Stained Glass Conservation in the 21st Century
An Introduction to Current Practice

Sarah Brown
The York Glaziers Trust
sarah.brown@yorkglazierstrust.org
Then and Now
Patch repairs with ‘stop-gaps’ from the glaziers store
Holy Trinity, Goodramgate, York
Past approaches: copy/replace
Winchester college chapel, c1385
Restored Betton & Evans, c1814
(photos: Gordon Plumb)
Painted repairs

Left: East Window, York Minster, 1405-8, repairs of 1820s
Above: East Window, Margaretting, Essex, mid C15, restored 1870s
Redressing the Balance: ‘Toned Insertions’

North Moreton, Oxon, c1300

Restored 1860s by Ward & Hughes, under direction of Charles Winston

(Photos: Gordon Plumb)
Mechanical Damage

- **Accidental Damage**
  - Ball games
  - Birds
  - Window cleaners
  - Scaffolders
  - Lawn mowers

- **Deliberate Damage**
  - Iconoclasm
  - Vandalism/Break ins
Examples of Accidental Damage (ball-game and bird-strike)
DELIBERATE ?: RELIGIOUS OR POLITICAL ICONOCLASM
Left: Fairford, Gloucs, East Window
Right: Holy Trinity Goodramgate, east window
VANDALISM AND CRIMINAL DAMAGE

Top: Attempted break in, York Minster

Right: Break out, Lincoln Cathedral
INHERENT WEAKNESSES:
The lead net
(Beverley Minster east window, leads of 1859-65)
PAST APPROACHES TO LEADED REPAIRS: MENDING LEADS AND STRAP LEADS
Left: St Michael, Spurriergate, York
Right: C12 glass in store, York Minster
Environmental Factors

- Moisture – external (rain, sleet etc)
- Moisture – internal (humidity and condensation)
- Wind pressure
- Air-borne pollutants / ‘acid rain’ (now less problematic)
- Heating/ventilation
- Building use
IMPACT OF MOISTURE – EXTERNAL DAMAGE

North nave aisle of York Minster, c1330
Internal moisture (condensation!)
Left: Norbury, C14
Right: Skelton upon Ure, Yorks, 1870s
Paint Loss: York Minster, North nave aisle
Paint Loss

Left: Sherborne, Dorset, Harman & Co. for Pugin, 1852

Right: St Martin, Scarborough, Morris & Co, 1870s
Paint Loss
Alborough, Yorks
William Warrington, 1840s
Manganese browning

New College, Oxford

Chapel north side, c1385
Microbial growth
Left: Norbury
Right: Checkley, Staffs
3.2.1 The installation of a protective glazing system is a crucial part of the preventive conservation of architectural stained glass, which is vulnerable to both mechanical and environmental damage. The principal aims of a protective glazing system are to relieve the stained glass of its function as a weather shield, to protect it against mechanical and atmospheric damage, and to prevent condensation on the surface of the stained glass. Every window installation is unique, and therefore the design of its protective glazing must take into account the particular preservation needs of the stained glass and its architectural setting, as well as the physical and aesthetic impact on the building.
East Front of York Minster, 1871
PROTECTIVE GLAZING PRINCIPLES
INTERIOR VENTILATION SYSTEM

1. Inner face of protective glazing. Any condensation will form on this surface.

2. Outer face of stained glass. This surface remains free of moisture due to constant airflow, maintaining an even temperature with the inner face of glass.

3. Inner face of stained glass. This surface remains free of moisture and at the temperature maintained within the building.

4. The mounting of the stained glass with an equal space at the top and base of the lancet admits uninterrupted airflow from inside the building.

5. A lead condensation tray at the sill will allow any condensation to run away to the exterior without damage to stone.

6. Small-gauge gravel within the upstand of the lead tray allows moisture to run off but resists ingress of air from the exterior.

NB: This illustration shows a common solution to an effective ventilated protective glazing system (often known as isothermal glazing). Variations in treatment and positioning of the glass and the technical details of fixing are possible, depending on the space available and the nature of the building. It is important to consider the need of each glazing scheme in context and on a case by case basis.
AN ENVIRONMENTAL PROTECTIVE GLAZING SYSTEM
INTERIOR VENTILATION

1. Original stained glass set into a bronze frame with integral bronze support bars
2. Protective glazing panel made with lead and clear glass as a simplified version of the stained glass design
3. Glazing groove in a stone mullion. Panels of protective glazing are set here and weathertproofed with traditional lime mortar

NB: This illustration shows a common version of an effective ventilated protective glazing system (often known as isothermal glazing). Variations in treatment and positioning of the glass and the technical details of fixing are possible, depending on the space available and the nature of the building. It is important to consider the need of each glazing scheme in context and on a case by case basis.
Exterior treatments:
Left: Checkley (large sheets)    Right: York Minster, leaded pieces
Effective UV protection
Other Conservation Interventions

- **Cleaning**
  - Mechanical (brushes, scalpel)
  - Chemical (solvents and chelating agents)
  - Dry/Wet

- **Bonding of breaks**
  - Adhesives: Epoxy Resin / silicon
  - Mechanical bonds: copper foil/string leads

- **Stabilisation/Consolidation of fragile paint**

- **Trimming of leads**

- **Renewal of lead matrix** – partial or total
Cleaning: Past Approaches

Left: York Minster, East Window
Right: Sainte Chapelle, Paris, c1248
York Minster’s Great East Window, 1405-8: Benefits of Edge-Bonding (and more appropriate leading)
Chapter House vestibule sV (c1290), state following releading in 1915 (right)
Chapter House vestibule sV (c1290)

After conservation and protection, in 2009
Venice Charter 1964 Article 12:
Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence.”

CVMA Guidelines 2004, Article 4.4:
The insertion of infills, inpainting and restoration of missing paint, rearrangements, or replacements of later additions should only be undertaken when fully justifiable based on thorough art-historical and technical research. Such treatment must be guided by the principles of minimal intervention and reversibility. Every addition of a new piece of glass must be identified in a permanent manner with a date and signature or other identifying symbols.
By 1953 York Minster, East window, panel 10h
Panel 10h with Ox of St Luke restored, 2011
7f: ‘The Dragon makes War on the Woman’s Seed’ (Rev 12:17)
Before and After Conservation, 2012