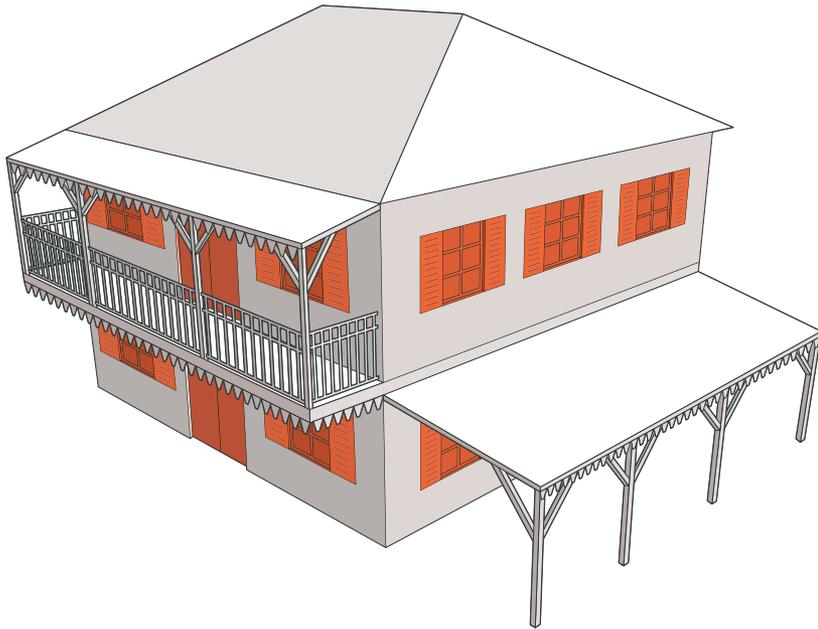




# WINDOWS AND BAY WINDOWS



**Public Information Sheet**



Practical Information Sheet

N°3



## Contents

Foreword.....	4
Failure modes under the effects of wind.....	5
Choice of joinery: window or bay window .....	6
Choice of materials .....	7
Choice of fasteners and accessories .....	8
Implementation.....	11
Examples of implementation .....	13
Joinery protection.....	15
Equipment and storage .....	18
Maintenance.....	18
Glossary.....	19
References .....	19

## FOREWORD

This practical information sheet provides implementation guidelines for windows and bay windows. It presents the important points having a direct influence on wind and earthquake resistance. Implementation details with regard to other requirements are not covered.

This document does not cover more than 3 m long bay windows. Moreover, those windows are not recommended in areas subject to cyclones.



*Figure 1: Opaque shutters that provided good protection*



*Figure 2: Louvred shutters that provided good protection*

## FAILURE MODES UNDER THE EFFECTS OF WIND

During hurricanes, the main risks to windows and bay windows are:

- Breaking glass;
- Failure of the fastenings to the building structure;
- Breakage caused by projectiles.

To avoid the first two failure modes, the joinery should be chosen according to the criteria given in the remainder of this sheet. Implementation should primarily be carried out according to the manufacturer's instructions.

The third failure mode can only be effectively avoided by using protection. This can take the form of shutters or temporary protection.

Figure 1 shows shutters on a traditional building. These opaque shutters offer very good protection, provided they are sufficiently thick and the fasteners are sufficiently strong.

If they are properly designed, as appears to be the case in Figure 2, louvred shutters can also provide protection.



Figure 3: Insufficiently-attached shutters

Conversely, Figure 3 shows a case where the shutter materials appear to have been too thin.

## CHOICE OF JOINERY: WINDOW OR BAY WINDOW

As there are French standards explicitly targeting the Overseas Departments, it is possible to select joinery according to the requirements applicable to the West Indies. The choice depends on two parameters: the type of terrain (category) and the height of the building. (Table 1)

### ✓ Notes:

- If the terrain category is unknown, use category 0.
- If the building is located on a slope, use category 0 and a height greater than 9 m.

Table 1: joinery classes

Terrain category	Building height H (m)	
	H ≤ 9	9 ≤ H ≤ 18
IV	A* <sub>3</sub> E* <sub>5</sub> V* <sub>A2</sub>	A* <sub>3</sub> E* <sub>5</sub> V* <sub>A3</sub>
IIIb	A* <sub>3</sub> E* <sub>5</sub> V* <sub>A3</sub>	A* <sub>3</sub> E* <sub>6</sub> V* <sub>A3</sub>
IIIa	A* <sub>3</sub> E* <sub>6</sub> V* <sub>A3</sub>	A* <sub>3</sub> E* <sub>7</sub> V* <sub>A4</sub>
II	A* <sub>3</sub> E* <sub>7</sub> V* <sub>A4</sub>	A* <sub>3</sub> E* <sub>8</sub> V* <sub>A5</sub>
0	A* <sub>3</sub> E* <sub>8</sub> V* <sub>A5</sub>	A* <sub>3</sub> E* <sub>8</sub> V* <sub>A2100</sub>

The letters have the following meanings:

- air permeability: A\*, with possible classes A\*1 to A\*4;
- watertightness: E\*, with possible classes E\*1A to E\*9A and E\*1B to E\*7B if partially protected;
- wind resistance: V\* with possible classes V\*A2 to V\*A5 and V\*A2100.

The terrain categories are those defined in Eurocode 1. To simplify, the following indications can be used:

- Category 0: coastal area exposed to the open sea.
- Category II: area with low vegetation and low level of urbanisation.
- Category IIIa: farmland with high vegetation.
- Category IIIb: urban or industrial area, area of dense vegetation.

### ✓ Notes:

- the labels on the joinery must give the class.
- give the main types of joinery to be found on the island.

## CHOICE OF MATERIALS

The choice of building materials and products is essential to the safety and durability of buildings. This information sheet details the criteria for choosing the correct products. The performance levels relating to these criteria must be specified by the manufacturer and can be found on the product itself or on its label. In order for this information to be of use, it must be presented in a specific way – the CE marking format.



Figure 4: Logo appearing on a product with CE marking

### ■ Joinery

The preferred materials are aluminium and timber for their intrinsic resistance to the maritime and tropical environment. Other materials may be used according to the explicit recommendations of the manufacturers.

For glazing, laminated glass is preferable as it offers better impact resistance. The manufacturer can justify other types of glass.

The joinery shall be ordered according to the size of the opening. The manufacturer will then be in charge of reducing the size in order to save some room for the sealing. Approximately minus 5 mm shall be left on either side.

- ✓ *Note: make sure the opening designed for the joinery is rectangular. If not, the frame has to be repaired to make it rectangular.*

## CHOICE OF FASTENERS AND ACCESSORIES

### ■ Mounting bracket

The joinery can be attached to the building structure using mounting brackets. Figure 5 shows an example.

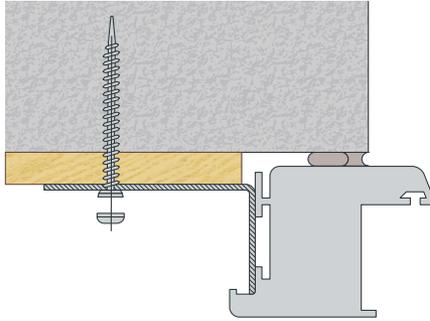


Figure 5: Example of bracket attachment

The brackets must have the minimum thickness stated by the window manufacturer. By default, select a bracket having a thickness of 2 mm.

They are made of Z275 galvanised steel with the galvanised fasteners described in the following paragraphs. On timber supports, the fastening screws must have a diameter of at least 5 mm.

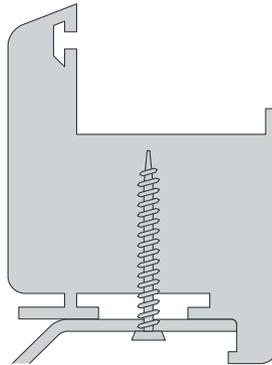


Figure 6: Example of bracket/joinery connection

- Fasteners for masonry/concrete substrate

Apart from the mounting brackets, the use of stainless steel fasteners is recommended, whatever the type of fastener may be. Choose A4 grade if available.

- Fasteners with screws without anchors

Special threaded screws can be used that do not require the use of an anchor. They must be suitable for the substrate.

✓ *Check that the screw is suitable for fastening in the intended wall type.*

The permissible strength of the screws is given by the manufacturer on the packaging or in separate documentation. Screwing shall be carried out more than 6 cm from the concrete edge.

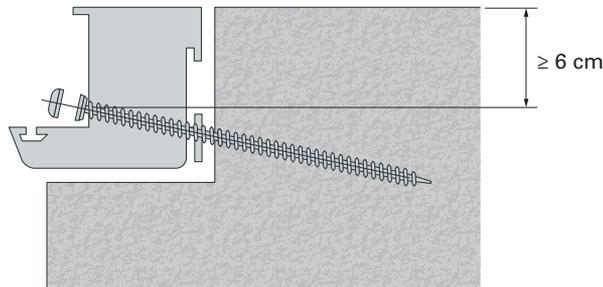


Figure 7: Example of fastening using "concrete screws"

- Fastening with plastic or bonded anchors

The recommendations of the plug manufacturers or the specifications validated by the fastener suppliers must be observed.

✓ *Note: This information must be provided when the anchors are purchased (on the packaging or on separate documentation).*

### ■ Fastenings on timber substrates

The axis of the fastener must not be less than 15 mm from the nearest edge of the timber support.

The screws must have:

- a diameter greater than or equal to 5 mm;
- a flat head in the case of face-mounting.

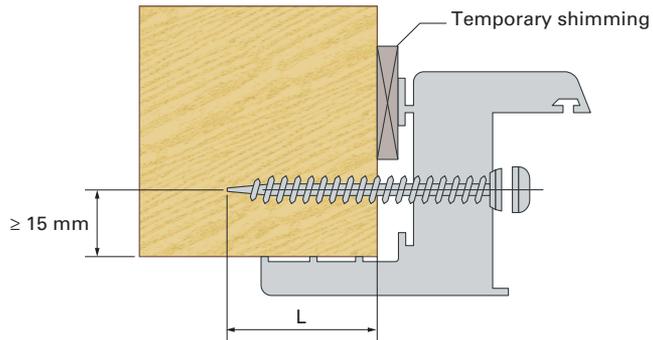


Figure 8: Direct screwing into a timber jamb (L: screwing length)

## IMPLEMENTATION

### ■ Location of the fasteners

The fasteners are positioned in priority near to the rotation axes (a maximum distance of 100 mm), the locking points of the opening leaves on the frame, the glazing setting blocks in the case of fixed frames and close to the mullions and transoms.

The maximum distance between two fasteners is 0.40 m including in the corners.

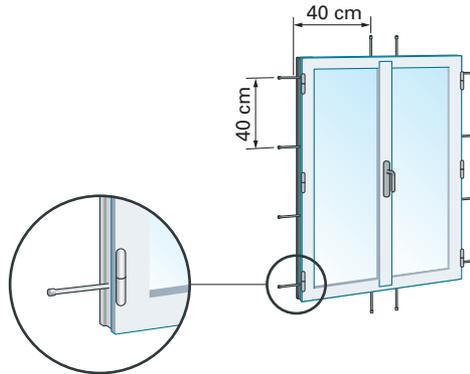


Figure 9: Principle for distance between fasteners

✓ **Note:** The fasteners are always fixed in the building structure.

The frames are pre-drilled according to the screw manufacturer's specifications. Provide at least a 4 mm diameter pre-drilled hole.

Drilling into masonry is done through the pre-drilled frames using bits specific to the system. It must be 10 mm deeper than that of the planned screw. The latter and the drilling diameter are given in the manufacturer's technical specifications according to the type of building structure.

### ■ Joinery shimming

This paragraph does not concern exterior doors.

Shimming is intended to transfer the dead weight and service loads applied to the joinery onto the building structure. It is also used to achieve the horizontal positioning of the frame during installation.

The shims are placed close to the ends of the side and intermediate jambs.

The shims must not cause discontinuity in the sealing. They can correct a level defect or evenness defect of 5 mm maximum. If this is exceeded, levelling must take place or a sub-frame (to be sized) must be installed.

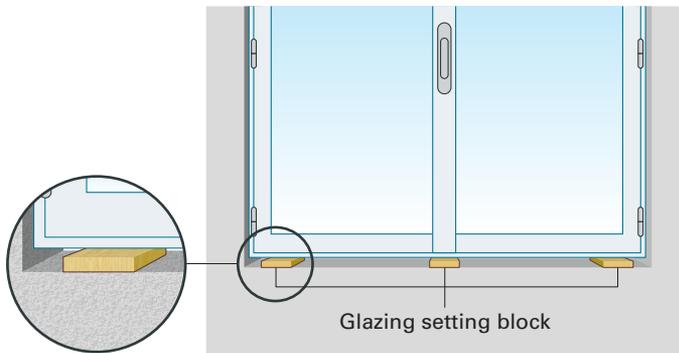


Figure 10: Example of shimming

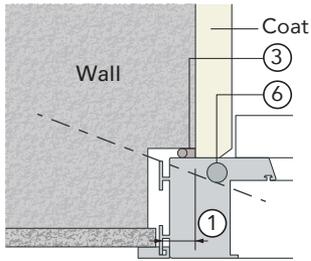
#### Specific cases

- Sliding: Shimming of the sill of fixed frames must be continuous and must run the entire width of the frame. It can be done using a full-length rail (L-profile or metal tube).
- Pivoting: A setting block will be positioned at the lower pivot.

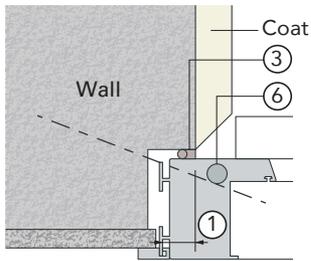
Shimming is not necessary, subject to:

- temporarily holding the frame at the desired distance (wedge and special clamps);
- screwing the fastening until the screw head comes into contact with the frame without distorting it.

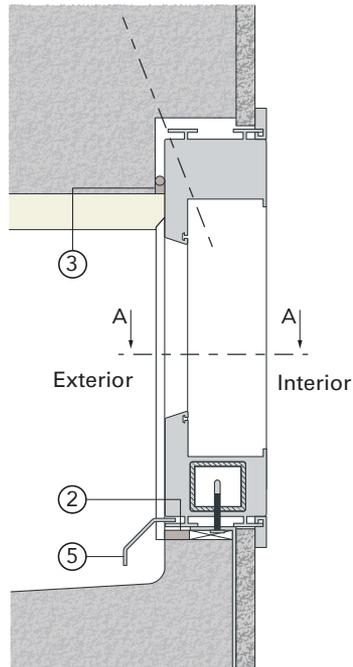
## EXAMPLES OF IMPLEMENTATION



Cross-section A-A

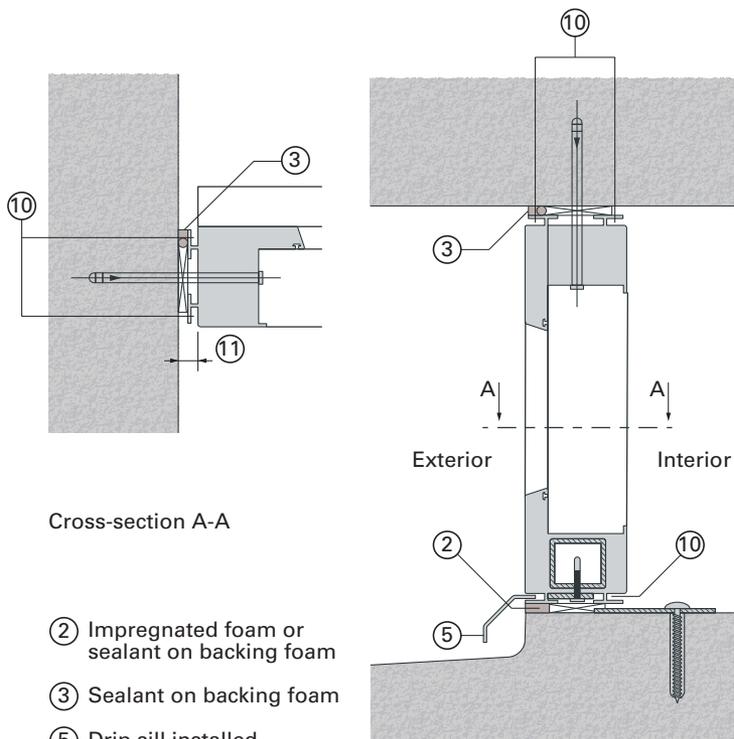


Cross-section A-A  
Variant for access to the seal



- ① Sill dimension on drawing 13 min  
Sill dimension measured 8 min at all points
- ② Impregnated foam or sealant on backing foam
- ③ Sealant on backing foam
- ⑤ Drip sill installed after caulking
- ⑥ The clip slot shall be sealed on the lower end parts

Figure 11: Sliding joinery in renovation work



Cross-section A-A

- ② Impregnated foam or sealant on backing foam
- ③ Sealant on backing foam
- ⑤ Drip sill installed after caulking
- ⑨ Caulking must be sized to take into account the dilation of the joinery and in compliance with the requirements of the SNJF. Dimensions 5 mm minimum
- ⑩ If there is a cover strip, it must be installed after the joinery has been fitted

Figure 12: Example of reveal joinery

## JOINERY PROTECTION

The impact of projectiles on the joinery is one source of damage during hurricanes. The information below is intended to provide indications for protection against small or light-weight projectiles: sheet metal, pieces of wood, branches. They are inspired by the measures traditionally taken in islands located in hurricane-prone areas.

✓ *Note: Resistance to major impacts is not considered (vehicles, wave overwash, etc.). The measures to be taken to withstand such impacts would be financially and architecturally difficult to bear. If a building is particularly exposed, specific protection structures must be designed*

### ■ Protection by shutters (ideal option)

Shutter manufacturers must be able to supply shutters together with details for implementation allowing them to withstand hurricanes. Traditional shutters can be made according to the instructions in the diagrams below.

The vertical fittings used to close the shutters are made of stainless or galvanised steel + paint. The cylindrical cross-section is 10 mm for windows and 12 mm for doors. They are screwed onto the shutters using at least 8 screws per metre. The connecting flats between two shutters are 2 mm thick.

For opaque shutters, the default rules are:

- Wood in the main part 30 mm thick;
- Interior wood reinforcement also 30 mm thick;
- Spacing between reinforcements no more than 1 m, with the first ones a maximum of 30 cm from the edges: 2 for a window, 3 for a door;
- Attached to the building structure by elements able to withstand a force of at least 150 kg (see supplier's documentation);
- Metal reinforcements at least 2 mm thick made of stainless steel or galvanised steel + anti-rust paint.

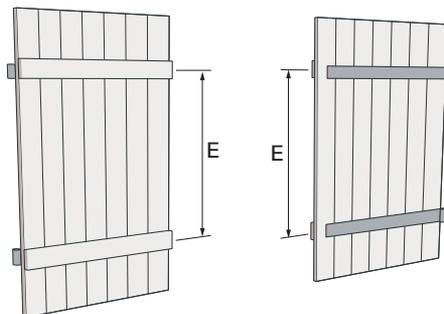


Figure 13: Traditional shutter with reinforcements

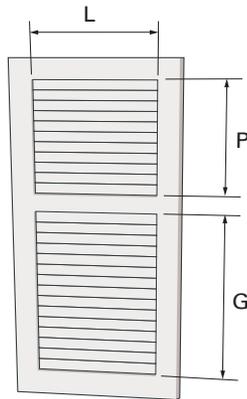


Figure 14: Traditional louvred shutter

For louvred shutters, the default rules are:

- Thickness of the wood around the edge is 30 mm and 20 mm for the louvres;
- G and P of 1 m maximum: 2 panels for a window, 3 for a door;
- Attached to the building structure by elements able to withstand a force of at least 150 kg (see supplier's documentation).

The selection criteria for a rolling shutter are the same as for joinery (see page 6).

The shutter manufacturer must provide the necessary information on the shutter labels.

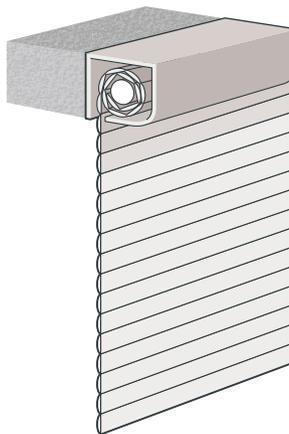


Figure 15: Example of a rolling shutter

Rolling shutters may be fitted with anti-storm hooks at the end parts of the slats. This makes it possible for the slats to be held in the jamb grooves.

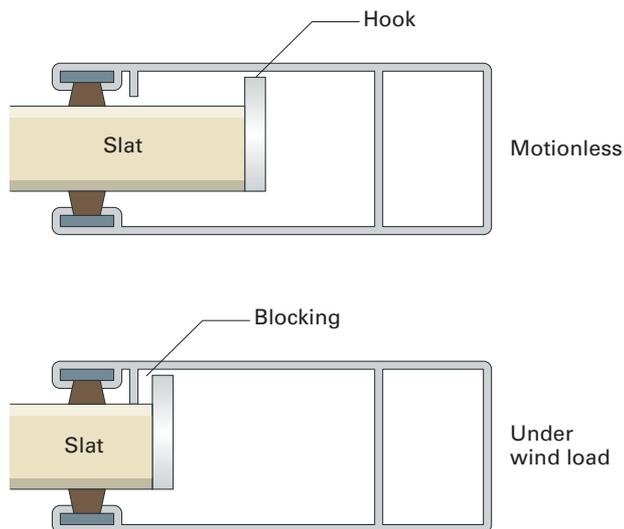


Figure 16: Example of an anti-storm hook

#### ■ Temporary protection

This paragraph only concerns windows with maximum dimensions of 1.5 x 1.5 m<sup>2</sup>. In this case, temporary protection can consist in an 18 mm OSB3 panel. For it to function properly, this panel must be attached all around the frame of the window every 15 cm (nails or screws).

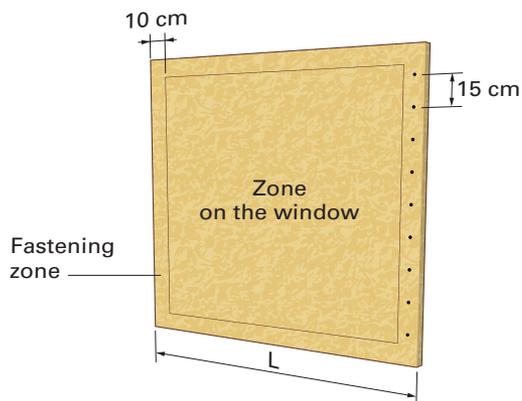


Figure 17: Example of a protection panel and its fasteners

## EQUIPMENT AND STORAGE

The joinery must be stored in a vertical position before being installed. The only tools needed are a drill and screw gun.

## MAINTENANCE

Maintenance should be carried out once a year at the approach of the hurricane season. At that time, an inspection should be performed to ensure that there has been no premature degradation.

For joinery, inspection includes the following points:

- If it is made of wood, check that the paint is in good condition. The wood must not be damaged (see below);
- The leaves and frames must not display any signs of rust, particularly on the moving parts;
- The window must not be distorted.

Apart from repainting, repairs to the joinery must be done by a professional. If there is any damage, the joinery must be replaced.

For shutters, inspection includes the following points:

- Check that the paint is in good condition. The wood must not be damaged (see below);
- The metal parts must not be corroded. If they are, the rust must be removed and anti-rust paint must be applied.
- If the fastening parts are corroded or not correctly fixed to the wall, do not hesitate to replace them or put the fasteners right.

✓ *Advice: joinery and shutter wood must resist the manual insertion of a screwdriver, knife or chisel.*



## Glossary

**Frame:** fixed part of joinery in contact with the building structure.

**Joinery:** term used to refer to both windows and doors.

**Sill:** element on which the frame is installed and then attached in the lower part.

**Trim:** part of the joinery covering the existing frame in renovation work.

## References

NF DTU 36.5 (P20-202): *Mise en œuvre des fenêtres et portes extérieures* (Installation of windows and exterior doors).

CSTB specification 3521.

Practical Guide to Sustainable Development – Aluminium, wood and PVC windows in renovation work - Design and implementation

## Photos

CAUE [*Conseil d'Architecture, d'Urbanisme et de l'Environnement* – Council for Architecture, Town Planning and the Environment] Guadeloupe.

DEAL [*Direction de l'Environnement, de l'Aménagement et du Logement* – Environment, Planning and Housing Directorate] Martinique and Guadeloupe.

*Délégation interministérielle pour la reconstruction des îles de Saint-Barthélemy et Saint-Martin* [Interministerial delegation for the reconstruction of the islands of Saint Barthélemy and Saint Martin].

## Diagrams

Laurent Stefano





**PRACTICAL GUIDE ON POST-HURRICANE REPAIRS**

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