

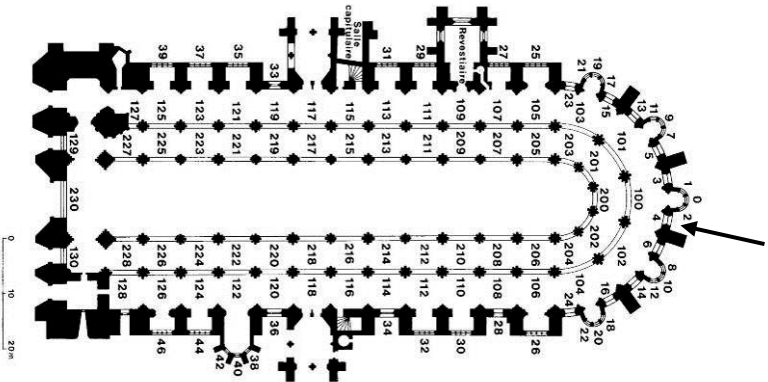
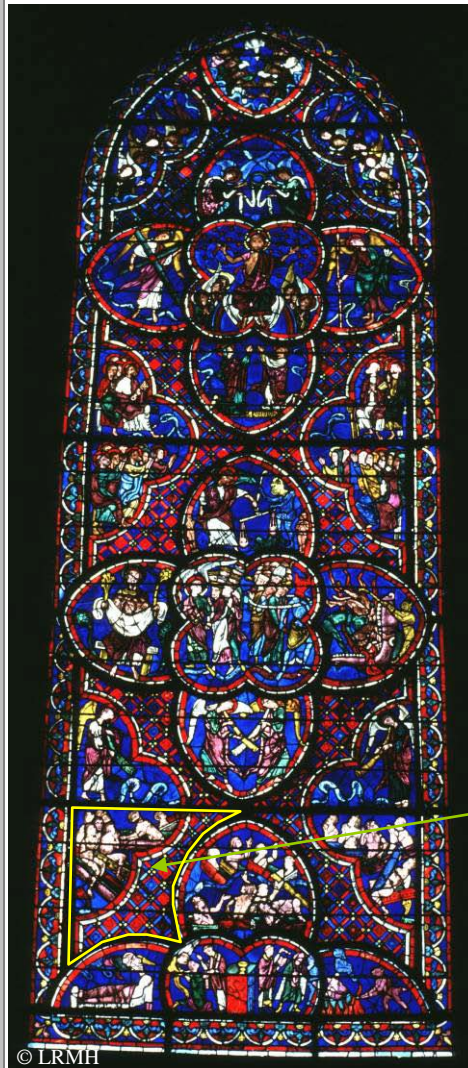
	CONSTGLASS	
	Data sheet for pilot objects	

Object:	Bourges Cathedral, BOU_b4p9	Date:	18.01.2010
OBJECT IDENTIFICATION			
Site	Bourges (France, 18)		
Building	Saint-Etienne Cathedral		
Location and orientation of the window Plan of the building	Ambulatory, bay 4  <p>© Corpus Vitrearum – Centre André Chastel</p>		



Description of the window opening (dimensions, number of lights; photo, test panel marked)






A broken arch lancet from the beginning of the 13th century.

Several restorations since the creation of this stained glass window. The most important was in 1853 by Coffetier studio. During the Second World War the window was removed, and then replaced in 1946, by Chigot and Lorin studios (no information about storage conditions). The last one was in 1976 by Chaufour studio.

42 panels,
Total height : ca 6 m
Total width : ca 2.20 m


Panel 9




Date	Ca 1210-1215
Short description of the window (identification of subject, artist, workshop)	The glass window represents the last Judgement. Unknown artist or studio. The panel 9 represents the resurrection of the dead.
Owner	French government
Person(s) in charge	DRAC (Direction Régionale des Affaires Culturelles) of Centre, Orléans (45) Curator : J.P. Blin
Investigated panel (inventory number, CVMA number, size)	Bay 4 Panel 9 (CVMA numeration) Size : 77.5 x 70 cm

	CONSTGLASS 
	Data sheet for pilot objects 

Manufacturing technique	unpainted glazing		<input checked="" type="checkbox"/>
	painting glazing		<input checked="" type="checkbox"/>
		oxide paint / grisaille paint inside	<input checked="" type="checkbox"/>
		oxide paint / grisaille paint outside	<input type="checkbox"/>
		silver stain inside	<input type="checkbox"/>
		silver stain outside	<input type="checkbox"/>
		transparent enamel inside	<input type="checkbox"/>
		transparent enamel outside	<input type="checkbox"/>
		<input type="checkbox"/>
	<i>Further information:</i>		

ENVIRONMENT IN SITU / IN STORAGE			
Protective glazing	no protective glazing		<input checked="" type="checkbox"/>
	protective glazing		<input type="checkbox"/>
		installed in the original position of the ancient panels	<input type="checkbox"/>
		mounted to the outside (ancient panels stay in their original position)	<input type="checkbox"/>
		no ventilation	<input type="checkbox"/>
		internal ventilation	<input type="checkbox"/>
		external ventilation	<input type="checkbox"/>
		size of interspace between ancient panel and protective glazing	cm
		ventilation slot at the top (size)	cm
		ventilation slot at the bottom (size)	cm
		date of installation	
<i>Further information:</i> Protected with a wire fence (grillage)			
Material protective glazing	No protective glazing		

Surround materials and construction related materials	 <p style="text-align: right;">Limestone of Charly and restauration stone* (Lise Leroux, LRMH)</p> <ul style="list-style-type: none"> - External wire grilles (iron), - saddle bars (iron), - sealant in stone groove (non-hydraulic lime mortar), - sealant between stained glass panels and supporting framework (linseed oil putty). <p style="text-align: right;">External view</p> <p style="text-align: right;">*Les pierres de la cathédrale de Bourges, BLANC Annie; ROLLAND Olivier</p> <p style="text-align: left; font-size: small;">© LRMH</p>		
Museal exposition / Storage	Room	<input type="checkbox"/>	
	Cabinet	<input type="checkbox"/>	
	Store (during the CONSTGLASS project)	<input checked="" type="checkbox"/>	
	<i>Further information:</i> Room temperature and relative humidity in the LRMH store : around 20°C and 30% RH		
Objects exposed to	partial sunlight	<input checked="" type="checkbox"/>	
	daylight, but no direct sunlight	<input type="checkbox"/>	
	artificial warmlight	<input type="checkbox"/>	
	artificial coldlight	<input type="checkbox"/>	
	mixed warm-/coldlight	<input type="checkbox"/>	
	<i>Note:</i>		
Climate of the building	East exposure No heating system 1 datalogger from April 2008 to Mai 2009 : Climate in the cathedral, internal surface of the window :		
		Minimum	Maximum
	Air temperature (°C)	0,0	24,5
	Relative humidity (%)	41,5	93
		Average	12,7
			73,3




	CONSTGLASS	
	Data sheet for pilot objects	

INSPECTION OF THE SITE BEFORE REMOVAL (WITH PICTURES)

Requirements for a safe removal in respect of minimal intervention	No particular recommendation: rubbing forbidden, vertical removal.
Environmental causes for damage	
Short report of removal	Removal by Vitraux Jean Jacques Prel studio in 2008. No specific difficulty to remove the panel. Presence of putty near metal structure. Fabrication of a specific wood box with a foam insert. Vertical removal.
Short report of transport	Horizontal and vertical transport in the specific wood box.

CONSERVATION MATERIAL

Conservation material (producer, product name, characterization, data, etc.)	Polyurethane resin : Viacryl[®] with Desmodur[®] 80 % acrylic resin (65 % Viacryl [®] VC 363 in ethylglycol acetate) + 20 % polyfunctional aliphatic isocyanate (75 % Desmodur [®] N75 in 1:1 xylene and ethylglycol acetate solution)	
Purpose of use	consolidation of paint layer / paint pigments	<input type="checkbox"/>
	coating / lamination	<input checked="" type="checkbox"/>
	edge bonding	<input type="checkbox"/>
	<input type="checkbox"/>
Application technique	application with brush	<input checked="" type="checkbox"/>
	application with spray	<input type="checkbox"/>
	single application	<input type="checkbox"/>
	repeated application	2 times
	concentration	%
	mixing ration	:
	
	<i>Further information :</i>	
Date of application	The application was realised in 1981 , by the Mauret studio. Curator and the comity took the decision to protect by some panels on the lower registers with Viacryl resin on the external surface. The aim was to compare evolution of panels' alteration.	
Documentation of this treatment	photographs (colour transparencies, b&w prints, colour prints, digital images)	<input checked="" type="checkbox"/> on b4 p5 only
	written records	<input checked="" type="checkbox"/>
	Diagrams	<input type="checkbox"/>
	data-files	<input type="checkbox"/>
	<input type="checkbox"/>

	
	CONSTGLASS
Data sheet for pilot objects	

	<p>*Bettembourg J.-M., Burck J.-J. : Bourges (Cher, 18). Cathédrale Saint Etienne. Chœur : conservation des vitraux du Jugement Dernier (XIII^e siècle). 1975, R 283 A</p> <p>*Bettembourg J.-M., Burck J.-J. : Bourges (Cher, 18). Cathédrale Saint Etienne. Chœur : conservation des vitraux (XIII^e siècle). 1979, R 283 D</p> <p><i>Further documentation :</i></p> <p>*Bettembourg J.-M., Stefanaggi M., Burck J.-J., Callède B. : Conservation des verres de vitraux anciens : nettoyage par une solution d'EDTA et de bicarbonate d'ammonium. Protection par film Viacryl[®] SM 564 + Desmodur[®] N 75. 1978, R 461 A</p> <p>*Bettembourg J.M. : La Protection des vitraux par un film de résine polyuréthane Viacryl[®] SM 564 + Desmodur[®] N 75. Contrôle effectué par le LRMH des applications in situ. 1983, R 461 B</p>							
	<table border="1"> <tr> <td rowspan="2">Do you think this documentation is</td> <td>exact</td> <td><input type="checkbox"/></td> </tr> <tr> <td>more or less reliable</td> <td><input checked="" type="checkbox"/></td> </tr> </table> <p style="text-align: right;"><i>Recommendations</i></p>	Do you think this documentation is	exact	<input type="checkbox"/>	more or less reliable	<input checked="" type="checkbox"/>		
Do you think this documentation is	exact		<input type="checkbox"/>					
	more or less reliable	<input checked="" type="checkbox"/>						
Previous restorations (data, treatments, material)	<p>External surface cleaned with EDTA and ammonium bicarbonate (30g/L respectively) solution (and mechanical abrasion if the solution is not efficient), if LRMH recommendations were followed.</p> <table border="1"> <tr> <td rowspan="3">Do you think the information is</td> <td>exact</td> <td><input type="checkbox"/></td> </tr> <tr> <td>more or less reliable</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>hearsay</td> <td><input type="checkbox"/></td> </tr> </table> <p style="text-align: right;"><i>Recommendations</i></p>	Do you think the information is	exact	<input type="checkbox"/>	more or less reliable	<input checked="" type="checkbox"/>	hearsay	<input type="checkbox"/>
Do you think the information is	exact		<input type="checkbox"/>					
	more or less reliable		<input checked="" type="checkbox"/>					
	hearsay	<input type="checkbox"/>						



CONDITION REPORT / DOCUMENTATION IN THE WORKSHOP

Pictures of panel / glass in transmitted light



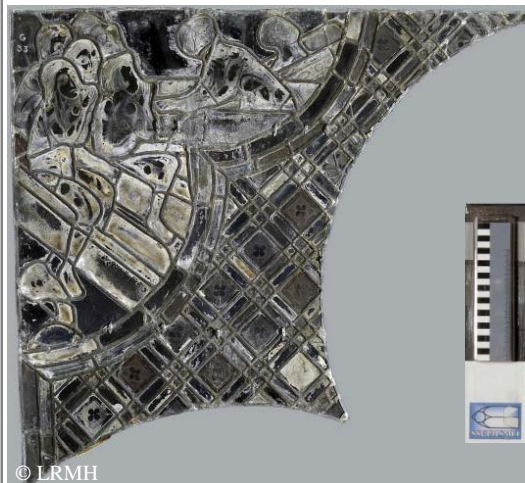
[All digital photos in this data sheet: LRMH, Nikon D2X for panels, and Canon PowerShot S70 for details]

Panel on a luminous table

© LRMH

Panel 9, internal surface

Pictures of panel / glass in reflecting and raking light, internal surface



© LRMH

Panel 9, internal surface

Pictures of panel / glass in reflecting and raking light, external surface



© LRMH

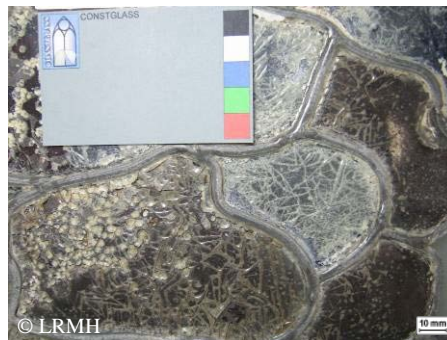
Panel 9, external surface



Examination of the object (if possible with microscope)

*Description of condition
concerning glass, paint, lead,
putty, coating, deposits;
scrutinizing internal and external
surface*

External face: The panel has been coated with Viacryl[®] on the *external surface*. The application has been made with a brush on the glasses and also on the leads. The external surface conserves a large part of altered Viacryl[®] on original pieces. On restoration pieces, there is no more Viacryl, except when located in protected area.



Glass: hole and crater alterations, uniform weathering

Paint: no painting

Lead: good condition

Putty: dry and waterproof

Coating: hard, breakable, yellowed, flaking

Deposits: restart of the corrosion process

This photo shows the support (colour and alteration degree) and the environment (protected or not) have an influence on degradation of Viacryl[®].

Internal face:



Glass: it seems to be less deteriorated on the internal surface. There are some holes of alterations dispersed. Marks of a previous cleaning with a metal brush on some pieces, but no alteration is visible in the marks.

Paint: ancient painting with thick line and wash drawing. Brown-red painting (warm brown).

Lead: good condition

Putty: dry and waterproof

Coating/consolidant: none

Deposits: thick and hard white (brownish) deposit on most of the pieces, possibly from distemper or mastic residue. These deposits often conceal the corrosion of the glass.

Selected damages

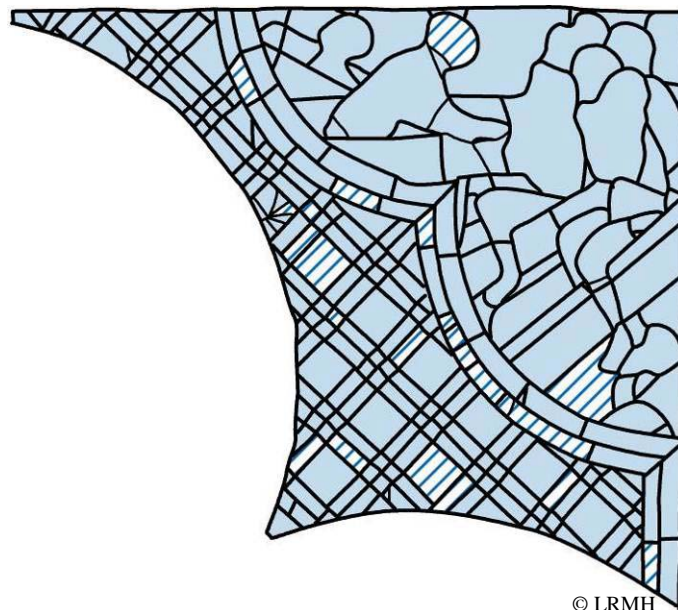
Selected choice of representative damages with short description and photo; add benchmark, note lighting conditions, note coordinates of documented area, etc.

These pictures will be part of the damage atlas.




External surface

It remains a lot of Viacryl[®] film on the panel.

Healthy glass is bared where Viacryl[®] peeled off. Under cracks, we can see that glass degradation has grown specifically and make a brown or white alteration lace.



Caption :

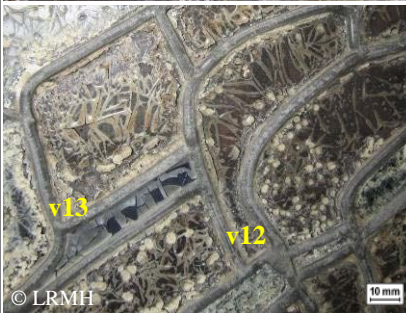
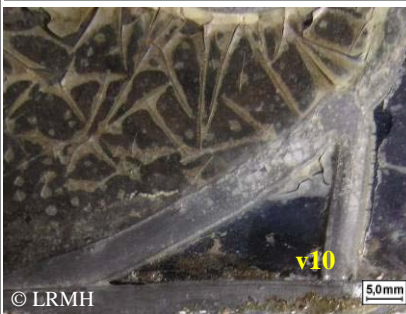
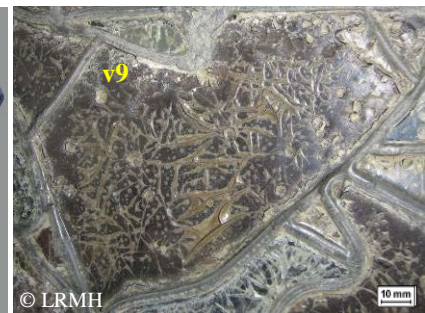
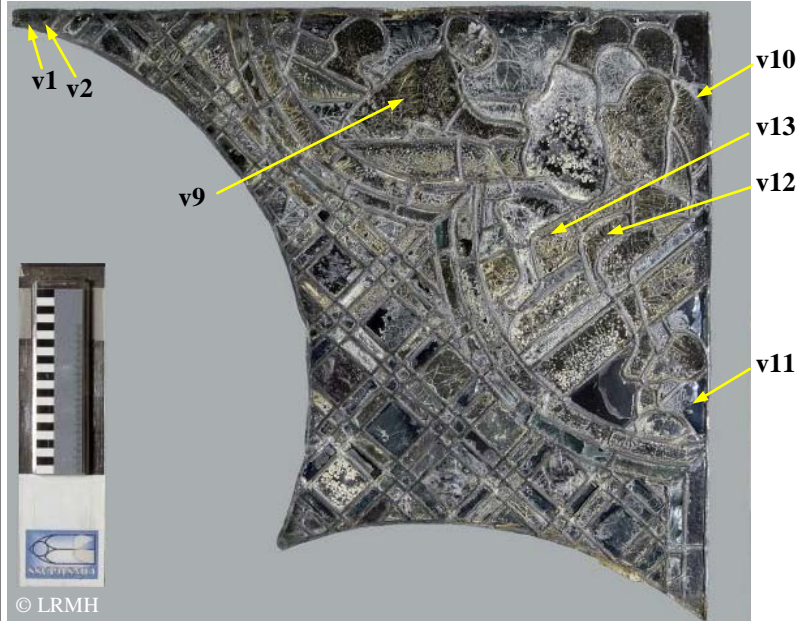
	Lead came (6-7 mm)
	Strap lead (5 mm)
	Broken glass / gap
	Bonding / presume bonding
	Bonding with double glazing
	Weathered painting
	Grisaille gap
	Remains of Viacryl [®] > 50%
	Remains of Viacryl [®] < 50%

Selection and documentation of samples to be analysed

Questions to the scientists

Diagrams, records and pictures, including a separate data-sheet for every single sample.

Viacryl® coating on the external face, reflecting light, selected samples :






Ageing Viacryl® composition ?

Physical characteristics ?

Adhesion between glass surface and the Viacryl® ?

Is Viacryl® responsible of preferential corrosion (between flakes) ?

How can we remove without damage the Viacryl® component?

	CONSTGLASS 
	Data sheet for pilot objects 

Selection and documentation of areas for reversibility tests or reactivation tests	Not foreseen in this case (<i>see panel 13</i>)
---	---

RESPONSIBLE CONSERVATORS (name, phone, e-mail)	
Person 1	Isabelle Pallot-Frossard, isabelle.pallot-frossard@culture.gouv.fr
Person 2	Claudine Loisel, claudine.loisel@culture.gouv.fr
Person 3	Delphine Geronazzo, geronazzo@dgvitrail.fr
Person 4	Jennifer Edaine, jennifer.edaine@gmail.com