

Direct glazing

DESCRIPTION

Traditional glazing methods have evolved as they had due to the limitations in the performance of the glass. A sturdy window frame was required to hold the glass in place and to protect it from forces that would shatter it. Also, the size of a window was limited for similar reasons and a broken window in heavy weather could compromise the safety of the vessel.

In addition marine regulations define the areas on the ship where bonding of windows is allowed and where additional mechanical fixations are necessary. It is therefore of interest to contact a Classification Society in case of vessels which are submitted to IMO and SOLAS or other national rules.

Modern glazing can be realised with mineral and organic glasses. The manufacturing techniques allow windows of

superlative performance to be produced in almost any shape, size and curvature to give designers the possibility of modern realisation of ships.

The traditional role of glazing as protection against the elements whilst allowing light and vision to pass through, has been extended to include the extra benefit of structural member.

Direct glazing, using peripherally applied structural adhesive systems, has become the primary method of installing windows due to the extensive list of benefits:

- Better protection against the elements than framed windows.
- Significantly improved design and styling capabilities for the marine architect by elimination of trim, frame and screws.
- Enlarged window area permits a more imaginative styling.
- Lower weight reduces running costs and improves speed.
- Fewer materials required reduce the cost of the build with lower component cost and quicker assembly times.
- Improved torsion stiffness of the boat.
- Reduction of the natural frequencies and vibrations, leading to an improved ride comfort.
- Improved aerodynamics reducing wind noise in operation.
- Better bridging of tolerances which has the advantages of quicker assembly and reduced adjustment costs.
- Greatly reduced production times leading to quicker delivery and lower labour costs.
- Fewer glass breakages both during construction and in operation.
- Easy repair at any place due to Sika's global presence.



DESIGN DIRECTIVES

Direct glazing represents a straightforward process whereby the glass is bonded directly to the body of the vessel. This must comply with all industry standards as laid down by the governing bodies, such as the classification societies, in each respective country. Specific details are described as appropriate for mineral and organic glazing later in this manual, but the general criteria are described following.

UV PROTECTION

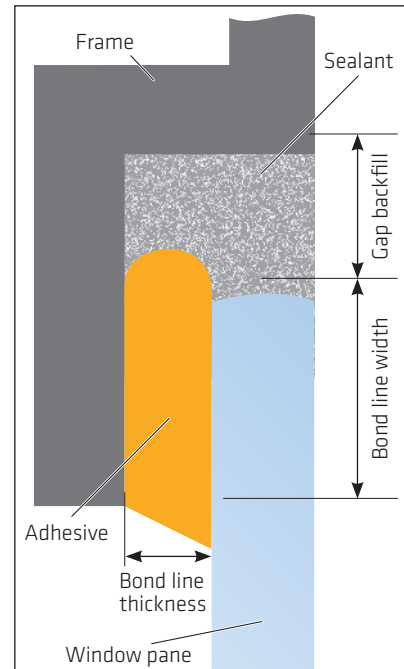
The bond line material must be protected from direct UV radiation as this causes deterioration of the chemical composition leading to failure. This is normally carried out by including a light impermeable mask as part of the design of the window. This can appear in the form of:

- Ceramic coating (peripheral) for mineral glass
- UV impervious paint or ink for organic glass
- External trim

The black silk screened ceramic border around the edge of the window is often feathered towards the centre of the window using various dot densities, resulting in an attractive shading effect. Adhesives can also be protected using external trim that is large enough to keep out the ultraviolet light and is also attractively designed such to enhance the appearance of the finish.

FITTING DIMENSIONS

Not only does the window have to fit correctly into the allotted aperture during assembly, but it must also take into account the changes that occur to the superstructure and the window under operating conditions.



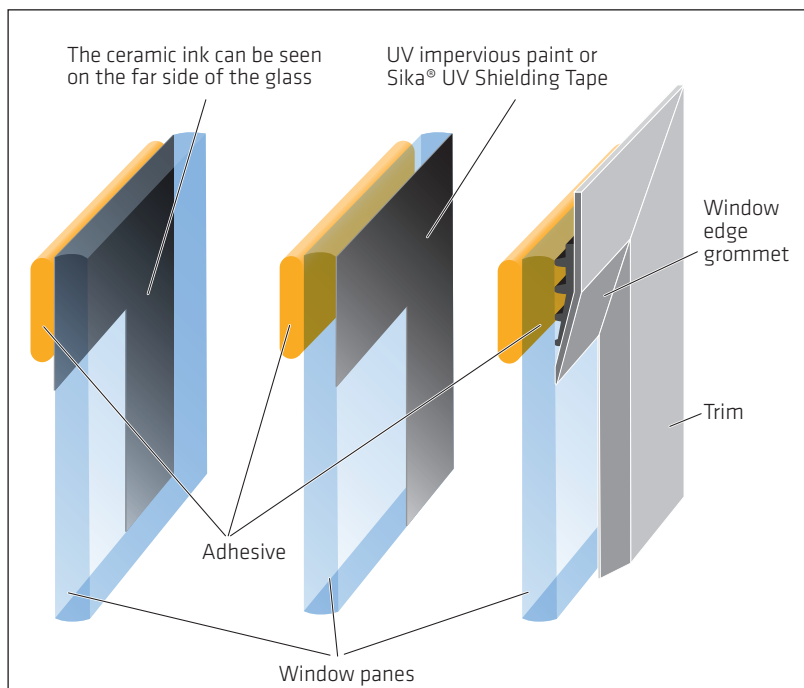
Bonding a decorative panel vertically

BOND LINE WIDTH

The overlapping area between the frame and the glazing, known as the bond line width, should be large enough to allow sufficient adhesive to bear the weight of the glazing, as well as the suction load and head pressure to which the environment exposes it. A dimensioning guide is provided adjacent to the different procedures for mineral and organic windows.

BOND LINE THICKNESS

After it has set, the adhesive remains flexible. However, if too thinly applied, the adhesive may shear due to the changes in dimension caused by differences in thermal coefficient of expansion between the glazing and the superstructure and also the natural flexing between the glazing and the window frame in the varying sea conditions. Sika's dimensioning guide provided adjacent to the appropriate procedures determines the depth of spacers required to be placed within the adhesive to keep the distance equal to or greater than the minimum depth required to ensure the reliability and longevity of the adhesive and the bond.



Bonding a decorative panel vertically

GAP BACKFILLING

Around the edge of the glazing, there should be a gap sufficient to prevent contact between the glazing and the window frame for all temperatures and under all mechanical strains. A dimensioning guide is provided adjacent to the appropriate procedures.

SURFACE PREPARATION

The adhesion properties between the glazing and the window mounting material must be verified by Sika's Technical Department to ensure that the correct materials, solutions and methods are used and followed. Procedure for organic and for mineral glass are described on the following pages. Improperly prepared surfaces could result in failure of the bond and may put the safety of the vessel in jeopardy.

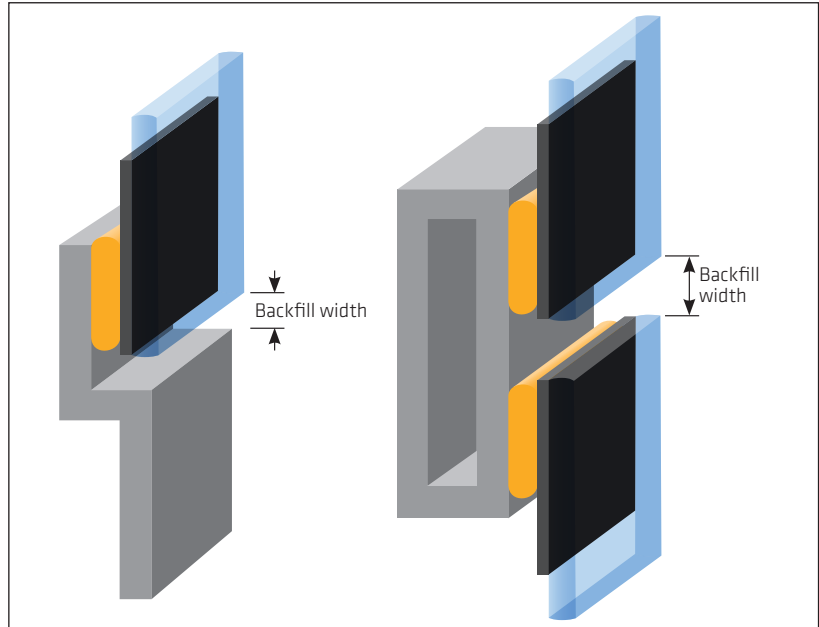
The high quality of Sika products is guaranteed and whereas Sika cannot vouch for the quality or compatibility of other manufacturer's products, only Sika primers, cleaners and adhesion promoters should be used with Sika adhesives and sealants.

PRIMERS AND CLEANERS

Flash off times for cleaners and primers must be strictly observed.

PRODUCT SELECTION FOR BOTH MINERAL AND ORGANIC WINDOWS

Selection of the correct surface preparation system is of utmost importance; as is the selection of the correct adhesive. These both depend on the type of window to be installed. The following table shows which adhesive should be used:



The definition of backfill width

Bonding System	Cleaner	Primer	Adhesive	Sealant
Laminated	Sika® Aktivator-100	Sika® Primer-206 G+P	Sikaflex®-296	Sikaflex®-295 UV
Mineral Glass				Sikaflex®-296
	Sika® Aktivator-100	Sika® Primer-206 G+P	Sikasil® SG-20	Sikasil® SG-20
				Sikasil® WS-605 S
Insulating	Sika® Aktivator-100	Sika® Primer-206 G+P	Sikaflex®-296	Sikaflex®-295 UV
Mineral Glass				Sikaflex®-296
	Sika® Aktivator-100	Sika® Primer-206 G+P	Sikasil® SG-20	Sikasil® SG-20
				Sikasil® WS-605 S

Sika® Primer-206 G+P can be eliminated if proper UV-protection of the bond line is ensured.

Bonding System	Grinding	Primer	Adhesive	Sealant
PC/PMM	Abrasive pad very fine	Sika® Primer-209 D	Sikaflex®-295 UV	Sikaflex®-295 UV
PC/PMM	Abrasive pad very fine	Sika® Primer-209 D	Sikasil® SG-20	Sikasil® WS-605 S

