B, Frenbury Estate, Drayton High Road, Norwich, NR6 5DP

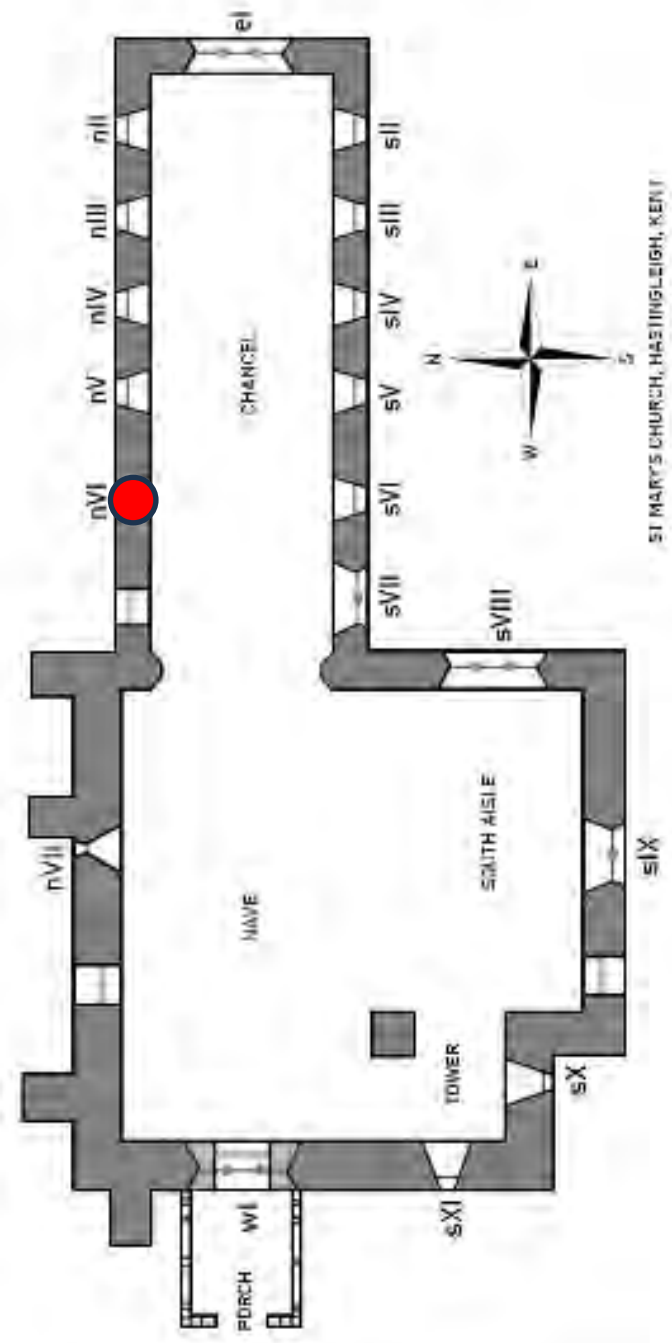
Isabelle Davies

Conservator

The Cathedral Studios, The Chapter of Canterbury, 8a The Precincts, Canterbury, Kent, CT1 2EG

Ground Plan of Church

Location of window



Historical Information

The window is a remarkably intact example of late 12th - early 13th century unpainted grisaille geometric glazing. This style is often associated with the Cistercian monastic order as it is commonly found in these contexts and followed the order's regulations of white glass, without crosses or pictures.[1] Early grisaille glazing is first colourless, then small pieces of coloured glass start to be inserted, as at Hastingleigh.[2] As the 13th century progressed the glass starts to be painted with geometric and floral designs, often increasing in complexity and naturalism over time.[3] There are two medieval stopgaps in the window that have painted floral designs, demonstrating this next stylistic step. Although clear white glass was less expensive than coloured glass, the complex cutting required and the inclusion of coloured potmetal and flashed glasses means this window was likely costly and a prestigious display, especially for a small parish church.

The window at Hastingleigh has Cistercian and non-Cistercian parallels in Britain and across Europe. Particular similarities can be found with glass in Salisbury Cathedral, York Minster, and a panel in the collection of the Stained Glass Museum at Ely.[4] The latter also includes small pieces of coloured glass at the woven design's intersections. A further local comparison is a lancet of 13th century painted grisaille glass at Stodmarsh church, including a painted design very similar to the stopgap located in the top of the window at Hastingleigh.[5] The window fits into a broader European context, with comparisons in France at Obazine, and Eberbach in Germany.[6]

The majority of the original medieval glass has survived. Some coloured glass pieces are modern replacements, and the paint suggests the pieces may have come from reused pieces of 19th century glass painted with drapery and vegetation. Painted replacements for the clear glass sections are painted with speckles to imitate corrosion. Evidence suggests a conservation campaign was undertaken in the 20th century where all the glass was releaded. This is likely when the painted infills were inserted. It is possible later repairs were made to the glass in situ, for example silicone plugs added from the outside. In the later 20th century polycarbonate protection was added to the exterior to shield the glass from impact damage. However, this created a micro-climate that encouraged extreme growth of microbes and vegetation which particularly colonised the medieval glass corrosion pits and caused darkening over a short period of time.[7] This is a primary reason for this conservation.

[1] Norton, C. (1986). Table of Cistercian legislation on art and architecture, In Cistercian art and architecture in the British Isles, ed. C. Norton and D. Park, Cambridge, Capitula c.1145-1151: L82

[2] Hayward, J. (1973). Glazed Cloisters and their Development in the Houses of the Cistercian Order, In Gesta, pp. 93–109

[3] Hayward, Glazed Cloisters, pp.93-109

[4] Allen, J. (2009). Panel of the Month Panel of Geometric Grisaille, c.1200-1250, Vidimus. [Online.] Available at https://www.vidimus.org/issues/issue-29/panel-of-the-month/; Harrigan, Z. (2015). Feature York Minster: The Twelfth-Century Grisaille Glass and Some Near-Contemporary Parallels, Vidimus. [Online.] Available at https://www.vidimus.org/issues/issue-91/feature/

[5] Clerk of Oxford. (2013). Some Kent Churches: Stodmarsh in Summer, A Clerk of Oxford. [Online.] Available at https://aclerkofoxford.blogspot.com/2013/11/some-kent-churches-stodmarsh-in-summer.html

[6] Zakin, H. J. (1979). French Cistercian Grisaille Glass, New York and London, p.20-1; Hayward, Glazed Cloisters pp. 93–109

[7] Fischer, H. (2015). Images taken of Hastingleigh window nVI internal side in situ. [Photographs.] Private collection; Morgan, N. (1970s). Images taken of Hastingleigh window nVI internal side in situ. [Photographs.] Private collection; Seliger, L. (2024). St Mary the Virgin's Church Hastingleigh, Kent: Report on the condition of the medieval grisaille glass in the north chancel with treatment recommendations. [Unpublished condition report], fig. 12.

References

List of sources used throughout the report.

Allen, J. (2009). Panel of the Month Panel of Geometric Grisaille, c.1200-1250, Vidimus. [Online.] Available at https://www.vidimus.org/issues/issue-29/panel-of-the-month/ [Accessed April 2025].

Clerk of Oxford. (2013). Some Kent Churches: Stodmarsh in Summer, A Clerk of Oxford. [Online.] Available at https://aclerkofoxford.blogspot.com/2013/11/some-kent-churches-stodmarsh-in-summer.html [Accessed April 2025].

Fischer, H. (2015). Images taken of Hastingleigh window nVI internal side in situ. [Photographs.] Private collection.

Harrigan, Z. (2015). Feature York Minster: The Twelfth-Century Grisaille Glass and Some Near-Contemporary Parallels, Vidimus. [Online.] Available at https://www.vidimus.org/issues/issue-91/feature/ [Accessed April 2025].

Hayward, J. (1973). Glazed Cloisters and their Development in the Houses of the Cistercian Order, In Gesta, pp. 93–109.

Marks, R. (1993). Stained Glass in England During the Middle Ages, London.

Morgan, N. (1970s). Images taken of Hastingleigh window nVI internal side in situ. [Photographs.] Private collection.

Norton, C. (1986). Table of Cistercian legislation on art and architecture, pp. 315-393, In Cistercian art and architecture in the British Isles, ed. C. Norton and D. Park, Cambridge.

Seliger, L. (2024). St Mary the Virgin's Church Hastingleigh, Kent: Report on the condition of the medieval grisaille glass in the north chancel with treatment recommendations. [Unpublished condition report].

Zakin, H. J. (1979). French Cistercian Grisaille Glass, New York and London.

Appendix

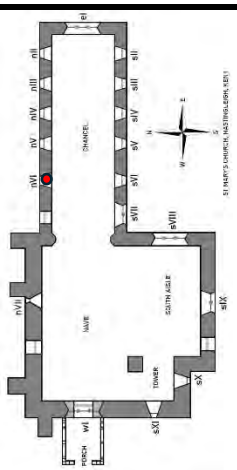
A

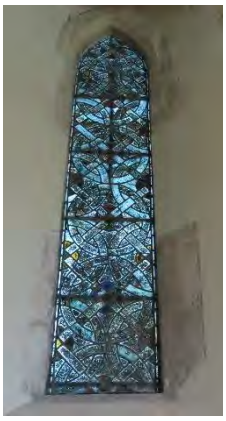
Documentation

CANTERBURY cathedral

THE CATHEDRAL STUDIOS

Conservation Records





Location: St Mary the Virgin, Hastingleigh

Panels: 1a, 2a, and 3a

Window: nVI

Measurements (h x w in mm)
1a:
765 (left) and 760 (right) x 422 (top) and 425 (bottom)
2a:
748 (left) and 745 (right) x 429 (bottom) and 415 (top)
3a:
529 x 405

Subject of Panel: Grisaille geometric glass.

Inscription: N/A

Approximate Date of Origin: Late 12th or 13th century.

Maker/Designer: Unknown.

Sources (publication, photographs, other records):
Richard Marks, Stained Glass in England During the Middle Ages, 1993, pp. 178-9.
Photographs by Professor Nigel Morgan (1970s).
Photographs by Hans Fischer (2015).

Date removed: 12 November 2024 **Date reinstalled:** 15 April 2025

Conservator	Date began	Date finished
I.D.	16/1/2025	1/05/2025

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, transmitted light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

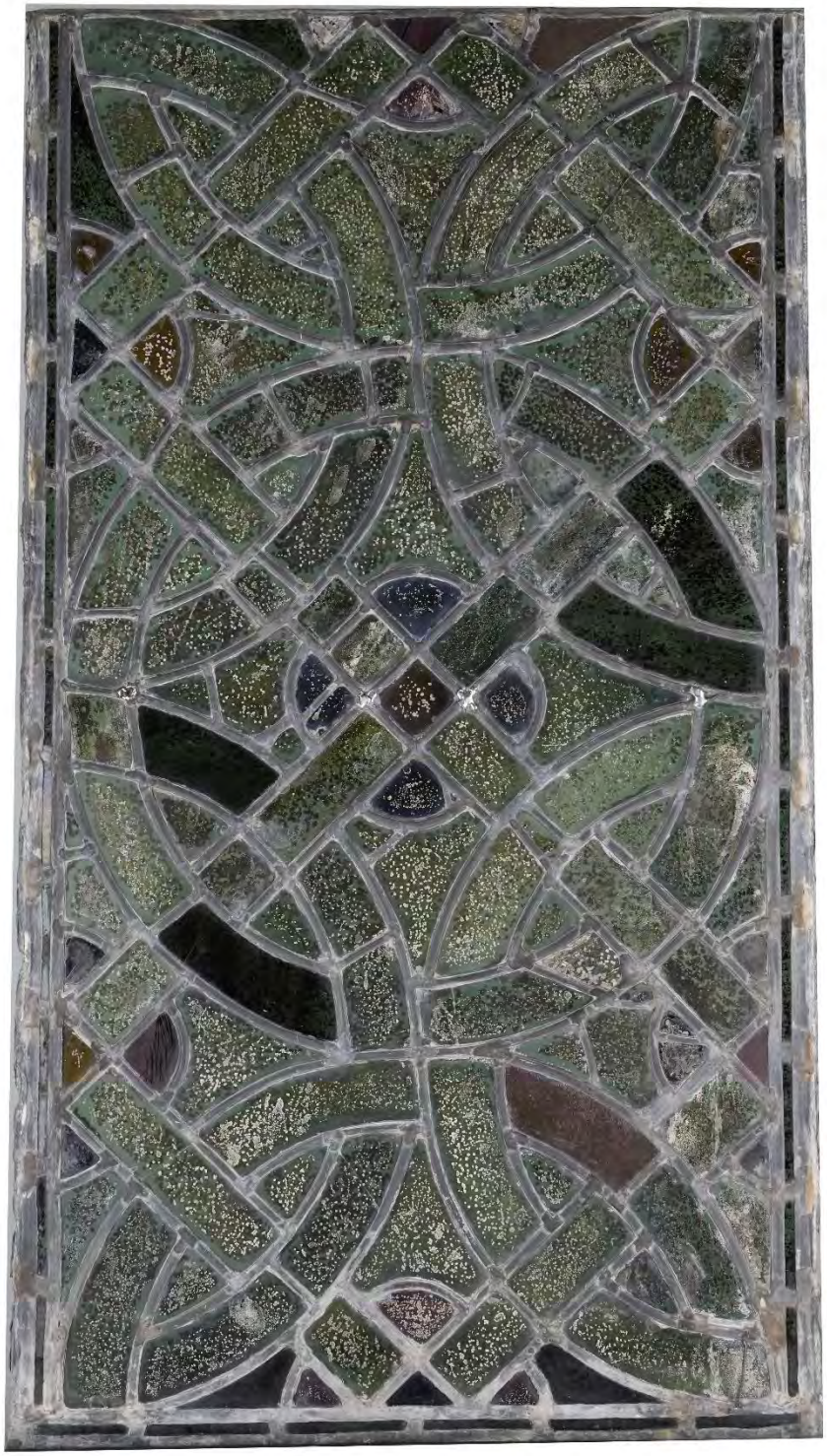
Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
Before Conservation **External**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
After Conservation **Internal**	**Image Information:** Digital, Studio darkroom, transmitted light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
After Conservation **Internal**	**Image Information:** Digital, Studio darkroom, reflected light



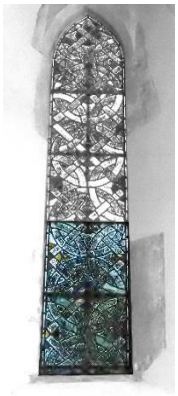
Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 1a
After Conservation **External**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 1a	**Dimensions:** 765 (left) and 760 (right) x 422 (top) and 425 (bottom) mm
Before Conservation Internal	**Date:** February 2025



- Original glass
- Modern replacement
- Another modern replacement
- Glass leaded back to front
- Glass crack
- Unsoldered lead joint
- Multiple leads or flanges
- S — Silicone added to reverse
- Strap lead
- Copper ties on exterior and evidence of past tie placement on interior

Extensive micro-organism and vegetation growth on exterior surface. See photos.

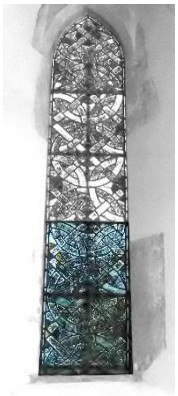
THE CATHEDRAL STUDIOS

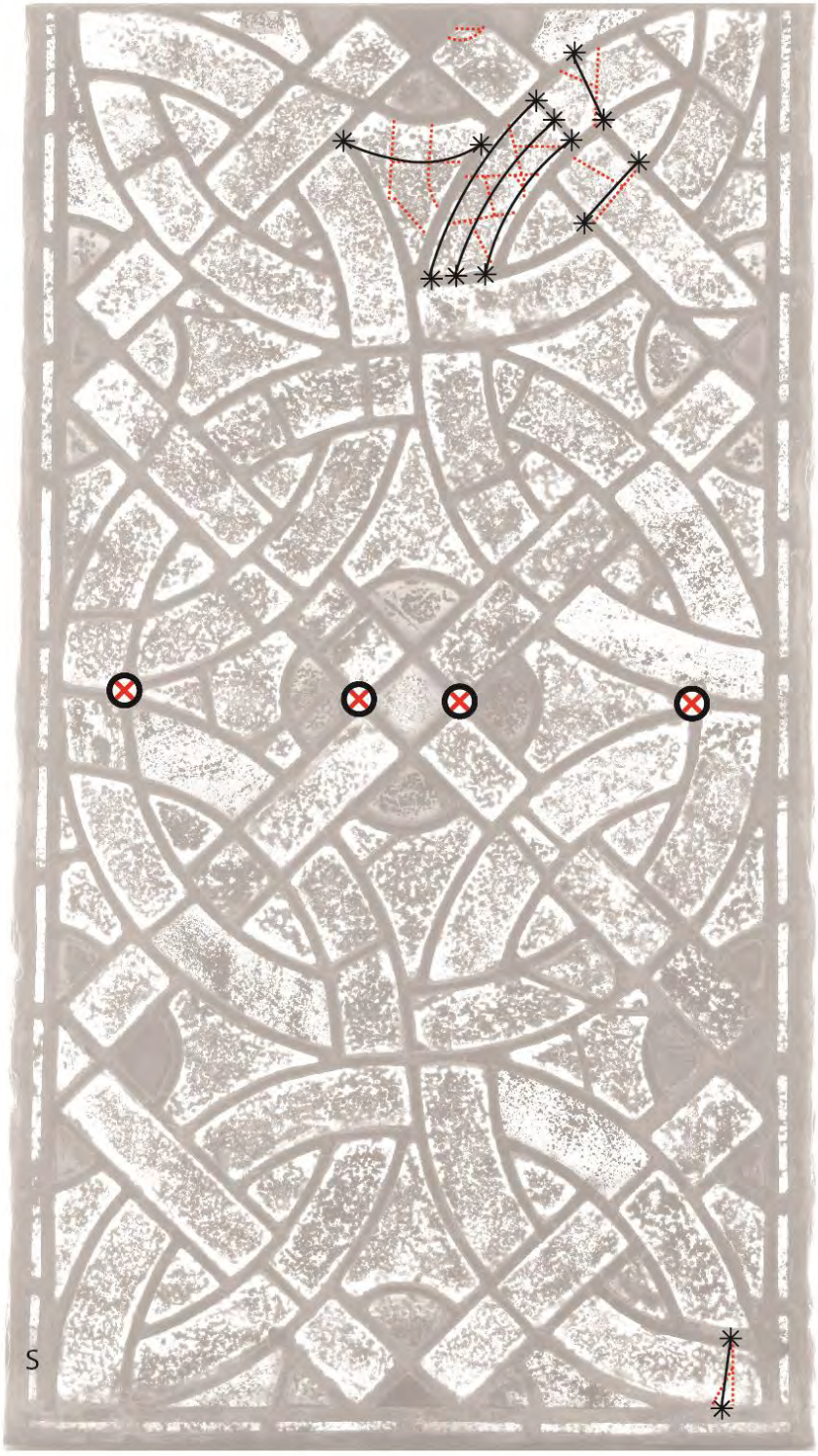
CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 1a	**Dimensions:** 765 (left) and 760 (right) x 422 (top) and 425 (bottom) mm
After Conservation Internal	**Date:** March 2025





Glass crack consolidated with Paraloid B72

Resoldered joint

Copper ties removed from exterior added to interior

Copper support wires

S Silicone

THE CATHEDRAL STUDIOS

CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, transmitted light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
Before Conservation **External**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
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Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
After Conservation **Internal**	**Image Information:** Digital, Studio darkroom, reflected light

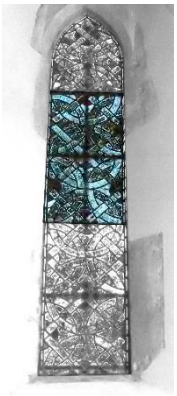
Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

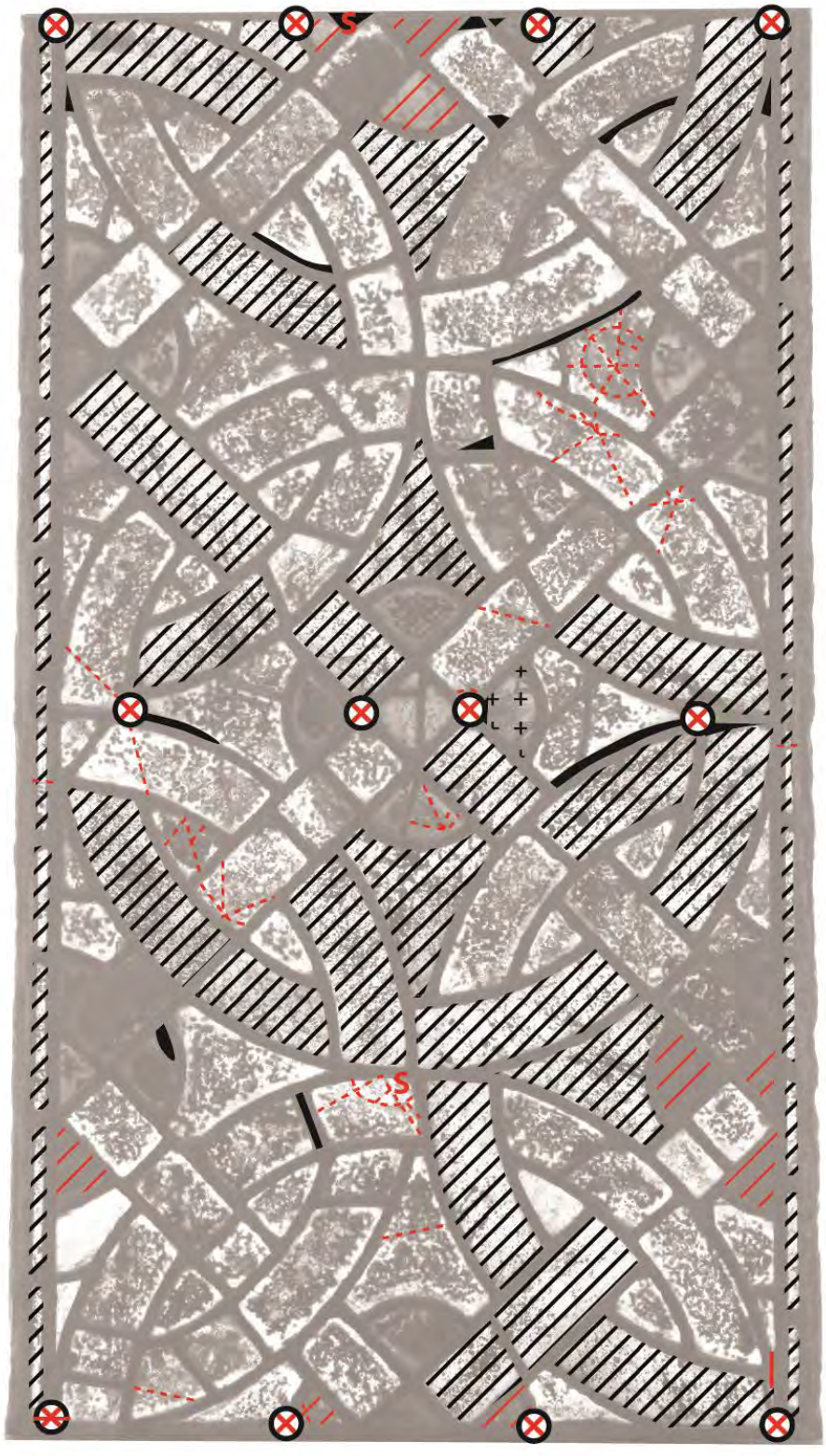
Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 2a
After Conservation **External**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 2a	**Dimensions:** 748 (left) and 745 (right) x 429 (bottom) and 415 (top) mm
Before Conservation Internal	**Date:** February 2025





- Original glass
- Medieval stopgap
- Modern replacement
- Another modern replacement
- Glass crack
- Lead crack or unsoldered joint
- Multiple leads or flanges
- S — Silicone added to reverse
- Copper ties on exterior and evidence of past tie placement on interior

Extensive micro-organism and vegetation growth on exterior surface. See photos.

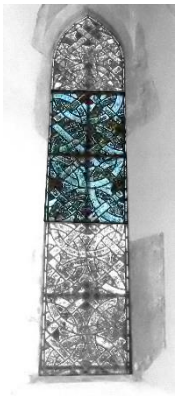
THE CATHEDRAL STUDIOS

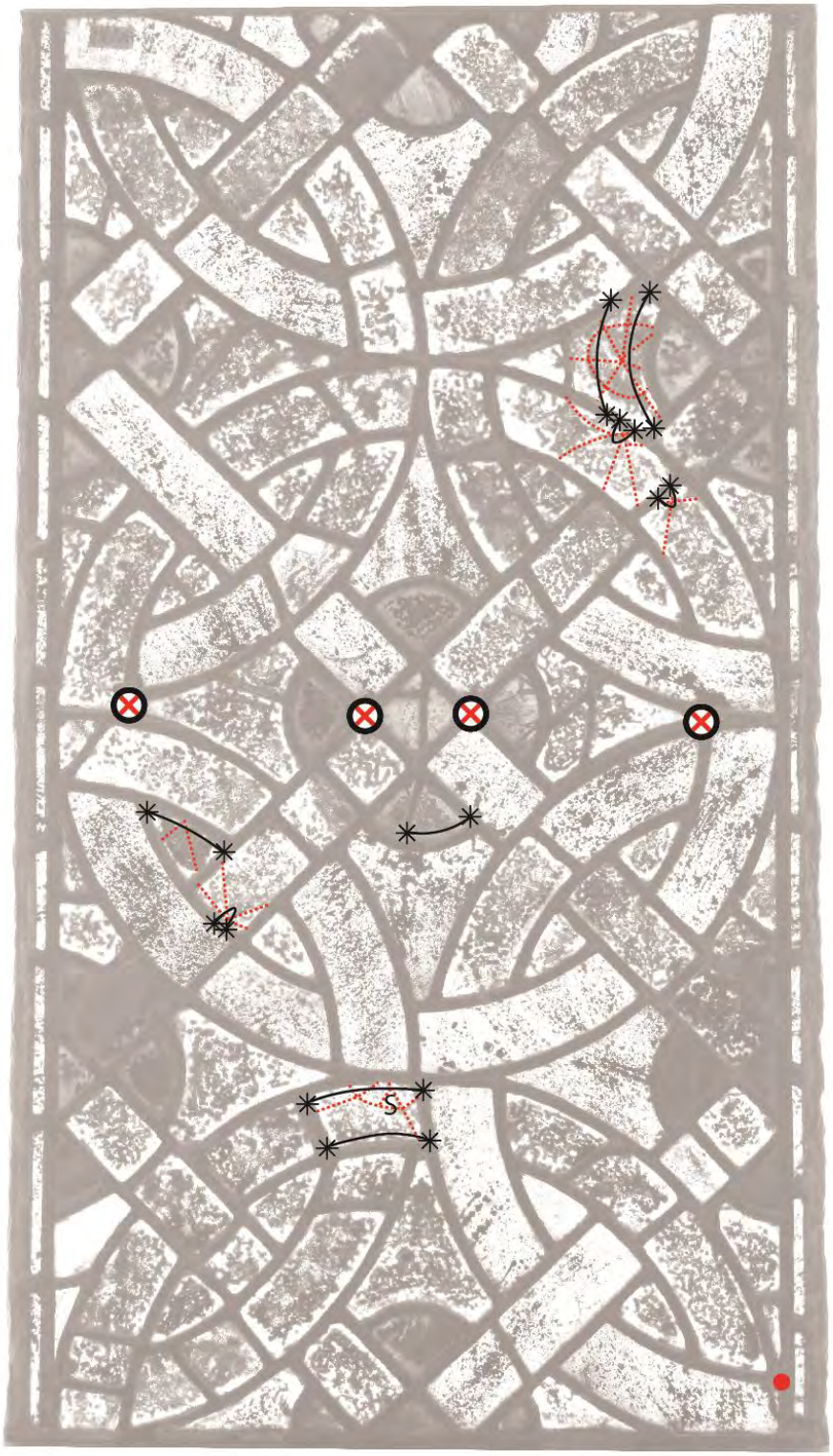
CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 2a	**Dimensions:** 748 (left) and 745 (right) x 429 (bottom) and 415 (top) mm
After Conservation Internal	**Date:** March 2025





Glass crack consolidated with Paraloid B72

Resoldered joint

Copper ties removed from exterior added to interior

Copper support wires

S Silicone

THE CATHEDRAL STUDIOS

CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 3a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, transmitted light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 3a
Before Conservation **Internal**	**Image Information:** Digital, Studio darkroom, reflected light

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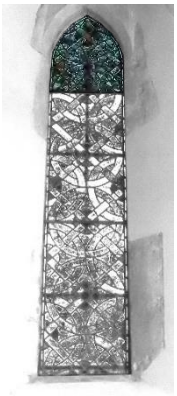
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh	**Window:** nVI
	Panel: 3a
After Conservation **External**	**Image Information:** Digital, Studio darkroom, reflected light

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 3a	**Dimensions:** 529 x 405 mm
Before Conservation Internal	**Date:** January 2025



Original glass

Medieval stopgap

Modern replacement

Glass crack

Lead crack or unsoldered joint

Multiple leads or flanges

Copper ties on exterior and past used ties on interior

Extensive micro-organism and vegetation growth on exterior surface. See photos.

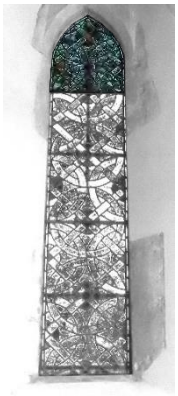
THE CATHEDRAL STUDIOS

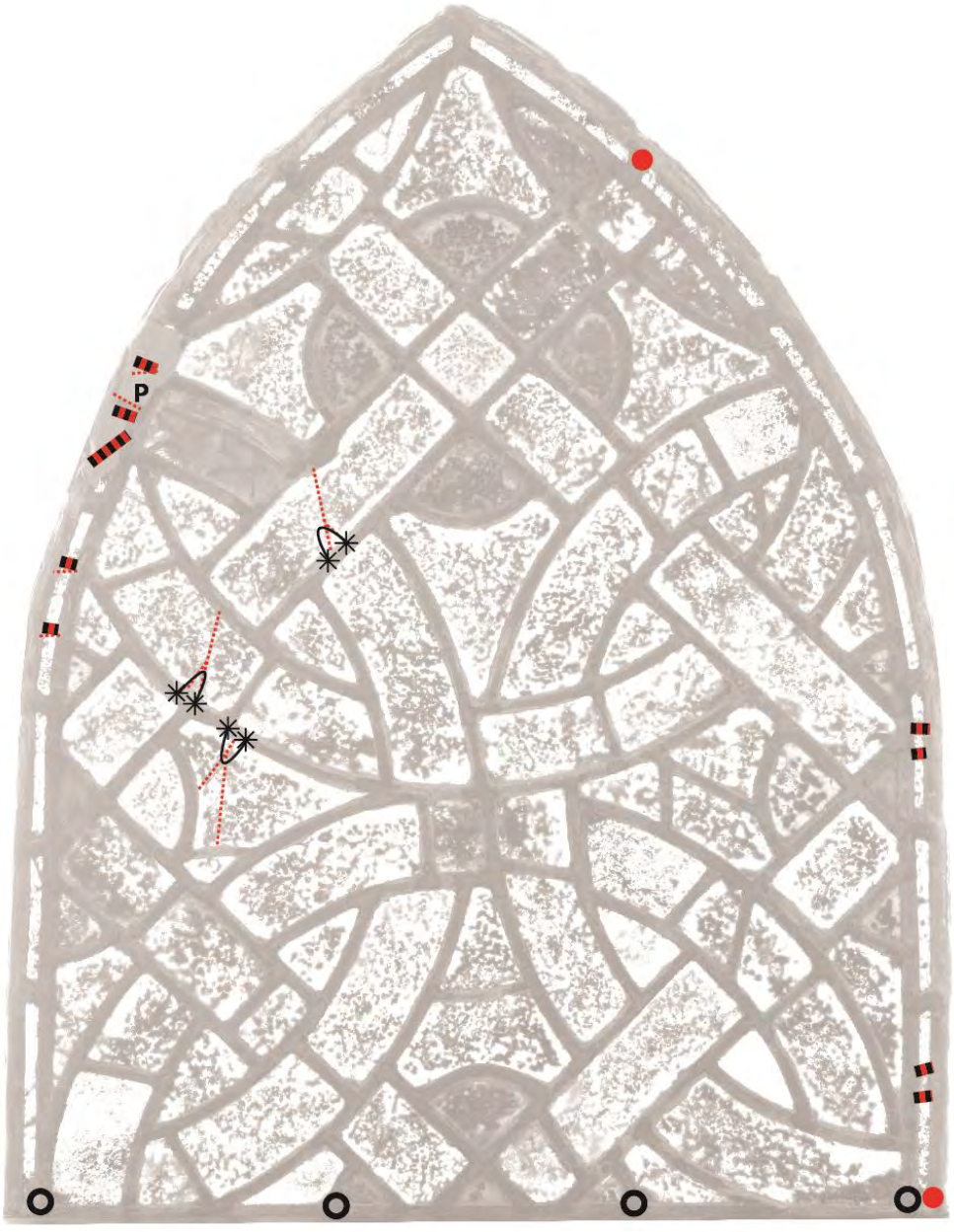
CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Location: St Mary the Virgin, Hastingleigh

Window number: nVI 3a	**Dimensions:** 529 x 405 mm
After Conservation Internal	**Date:** March 2025





Glass crack consolidated with Paraloid B72

Resoldered joint

Previous copper ties removed from interior and exterior

Copper support wires

Strap lead

P Putty repair

THE CATHEDRAL STUDIOS

CANTERBURY cathedral

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

CONDITION REPORT

Condition of window

The window was in a poor condition. There was significant corrosion of the glass and numerous complex fractures. There was slight bowing in each panel.
The external polycarbonate protective sheets had discoloured and created a sheltered and damp micro-climate ideal for the growth of microorganisms on the window's exterior.

Condition of Panels

Bowing: All panels are slightly bowed, but it appears that no pressure is being placed on the glass. 1a has slight bowing at the top and base, 2a at the top and sides, and 3a in the centre.

Bars (Number, Material, Section): External iron ferramenta, attached to the square bars externally. 1a and 2a were attached to three bars each, and 3a was attached to one.

Ties (Number, Material): All panels have external copper wires, with evidence of past internal ties. 1a and 2a each have twelve external copper wires and evidence of twelve past internal copper wires, but only large solder drops remain. 3a has four old and unused internal copper wire ties and four external copper wire ties

Lead

Type and Width: All leads are flat and milled. Internal ¼"; Borders 5/16"; Perimeter ½"; Mending leads 4mm.

Age of Lead: The panel has been releaded, likely 20th century.

Condition: The lead is in a stable and good condition.

Fractures: Minor lead fractures in all panels, generally at the perimeter but some in the body of the lead matrix. A few solder joints have been missed in the past, particularly in the borders, but these are not of structural concern.

Multiple leads: Numerous multiple leads have been used to accommodate the complex geometric shapes. In panel 1a there are three double leads and ten flanges, in 2a there are thirteen double leads and eight flanges, and 3a has five double leads and five lead flanges.

Comments: None.

Glass

Type: Medieval: Mouthblown cylinder glass.
Modern replacements: Mouthblown cylinder glass.

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Colour (Tint, Pot Metal, Flashed etc): Medieval: White tint; pot metal blue, yellow, and green; red flashed streaky glass.
Modern replacements: white tint; pot metal yellow and green; flashed red.

Thickness: Medieval: 3 mm
Modern replacements: 3 mm

Damage (Cause, if known): 1a has ten single cracks, perhaps due to pressure from slight bowing. There is an area at the top of the panel where five medieval glass pieces have multiple complex cracks; this might have been caused by an impact, e.g. a football. The modern borders have three single cracks.

2a has six single cracks perhaps from bowing pressure. There is an area at the top right of the panel where three medieval glass pieces have multiple complex cracks, and an area in the lower left where three more medieval glass pieces have multiple complex cracks; these cracks seem to be made by impacts (some lead flanges have been bent or torn back also), e.g. stones or hail. The modern borders have two single cracks.

3a has eight single cracks in the body of the glass. The modern borders have seven single cracks and one severely multi-cracked.

Dirt and Deposits:
Internal: Cobwebs, dust, dirt.
External: Cobwebs, dirt, lichen, algae, moss, mould, insects, rust, black paint splats from stanchion.

Corrosion and Corrosion Deposits:
Internal: Medieval: All show some corrosion, with pits of varying sizes, density and coverage. Pits have white and beige corrosion product.
Modern replacements: No corrosion visible.

External: Medieval: All show some corrosion, with pits of varying sizes, density and coverage, although pits are generally larger and deeper than on the internal surface. Pits have white, beige, and dark brown corrosion product. Vegetation and micro-organism growth has colonised the corrosion pits. Rust from the ferramenta has become adhered to the corrosion product in pits.
Modern replacements: No pitting. Some vegetation and micro-organism growth, but much less than on the medieval glass.

Paint, Stain and Enamel

Description:
Internal: 1a
Medieval: None.
Modern replacements: All borders and ten pieces in the main body of the panel are painted on the reverse with red grisaille spatters and dry brushed matt to mimic age, dirt, and corrosion, two of which are reversed.
Three replacement pieces of coloured glass are painted with red grisaille paint but are not painted with faux-corrosion, instead showing stippling, and stick-work, perhaps depicting grass or feathers? This glass is not medieval but could be stopgaps from older glass, possibly Victorian?

2a
Medieval: One thirteenth-century grisaille painted stopgap. A floral design with straight borders (suggesting it was taken from a rectangular piece) in reddish brown paint.
Modern replacements: Seven replacement stopgap pieces of possibly Victorian coloured glass painted with red grisaille paint with stippling, and stick-work.

3a
Medieval: One thirteenth-century grisaille painted stopgap. A floral and hatched design in reddish brown paint.
Modern replacements: No paint on internal surface.

External: 1a
Medieval: None.
Modern replacements: All borders and ten pieces in the main body of the panel are painted with red grisaille spatters and dry brushed matt to mimic age, dirt, and corrosion.

2a
Medieval: No paint on external surface.
Modern replacements: All borders and twenty-four pieces in the main body of the panel are painted with red grisaille spatters mimicking age.
Two replacement stopgap pieces of possibly Victorian green coloured glass painted with red grisaille paint with stippling, and stick-work.

3a
Medieval: No paint on external surface.
Modern replacements: All borders and three pieces in the main body of the panel are painted with red grisaille spatters and dry brushed matt to mimic age.

Condition of Surface Decoration:

Internal: Medieval: N/A
Modern replacements: Good and stable.

External: Medieval: N/A.
Modern replacements: Good and stable condition.

PREVIOUS RESTORATION

Repairs: Mending leads and replacement glass pieces were likely added to all panels during the complete releading of the window sometime in the 20th century.

1a has one strap lead and one gap in the exterior secured with clear silicone were probably done after the releading.
2a has clear silicone used in two places to fill holes in the glass. One is at the top of the panel, and the other is lower down and secures a complex set of cracks. This was likely added in situ from the exterior.

Releading: The whole window was likely releaded during the 20th century.

Later Additions: Evidence suggests that the ties were originally on the interior on the window but were later moved to the exterior.

1a has twenty-eight border glass pieces and ten glass pieces in the main body of the panel that are modern replacements painted to mimic age, dirt, and corrosion.
Three replacement pieces of coloured glass are stopgaps made of possibly re-used Victorian glass.

2a has twenty-one border glass pieces and twenty-four glass modern replacements pieces painted to mimic age, dirt, and corrosion, and nine replacement pieces of coloured glass are stopgaps made of possibly re-used Victorian glass.

3a has fifteen border glass pieces and three glass pieces that are modern replacements painted to mimic age, dirt, and corrosion.

Coatings: None.

Over- painting: None.

Comments: None.

CURRENT CONSERVATION

Glass

Cleaning, tools and materials used:

Internal: Repeated spraying with an ethanol and water 70:30 solution to kill micro-organisms. Stiff dry brush, vacuum, and cotton wool buds and poultices dampened with an ethanol and water 70:30 solution to remove dirt and deposits

External: Repeated spraying with an ethanol and water 70:30 solution to kill micro-organisms. Stiff dry brush, vacuum, and cotton wool buds and poultices dampened with an ethanol and water 70:30 solution to remove dirt and deposits.

Adhesives used for Edgebonding: Paraloid B72® was used on all panels to stabilise fractures and attach loose shells of glass (see diagrams).

1a also had Elkem CAF™ 33 black silicone used to stabilise and block a light leak in a broken modern border piece.

2a also had Elkem CAF™ 3 clear silicone used to fill up and even out the older stable silicone from a past restoration that fills a glass lacuna in the lower section of the panel. The silicone plug at the top of the panel added during a previous restoration was neatened and then left as it was stable.

Other Edge joining methods: None.

Plating: None.

Copper wire supports: 1a had seven copper wire supports added front and back.

2a had eight copper wire supports added front and back.

3a had three copper wire supports added front and back.

Insertion (Glass, Artificial Fillings): None.

Others: None.

Paint

Consolidation Method: None.

New Paint on Plating: None.

Retouching/cold paint: None.

Lead

(Releading/ New lead leaves/ Repairs to lead)

Mortar deposits were removed from all the panels with a scalpel and stiff dry brush. All ties were removed from the external surface and excess solder removed from the internal surface. Ties were moved back to the internal side, except for panel 3a as the new framing system will support the panel without ties. All new solder and support wires were patinated with Provetro® black patina.

1a had four broken or missed joints resoldered externally, as well as sixteen joints that had been cut to reduce bowing. Seven copper wires were added front and back to support multi-crack areas.

2a had one broken joint re-soldered internally and five broken or missed joints resoldered externally. Eight copper wires were added front and back to support multi-crack areas.

3a had two broken joints were re-soldered on the interior. Nine straps were added front and back on the borders. Three copper wire supports were added front and back to support single cracks.

Cementing Material and Method

Only panel 3a required linseed oil putty darkened with iron oxide to block one light leak in a border section.

Additions to the panel

All the historic glass panels are framed as part of the installation of protective glazing. This is where new clear panels of glass are inserted into the original glazing groove in stonework, and the original glass is brought slightly inside the church. This creates an internally ventilated inter-space between the new and historic glass which maintains a dry environment, preventing condensation forming on the historic glass and deterring re-growth of damaging micro-organisms.

Panel 1a was framed together with panel 2a to form a single unit. The panels were framed with manganese bronze U-section channels, 12mm wide on the sides and at the base, and 6mm wide at the top of the unit. Panels 1a and 2a are divided by a T-section bar that has two pairs of copper strip brackets attached with solder to the exterior side. One square bronze bar has been added across the internal sides of both 1a and 2a, using the

locations of old copper ties to place new ties. Four copper tabs are attached to hang the panel from the surrounding stonework, and lead tape is soldered to the sides pf the bronze channels to block light leaks.

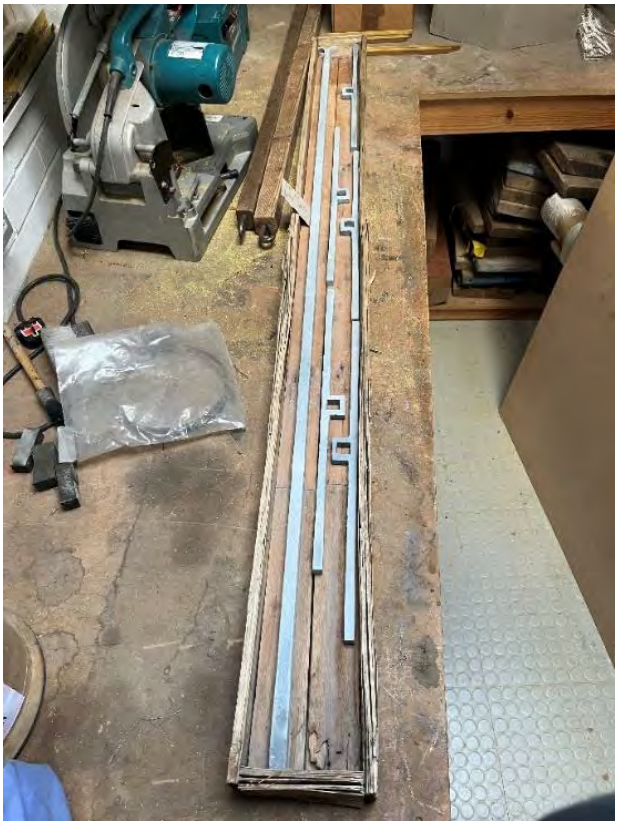
Panel 3a is framed with manganese bronze U-section channels that are 6mm wide on the sides and with a T-section bar at the base with a pair of copper strip brackets attached with solder to the exterior side. Four copper tabs are attached to hang the panel from the surrounding stonework, and lead tape is soldered to the sides pf the bronze channels to block light leaks.

Treatment of Metalwork

The external ferramenta stanchion was sandblasted and 70mm of each end of each bar was removed and then 70mm stainless steel tips were newly added to embed in the stonework. This was zinc sprayed and then painted with Rust-oleum CombiPrimer Tack-coat and then Rust-oleum CombiColor Original RAL 9005 Satin.

Before treatment

After zinc spraying



During painting of primer

After treatment

INSTALLATION

Protective glazing

One new clear laminated glass panel was made for each panel of stained glass. Each panel was slotted into the original stone groove. The lancet panels are stacked and saddled on top of each other. All panels were then pointed with lime mortar both internally and externally. The mortar was made by The Cathedral Studios. The division leads were sealed with blackened linseed oil putty. The original ferramenta which has been cleaned, re-sprayed and repainted was reinstalled to support this laminated protective glazing.

A bespoke lead tray was constructed and fitted on the cill in the interspace between the protective glazing and the stained glass to collect any condensation which forms on the protective glazing. These were pointed with the same mortar used for the protective glazing.

During installation of the protective glazing, repairs were made to the surrounding stonework.

Stained glass

The stained glass panels were framed with manganese bronze U-section channels. Phosphoros bronze tabs were attached to the external side of the frames at measured intervals. The tabs allow the frames to be fixed to the internal stonework with bronze screws. This creates an internally ventilated 70mm interspace. Each frame has lead tape soldered to the frame on the exterior of the side channels. This lead is flexible and can be positioned to block any light seepage from around the frame. Square brass bars were soldered to the frames along the position of the original bar lines and partly patinated with Provetro® black patina where necessary. New copper ties on the panel were fixed to these bars to provide support.

The framed panels were offered into position and the exact spot for drilling was marked through the holes in the tabs. They were then fixed to the stonework on internal side of the protective glazing with a 70mm interspace. The lead flashing was carefully manipulated away from areas of stonework in the head panel to allow free-flowing air in the interspace.

The bottom panel of the lancet rests on a bespoke brass bracket designed by Leonie Seliger and made by Fabweld Metalworks. This provides support to hold the weight of the panels. This bracket is fixed into the stone cill with stainless steel countersunk screws. This bracket also maintains a set width between the stained glass and the stone profile to provide the ventilation gap necessary at the base of the stained glass.

After installation internal

After installation external

RECOMMENDATION FOR CARE AND MAINTENANCE

Members of the church play an important role in the early detection of warning signs that stained glass may need additional maintenance. These could include the opening of cracks and movement of any glass or frame sections.

The windows should be especially monitored for re-growth of micro-organisms. It is recommended that checks should be carried out by the church architect as part of the quinquennial inspection and/or by a conservator at 5 to 10 year intervals.

If any concerns arise, please inform The Cathedral Studios immediately. The care and maintenance of stained glass is a highly skilled task, and it is recommended that only experienced professionals should undertake any work.

Location: St Mary the Virgin Hastingleigh
Date: May 2025
Author: I.D.

Appendix

B

Contact Sheet of Record Photography

Before Restoration

Photography


Hastingleigh nVI 1a BR-Z-I-BL (1).JPG


Hastingleigh nVI 1a BR-Z-I-BL (2).JPG


Hastingleigh nVI 1a BR-Z-I-BL (3).JPG


Hastingleigh nVI 1a BR-Z-I-BL (4).JPG


Hastingleigh nVI 1a BR-Z-I-BL (5).JPG


Hastingleigh nVI 1a BR-Z-I-RL (1).JPG


Hastingleigh nVI 1a BR-Z-I-RL (2).JPG


Hastingleigh nVI 1a BR-Z-O-RL (1).JPG


Hastingleigh nVI 1a BR-Z-O-RL (2).JPG


Hastingleigh nVI 1a BR-Z-O-RL (3).JPG


Hastingleigh nVI 2a BR-Z-I-BL (1).JPG


Hastingleigh nVI 2a BR-Z-I-BL (2).JPG


Hastingleigh nVI 2a BR-Z-I-BL (3).JPG


Hastingleigh nVI 2a BR-Z-I-BL (4).JPG


Hastingleigh nVI 2a BR-Z-I-BL (5).JPG


Hastingleigh nVI 2a BR-Z-I-RL (1).JPG


Hastingleigh nVI 2a BR-Z-I-RL (2).JPG


Hastingleigh nVI 2a BR-Z-O-RL (1).JPG


Hastingleigh nVI 2a BR-Z-O-RL (2).JPG


Hastingleigh nVI 2a BR-Z-O-RL (3).JPG


Hastingleigh nVI 3a BR-Z-I-BL (1).JPG


Hastingleigh nVI 3a BR-Z-I-BL (2).JPG


Hastingleigh nVI 3a BR-Z-I-BL (3).JPG


Hastingleigh nVI 3a BR-Z-I-BL (4).JPG


Hastingleigh nVI 3a BR-Z-I-BL (5).JPG


Hastingleigh nVI 3a BR-Z-I-RL (1).JPG


Hastingleigh nVI 3a BR-Z-I-RL (2).JPG


Hastingleigh nVI 3a BR-Z-O-RL (1).JPG


Hastingleigh nVI 3a BR-Z-O-RL (2).JPG


Hastingleigh nVI 3a BR-Z-O-RL (3).JPG

After Restoration

Photography


Hastingleigh nVI 1a AR-Z-I-BL (1).JPG


Hastingleigh nVI 1a AR-Z-I-BL (2).JPG


Hastingleigh nVI 1a AR-Z-I-BL (3).JPG


Hastingleigh nVI 1a AR-Z-I-BL (4).JPG


Hastingleigh nVI 1a AR-Z-I-BL (5).JPG


Hastingleigh nVI 1a AR-Z-I-RL (1).JPG


Hastingleigh nVI 1a AR-Z-I-RL (2).JPG


Hastingleigh nVI 1a AR-Z-I-RL (3).JPG


Hastingleigh nVI 1a AR-Z-O-RL (1).JPG


Hastingleigh nVI 1a AR-Z-O-RL (2).JPG


Hastingleigh nVI 1a AR-Z-O-RL (3).JPG


Hastingleigh nVI 2a AR-Z-I-BL (1).JPG


Hastingleigh nVI 2a AR-Z-I-BL (2).JPG


Hastingleigh nVI 2a AR-Z-I-BL (3).JPG


Hastingleigh nVI 2a AR-Z-I-BL (4).JPG

Hastingleigh nVI 2a AR-Z-I-BL (5).JPG

Hastingleigh nVI 2a AR-Z-I-RL (1).JPG

Hastingleigh nVI 2a AR-Z-I-RL (2).JPG

Hastingleigh nVI 2a AR-Z-I-RL (3).JPG

Hastingleigh nVI 2a AR-Z-O-RL (1).JPG

Hastingleigh nVI 2a AR-Z-O-RL (2).JPG

Hastingleigh nVI 2a AR-Z-O-RL (3).JPG

Hastingleigh nVI 3a AR-Z-I-BL (1).JPG

Hastingleigh nVI 3a AR-Z-I-BL (2).JPG

Hastingleigh nVI 3a AR-Z-I-BL (3).JPG

Hastingleigh nVI 3a AR-Z-I-BL (4).JPG

Hastingleigh nVI 3a AR-Z-I-BL (5).JPG

Hastingleigh nVI 3a AR-Z-I-RL (1).JPG

Hastingleigh nVI 3a AR-Z-I-RL (2).JPG

Hastingleigh nVI 3a AR-Z-I-RL (3).JPG

Hastingleigh nVI 3a AR-Z-O-RL (1).JPG

Hastingleigh nVI 3a AR-Z-O-RL (2).JPG

Hastingleigh nVI 3a AR-Z-O-RL (3).JPG

Appendix

C

St Mary the Virgin's Church Hastingleigh, Kent Report on the condition of the medieval grisaille glass in the north chancel with treatment recommendations

THE CATHEDRAL STUDIOS

St Mary the Virgin's Church

Hastingleigh, Kent

Report on the condition of the medieval grisaille glass in the north chancel with treatment recommendations

The Cathedral Studios 8A The Precincts, Canterbury, Kent CT1 2EG

Tel 01227 865 265 email: leonie.seliger@canterbury-cathedral.org

ACCREDITED MEMBER

Frontispiece:

The bottom section of the window seen from the inside

1. Introduction

1.1. Purpose

This report records the content and the condition of the glazing of the westernmost window on the north side of the chancel, (CVMA number nVI). It gives recommendations for the conservation / restoration treatment of the glazing and discusses the introduction of protective glazing.

The report was commissioned by The Friends of Hastingleigh Church.

1.2. Author

The author, Léonie Seliger ACR, is Director of Stained Glass at Canterbury Cathedral, and a PACR accredited conservator with over 30 years' experience. She advises the dioceses of Canterbury and Rochester on faculty applications regarding glazing in churches.

1.3. Access for survey and photographic recording

A survey of the windows was carried out by the author. Physical access to the windows was limited to a ladder reaching sill level. Weather conditions were bright and dry. Light levels were moderately high.

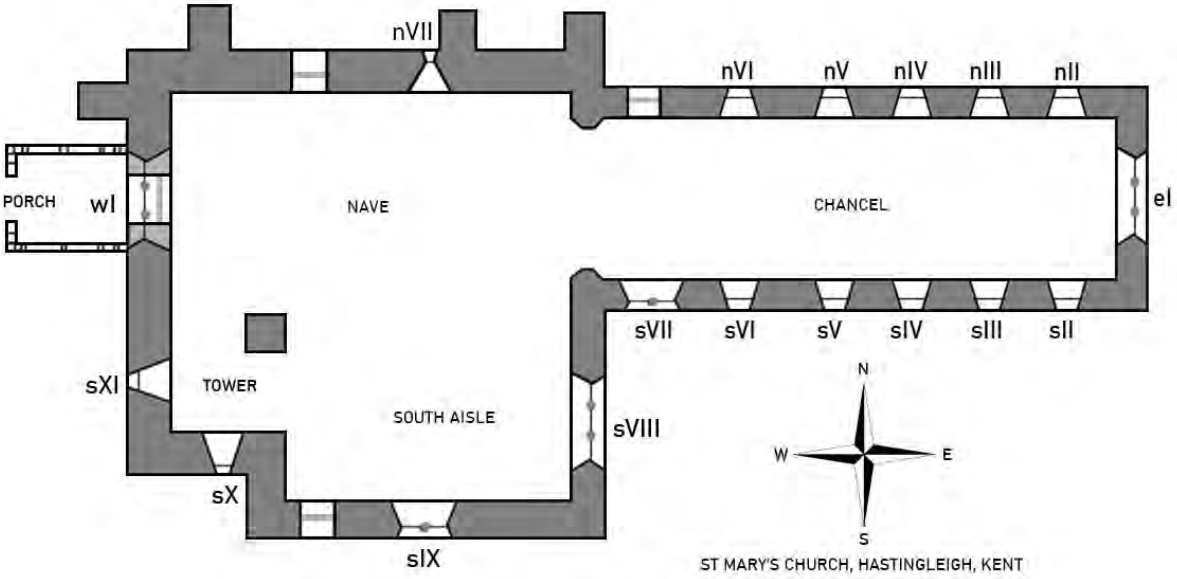
Digital photographs including details of damages were taken by the author on the day of the survey.

1.4. Numbering

The numbering of the windows was applied by the author using the CVMA window numbering system. The numbering assumes clerical orientation and ignores the actual orientation of the building. The numbering begins with the windows in the axis of the choir and continues towards the west, taking north and south sides simultaneously. North windows are labelled 'n + number', south windows 's + number'.

1.5. Terminology

- ‘Lancet’ – a single uninterrupted opening in the stonework.
- ‘Panel’ – a single unit of glazing; the glazing of a lancet usually (although not always) comprises two or more panels. Panels are usually rectangular; those at the top of a lancet conform to the shape of the window opening.
- ‘Head’ – the topmost panel within a lancet (usually from springing upwards).
- ‘Saddle bar’ – a horizontal metal bar attached to the lead matrix of a glazing panel with tie wires or lead strips; the ends of the bar are embedded into the surrounding stonework to give lateral stability to the glazing.
- ‘Springing’ – the point at which a vertical line turns into an arch.



2. Window nVI (north side of the chancel, fig.1)

Summary: This is without doubt the most important window in the church. It is in very poor condition and requires urgent action to reduce the currently high environmental stresses on the medieval glass.

There are significant corrosion damages as well as many compound fractures in the glass.

The existing external polycarbonate sheets have discoloured and do not prevent the growth of micro-organisms on the corroded glass. This means that they have failed to provide the necessary protection.

Some possible structural movement in the surrounding stonework.

Priority: high.

Fig.1

2.1. Date

Late 12th or 13th century

2.2. Size

2150mm x 415mm

2.3. Iconography

Geometric ornament, known as 'grisaille', glass. The ornament is based on interlocking circles and squares. Similar geometric patterns are present in York Minster and in French Cistercian glazing (fig2).

2.4. Attribution

Unknown.

2.5. Condition

2.5.1.External protection:

The window is protected on the outside by three stacked sheets of polycarbonate (fig.3). The sheets are affixed to the stonework surrounding the glazing with stainless steel shroud plates [1] (fig.4).

The location of the polycarbonate, sitting just proud of the wall surface, and the fact that the three sheets are stacked on top of each other, allows water to run into the interspace between external cover and medieval glazing. Significant amounts of dirt have accumulated on the inside as well as the outside of the polycarbonate (fig.5). The polycarbonate itself has become opaque to the extent that from the outside the medieval glass is invisible. From the inside, the opaque and dirty polycarbonate reduces the light transmission through the glass.

2.5.2.Glass:

Original glass: a preliminary visual in situ assessment suggests that over 80% of the original glass survives (fig.6). It is mouthblown glass of pale green tint, accented by small pieces of green, blue, yellow pot metal glass and red flashed and striated glass (fig.7).

Both internal and external glass surfaces show corrosion damages in the form of pitting (fig.8).

Many glass pieces are badly broken, some missing small fragments (fig.9).

Later glass: the modern glass replacements are also of mouthblown glass with a similar green tint. It shows no corrosion but has been painted to emulate the appearance of corroded glass.

2.5.3.Lead:

The lead appears to be in sound condition. It is certainly no older than 100 years, and probably contemporary with the modern glass replacements.

The glazing is divided into three panels; divisions occur at the second and forth horizontal ferramenta bars. The leadwork appears to be structurally sound and flat.

2.5.4.Painted decoration:

[1] Holt Allen HA 4025 shroud plate. The earliest use of these plates was ca 1960, so the installation must post-date this.

Only the modern replacement glass has been painted with vitreous oxide paints to emulate the effects of corrosion on the original glass. None of the original glass appears to have been painted. What paint there is appears to be stable.

2.5.5.Dirt and deposits:

Excess glazing grout, some spatters of whitewash. The corrosion pits are filled with white corrosion products. On the outside, the deeply pitted glass surfaces are almost entirely covered with green algae and small discreet spots of lichen (fig.10). Cobwebs trap detritus between the stanchion bars and the glazing.

The modern glass is far less affected by microbial growths.

2.5.6.Stonework:

The glazing appears to be set into a reveal rather than a glazing groove. Generally sound. On the inside fractures between pointing and quoins have developed. Two quoins show movement (fig.11), probably through rust expansion of embedded iron bar ends.

2.5.7.Structural support:

The glazing is supported by external ferramenta: a vertical stanchion passing through lugs in four horizontal bars. These are hand-forged wrought iron, possibly medieval.

The embedded bar ends are causing damage to the stonework through rust expansion.

2.5.8.Pointing:

Hard cementitious mortar used to hold the glazing in place.

2.6. Assessment

2.6.1.Significance:

This window is a rare survival of what must once have been a common sight – geometric patterned windows probably made up the larger part of ecclesiastical glazing in parish churches, with historiated stained glass used sparingly and mainly reserved for cathedrals and abbeys[2].

[2] Richard Marks, Stained Glass in England During the Middle Ages, 1993, pp178-9.

The similarity of the pattern with windows in York Minster and in the Cistercian Abbey of Obazine, France (fig.2), dating to the 2nd half 12th century, sets this window into an international context, illustrating the sophistication and connectedness of a rural location such as Hastingleigh in the Middle Ages.

The window has undergone restoration at least once. All of the lead and about 20% of the glass has been replaced, and many fractures were repaired with additional leads.

The date of the restoration is unknown, but the condition and type of lead indicates that it was carried out within the last 100 years. The addition of polycarbonate sheets to the outside may have been carried out at the same time. Other, earlier restorations may have also taken place.

2.6.2. Causes for deterioration:

The glass in this window shows serious damages due to corrosion. Glass corrosion affects medieval glass far more than Roman or modern glass, due to its high content of potash as a flux. It is a complex chemical process which requires the presence of liquid water, either in the form of rain or condensation. Particularly damaging is long-term exposure to moisture.

Set on the north side of the church, this window is likely to experience longer periods of condensation on its interior than windows that are regularly dried by sunlight.

The (no doubt well-intentioned) addition of external polycarbonate sheets protects the glazing from vandalism and accidental impact. Unfortunately, it also provides a sheltered environment for microbial growths to flourish. These contribute to the glass decay by acting like a sponge, attracting and keeping water on the surface. In addition, their metabolic products can attack the glass itself. They also reduce the light transmission through the glass considerably.

2.6.3. Rate of deterioration:

While it is always difficult to quantify the rate of deterioration, a comparison between photos taken in the 1970s, in 2015, and in 2023 shows that significant darkening has

occurred (fig,12)[3]. This is likely due to the microbial growth on the outside of the window thriving in the sheltered by moist environment created by the polycarbonate sheet.

2.7. Recommendations

2.7.1. Ferramenta:

The ferramenta need to be removed to replace the embedded ends with stainless stell ends. They should be shotblasted, zinc-sprayed, and painted with a rust-inhibiting paint finish before reinstallation.

2.7.2. Stained Glass:

While the lead matrix of the window appears to be in sound condition, the medieval glass requires urgent attention:

The many fractures need to be secured to prevent further losses of original materials. Assuming that the window will be given a new and well-functioning protective glazing system, most glass fractures can be secured by wicking in an acrylic resin (Paraloid B-72™). This will eliminate the need to remove glass from the lead matrix for repairs.

The microbial growth needs to be treated with repeated spray applications of 50:50 ethanol and water mix to kill the active growths. After the microbial growth has been neutralised, it can be removed using poultices and cotton wool swabs dampened with the same solvent mixture.

NB: microbial growths will re-colonise the glass surfaces if the environmental conditions allow it, as the microbial spores are always present in the air. The only way of preventing re-growth is to drastically change the environmental conditions of the window. Cleaning and the installation of a well-functioning protective glazing system will eliminate or at least very significantly reduce the available water and food source.

[3] I am grateful to Professor Nigel Morgan and Hans Fischer for their kind permission to use their historic photographs for comparison with the current condition of the glazing.

2.7.3.Protective glazing:

- Purpose:

The purpose of protective glazing is to significantly reduce environmental stresses on the historic glass and to provide a measure of resistance to impact damage in locations that are vulnerable to vandalism or break-ins. The external appearance of the protective layer should be designed with the aesthetic impact upon the building as a whole and upon the glazing itself.

The existing external cover of the window has failed in two out of the three requirements:

a. It has encouraged rather than prevented microbial growths. Glass corrosion is still ongoing.
b. It has discoloured and is extremely unsightly from the outside. The yellow opaque plastic makes the glass look dark from the inside.
c. It does, however, still provide protection against vandalism and accidental damage.

- Design of the new external layer:

Several options may be considered.

Glazing type	Advantages	Disadvantages
a. Laminate glass (fig.13)	Provides good protection from impact damage to the historic glazing. Is invisible from the inside. Cost effective.	Large reflective surface unlike the leaded windows. Can be perceived as unsightly.
b. Mouthblown glass with wire grilles (fig.14)	Provides good protection from impact damage, both to the historic glazing and to the mouthblown glass. Reflection of the mouthblown glass is less flat than that of laminate glass and is further	Wire grilles can be visible from the inside. Higher cost.

	reduced by the wire grilles.	
c. Toughened glass	Provides very good protection from impact damage, both to the historic glazing and to the toughened glass.	Large reflective surface unlike the leaded windows. Can be perceived as unsightly. Can fail completely if hit with a sharp point (air gun pellet, pointed tool); it will then disintegrate into tiny fragments. Higher cost.
d. Leaded lights copying some of the lead lines in the original glazing (fig.15)	Gives a traditional leaded light appearance from the outside. Can be repaired in situ if damage occurs to individual glass pieces.	The extra lead lines can be visible from the inside. In the case of this window, which relies on its geometry for effect, this would be unacceptable. Higher cost.

Of those, we recommend option 1 as the most suitable and cost-effective one in this location and for this glass.

It will introduce a large reflective surface, however the north aspect of the church is not a show side of the building and is not overlooked by the public except those few who walk around the building.

2.7.4.Installation

- Protective layer

The new protective glazing layer should be installed into the reveal that currently houses the medieval glazing. This will ensure that the protective glazing prevents water from penetrating into the interspace between the two glazing layers. The laminate sheet will be made in two sections, with a division at the level of the upper horizontal bar, so it will not be visible. The two sections of laminate sheet will be surrounded with lead profile, both to protect the raw glass edges, and to protect the resin interface between the two glass layers from the alkalis in the mortar used to install the glazing.

- Medieval glass

The medieval glazing will be brought inwards and suspended from the stonework in a bespoke bronze U-channel frame (fig.16). Narrow strips of lead flashing attached to the perimeter of the bronze frame will prevent light seepage between frame and stonework.

The distance between the two layers will be ca 50mm and must be ventilated to the interior of the building. This will reduce thermal extremes on the medieval glass and prevent condensation from forming on it. The most discreet ventilation slots can be achieved by replacing with stainless steel mesh ca 50% of the narrow border glass strips from the bottom and from the curved part of the top of the glazing. These border glass strips are all of modern glass, which will be archived after removal. Condensation will still form on the inside of the new protective glazing. This will be evacuated via a lead drip tray at the bottom of the laminate glass sheet.

Sectional drawings of the current installation and of the proposed new arrangement are appended to this report.

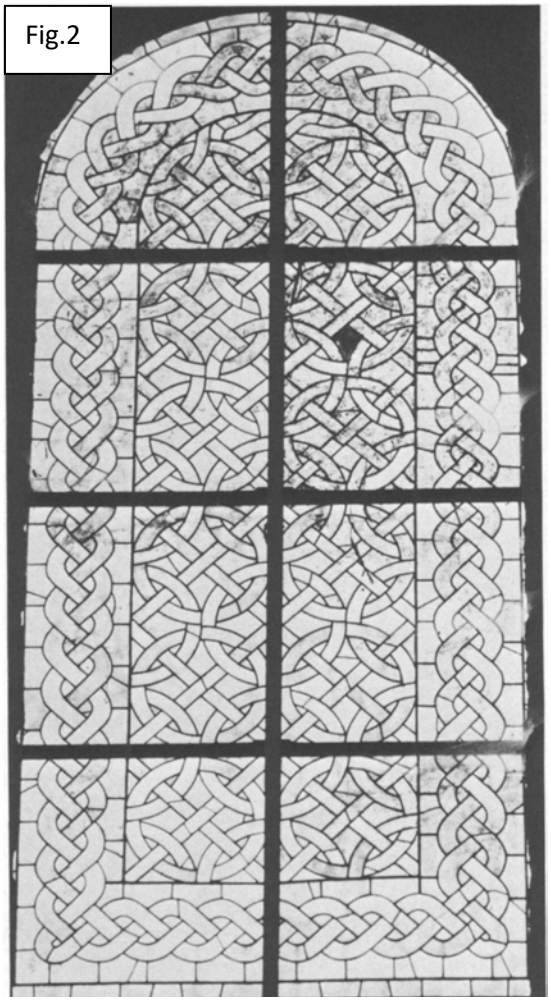
2.8. Continuing Care

The installation of the medieval glass into a well-ventilated environmental glazing system as described above will significantly reduce the risk of re-growth of microbial mats as currently present on the outside. It will greatly extend the life span of this important and beautiful window as well as of the existing resin repairs to fractured glass.

Corrosion should not be progressing at a measurable rate once the glass is kept in a dry condition.

The glass should still be inspected periodically (e.g. as part of the quinquennial inspection).

Fig.2



Almost identical pattern in the Abbey of Obazine

Fig.3

The window seen from the outside (on the left)

Fig.4

Shroud plate fixing

Fig.5

Accumulation of dirt on polycarbonate

Fig.6

Original glass and later additions (in grey)

Fig.7

Reconstruction of original design

Fig.8

Corrosion pitting on the inside, showing white corrosion products

Fig.9

Glass fractures highlighted

Fig.10

Microbial growths, dirt, cobwebs in interspace, rust staining of mortar at bar ends

Fig.11

Damage to stonework through rust expansion of embedded ferramenta bar ends

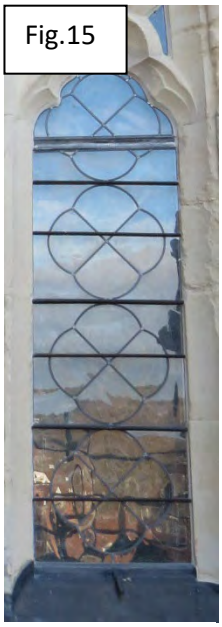
Fig.12

Condition of glazing in the 1970s (Prof Nigel Morgan), 2015 (Hans Fischer), 2023 (author)

Fig.13

Fig.14

Fig.15



Examples of (from left to right) laminate glass; mouthblown glass in combination with wire grilles; mouthblown glass in simplified lead pattern

Fig.16

Examples of bronze-framed medieval stained glass in Holy Trinity Church, Long Melford, suspended on the inside of the stonework, with laminate protective glass on the outside