

**Disclaimer**

This sheet is intended for designers, specifiers and other members of construction project teams wishing to reuse this building material or product. It is part of a collection of sheets aimed at bringing together the available information to date that is likely to facilitate the reuse of building materials and products.

This sheet has been produced by Rotor vzw/asbl within the framework of the Interreg FCRBE project - Facilitating the Circulation of Reclaimed Building Elements, supported by the entire project partnership. Sources of information include the experience of reclamation dealers and involved project partners, lessons learned from exemplary projects, available technical documentation, etc.

The sheets have been produced between 2019 and 2021. As the reclamation sector is evolving, some information, notably regarding pricing and availability, may change over the time. When the text refers to European standards, it is up to the project team to refer, if necessary, to their national implementations and local specificities.

It is important to note that the information presented here is not exhaustive or intended to replace the expertise of professionals. Specific questions are always project related and should be treated as such.

The complete collection of sheets (including the introductory sheet) is freely available from different reference websites (a.o. [opalis.eu](http://opalis.eu), [nweurope.eu/fcrbe](http://nweurope.eu/fcrbe), [futureuse.co.uk](http://futureuse.co.uk)).

Non-exhaustive directories of dealers in reclaimed building materials are available on [www.opalis.eu](http://www.opalis.eu) and [www.salvoweb.com](http://www.salvoweb.com).

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Interreg FCRBE partnership: Bellastock (FR), the Belgian Building Research Institute / BBRI (BE), Brussels Environment (BE), the Scientific and Technical Center of Building / CSTB (FR), Confederation of Construction (BE), Rotor (BE), Salvo (UK) and University of Brighton (UK).

The information contained in this document does not necessarily reflect the position of all the FCRBE project partners nor that of the funding authorities.

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### Material Description

'Steenschotten' type timber formwork panels are a true classic on the reclaimed market in Belgium and the Netherlands and, to a lesser extent, in France and Germany. These panels find their first application in the concrete industry where they are used as supports to vibrate and dry precast concrete products (blocks, pavers, curbs, etc.).

These are square or rectangular panels made up of wooden planks interlocked with each other by a tongue-and-groove assembly along the entire length. Planks are often held together by threaded rods across the width of the panel, and the ends are protected and reinforced across the width by metal C-channels (galvanised). Other assembly systems may also exist.

Their water repellency and altered appearance are caused by the impregnation of water and cement on the surface, the heat emitted during drying, friction with moulds and concrete blocks, and the use of form release oil.

Three main wood species are found on the current reclaimed market: azobé (*Lophira alata*, hardwood), Douglas fir (*Pseudotsuga menziesii*, softwood, also called Oregon pine) and larch (*Larix sp.*, softwood). Maritime pine (*Pinus pinaster*) panels are sometimes available. These variants differ in appearance (shade, texture, etc.) and properties (density, durability class, etc.). Raw panels generally have a rough, woolly texture which reflects their original use.

The dimensions of the panels are variable and in the order of [100 to 150] cm × [50 to 70/90 to 150] cm. Their thickness varies from 3 to 6 cm.

Their use in panel form is widespread for exterior applications such as patio floors, fences, palisades, wooden shelters, outdoor furniture, retaining walls, etc. The boards can also be dismantled and used for other applications (e.g. façade cladding). They are occasionally found in interior use as flooring or panelling.



Reuse of "steenschotten" in flooring and terrace floors. Brasserie de la Senne. Brussels (BE). Archi : La Générale  
© François Lichtlé.



### Material reclamation

The panels are mainly available from specialist dealers and can sometimes supplement the offer of new wood dealers.

The involvement of specialised professionals ensures the smooth running of the following operations:

- **Treatment:** the panels are generally resold in the raw state, without treatment. In some cases, or on demand, they can be sanded, sandblasted or washed with a high pressure cleaner. Some dealers offer to take the panels apart and resell them as individual planks at a higher cost.
- **Storage:** the panels are stored horizontally and stacked on pallets, usually outdoors. Depending on climatic conditions and the type of wood, the panels can become loaded with humidity, which significantly increases their specific weight.
- **Transport and delivery:** little or no difficulty. The specific weight of the panels (up to 120 kg for some azobé panels) must be taken into account during handling and transport.

#### Did you know?

The 'steenschotten' type wooden formwork panel is one of the few reclaimed building materials coming directly from the industrial production sector. On average, the service life of Douglas fir panels by the concrete industry is 3 to 5 years, that of azobé panels is 8 to 10 years.

The nomenclature of 'steenschotten' type formwork panels in wood is not fixed. They are sometimes found under the name 'shuttering panels', wooden cinder block drying boards, 'boat deck', etc.

Reclaimed 'steenschotten' type panels hardly ever benefit from a wood label (e.g.: FSC, PEFC, etc.). Their origin and their manufacturing conditions are rarely certifiable. The ecological impact of their use is difficult to quantify and should certainly not be considered as zero or low.



Panels before treatment



Cleaned and sorted panels



Exterior storage on pallets



## Applications and Installation

Reclaimed steenschotten wood panels are suitable for various applications, both indoors and outdoors.

### Outdoor use:

- **Flooring and terrace floors:** placing the panels is relatively simple and similar to that of other wooden decks. The panels can be fixed to a wooden structure (boards and joists) allowing ventilation from below (air space). Other systems (posts, studs, etc.) are also used. Fixing with stainless steel screws is recommended in order to avoid persistent rust discolouration of the wood. A preservative treatment (fungicide/insecticide) is recommended for Douglas fir and larch panels in order to prolong their longevity. It is advisable to protect the edges of panels subjected to heavy traffic.
- **Palisades, fences, cladding, outdoor furniture, retaining walls, etc.:** refer to table 2.

### Indoor use:

- **Flooring and panelling:** for interior applications, it is necessary to dry panels that have been stored outdoors before placing them (up to a moisture content of 8-12%). During drying, the wood tends to contract and the placement of dry panels will ensure better dimensional stability and avoid the appearance of cracks. It is recommended to consult a professional for drying.

Sanding of a panel floor covering of the 'steenschotten' type is generally carried out after installation by means of several passes with a rotary parquet sander and with abrasive discs of suitable grain size. The use of a belt sander is generally prohibited because of the grains of concrete present in the structure of the wood. In order to limit the presence of concrete residues, it is best to clean the panels using a high pressure cleaner before sanding.

The panels can be sanded, sandblasted, brushed, burnt ('shou sugi ban'), oiled, varnished, stained or painted.

It is preferable to avoid cutting the panels due to the presence of the metal C-profiles and the fixing rods. If necessary, it is recommended to cut the panels parallel to the metal C-profiles at the ends. Azobé is a hard wood and requires suitable tools.

For all uses, in order to facilitate installation, the designer/specifier will take care to use batches with a certain degree of uniformity in terms of the following characteristics. Most professional suppliers are normally able to ensure that delivered batches meet these requirements.

- **Batch composition:** the batch must consist of panels made with the same type of wood.
- **Dimensions:** the dimensions of the panels must be uniform, including their thickness.
- **Colour:** relative uniformity, slight variations in colour are possible within the same batch.
- **Toxicity:** the absence of mineral formwork oil (black and toxic) from the original use of the panels must be guaranteed for interior applications or in direct contact with the skin.
- **Condition:** Panels must be free from mould. The degree of wear and traces of use can vary greatly from batch to batch. Some dealers make a distinction between first and second choice panels. In the latter category, we often find panels with slight damage such as broken or missing metal profiles, cracks and pitting in the wood, exploded surfaces, non-straight edges, rounded corners, etc.

It is up to the designer/specifier to define the degree of imperfection tolerated, with regard to the intended use and any restoration work, by specifying the acceptance or rejection of the defects. For example, cracked panels are unlikely to be suitable for a heavily loaded flooring application, just as panels with rounded corners will affect the aesthetic appearance of a patio floor.

Most of the reclaimed building materials are sold as is. The conditions of sale may however contain specific guarantees specific to the material. Some suppliers are able to indicate the origin of the material and/or provide documentation on the product purchased (*for more information, see introductory sheet*).

It is important to purchase a sufficient quantity of panels from the outset. Resellers usually have panels whose format is linked to a specific batch. It is therefore uncertain that the desired format will still be available in a subsequent order.

### Find specialised businesses



[salvoweb.com](http://salvoweb.com)

[opalis.eu](http://opalis.eu)





**Characteristics and fitness for use**

In the particular case of 'steenschotten' type wooden formwork panels, there are no standards allowing their specific performance to be determined as a construction element. However, experience as well as normative and technical documents relating to wood and new wood-based materials sold make it possible to highlight the following characteristics and recommendations:

*Table 1: Technical characteristics of the 3 main types of wood used in the panels*

	Azobé <i>Lophira alata</i>	Douglas <i>Pseudotsuga menziesii</i>	Mélèze <i>Larix sp.</i>
<b>Density [kg/m3]</b>	1050	550	600
<b>Monnin / Janka hardness – Sinking resistance *</b>	10,7 / 17000 N (hard)	3,2 / 2940 N (medium-hard)	3,8 3400 N (medium-hard)
<b>Stability in use</b>	Low	Medium	Medium
<b>Natural durability (resistance to wood-eating fungi)**</b>	Class I-II (durable to highly durable)	Class III (weak to moderately durable)	Class III (weak to moderately durable)
<b>Durability against xylophagous insects**</b>	(Durable against termites)	Durable	Durable
<b>Colour (shade)</b>	Reddish-greyish	Orangish-greyish	Yellowish-greyish

\* There are various methods for determining the hardness of wood, with different test arrangements (Monnin, Janka, Brinnell). The values below, taken from different sources, are given as an indication. They show the transversal sinking resistance at 12% moisture content.

\*\* This classification is only valid for heartwood and not sapwood (peripheral wood). We are taking into consideration here that 'steenschotten' shuttering panels are produced

*Table 2: Classes of use of wood and the associated biological risks*

Usage class	General use	Biological risks		Natural durability class of wood				
		Insects	Fungi	I	II	III	IV	V
				Azobé		Douglas / Larch		
1	Indoors, in the dry	Yes	No					
2	Indoors, or under shelter, not exposed to bad weather. Possibility of water condensation	Yes	Low					
3	Outside, above ground, exposed to bad weather	Yes	Yes					
4	Outside in contact with the ground and/or fresh water	Yes	Yes					
5	Immersed in salt water on a regular or permanent basis	Yes	Yes					

Treatment not Required  
Recommended Treatment  
Treatment Needed

The performance of wood in use is essentially determined by the following parameters: durability class of the wood (resistance to fungi and insects), water permeability and the presence of humidity in its immediate environment. The harmonised European standard EN 460 thus defines five classes of use of wood and the associated biological risks, and recommends the possible application of an adequate protective treatment according to the use and the class of natural durability of the wood used (see table 2).

*N.B.: the durability and water permeability of 'steenschotten' type panels is already influenced by their primary use and their impregnation with cement and release oils.*

In general, azobé panels are recommended for exterior floor applications exposed to bad weather (terraces) without preservative treatment. This tropical hardwood is stronger, more resistant to compression and humidity than coniferous species (Douglas fir/larch), which increases its longevity in use. However, panels based on coniferous species can also be recommended on condition that an adequate preservative treatment is applied with more frequent maintenance.

*For other interior and exterior applications, the three species can be used in accordance with the recommendations in table 2.*



**Other relevant characteristics to be assessed according to use and context**

Characteristics	Comments
<b>Dimensions (length, width, thickness)</b>	These characteristics are closely linked to the degree of sorting of the panels. A visual or detailed examination of the batch is often sufficient to estimate it.
<b>Geometry (straightness of edges, angularity, flatness of the surface)</b>	These characteristics are closely linked to the degree of sorting of the panels. A visual or detailed examination of the batch is often sufficient to estimate it.
<b>Surface and edge quality</b>	These characteristics are closely linked to the degree of sorting of the panels. A visual or detailed examination of the batch is often sufficient to estimate it. The quality of the surface must anticipate the desired degree of finish (raw, sanded, sandblasted, brushed, burnt, etc.).
<b>Water absorption</b>	The water absorption properties of 'steenschotten' type panels are difficult to measure and are probably reduced to their original use (impregnation with cement and release oils would improve the water repellency of the product). The application of preservative/finish will also influence this parameter.
<b>Mechanical performance</b>	The in-depth evaluation of mechanical performance is relevant in case of high static and/or dynamic loads.
<b>Wear</b>	Azobé panels have a higher risk of splitting. Tropical wood splinters usually contain chemicals that increase pain in case of injury. It is therefore recommended to sand them so that they can be used barefoot as a floor covering.
<b>Safety</b>	Panels with rusty profiles (which is quite common) and which may come into direct contact with the skin should be treated appropriately. Some panels have stainless steel profiles, but they are rather rare.
<b>Slippage</b>	The type of finish (sanded, brushed, raw) affects this parameter and influences the appearance of algae in a humid environment. The presence of algae on the panels must be controlled by frequent cleaning and/or suitable preventive treatment.
<b>Reaction to fire</b>	<p>Specific requirements for the reaction to fire of coatings are determined by national regulations. These requirements depend, among other things, on the use of the premises (for example: private or community housing, emergency exits, terraces on flat roofs, etc.), on the height of the building (for façade cladding) but also on the ability of users to evacuate the premises in the event of fire (senior citizens' residence, hospital, etc.).</p> <p>The reaction to fire of construction products is defined by European standard EN 13501-1 (Euro-class) and is assessed in particular on the basis of a test carried out under the final application conditions, i.e. taking into account the entire construction system. According to the European classification, solid wood panels (minimum density 400 kg/m<sup>3</sup>, minimum thickness 12 mm) are classified Dfl-s1 for floor applications and D-s2, d0 for other applications (without an air gap behind the wood panel).</p> <p>It is therefore important for the designer/specifier to meet regulatory requirements in terms of reaction to fire by determining the materials and their method of implementation, with regard to the intended use.</p> <p>With regard to 'steenschotten' type panels, fire retardant treatments improve reaction to fire and reduce their contribution to the conflagration and the spread of the fire.</p>
<b>Toxicity</b>	During their first use, the use of form release oils on the surface of the panels is frequent and their impact in terms of toxicity is sometimes uncertain. A distinction is made between mineral oils (black), which are harmful to health and the environment, and vegetable oils (white), without noticeable toxicity. In the absence of information on this subject, it is best to stick to the 'precautionary principle' for interior applications.



Assessing the global warming impact of reclaimed wood construction products is complex and difficult to generalise. The analysis is specific to the product concerned, and involves parameters such as the origin of the product, the environmental performance of the new equivalent, the working life, the quantity of biogenic carbon stored in the material, etc. The analysis is also specific to the product itself. For more information, it is advisable to consult the specific paragraph dedicated to this issue in Fiche introductive.

**Availability**

'Steenschotten' type timber formwork panels are a relatively common product on the reclamation market. However, availability depends on the quantities required. As an example:

Frequent	Batch from 0 to 500 m <sup>2</sup>
Ocasional	Batch from 500 to 1000 m <sup>2</sup>
Rare	Batch > 2000 m <sup>2</sup>

In recent years, the new production of azobé panels has fallen sharply in favour of panels in Douglas-fir/larch/maritime pine or in composite materials, as a result of which their price has risen sharply. This is due to the stricter deforestation rules that currently apply in tropical regions where this species of wood is exploited. Similarly, new technologies allow used panels to be honed in order to extend the life of their primary use. The market for 'steenschotten' - reclaimed panels is probably likely to shrink over the next decade.

**Indicative prices (first choice, excl. tax)**

A non-exhaustive sample of the Western European reclaim market (Belgium, France, UK, and the Netherlands) has allowed us to extract some indicative prices:

→ Douglas 140 × 110 × 5 cm: 15 to 25 €/m<sup>2</sup>

→ Azobé 140 × 110 × 4.5 cm: 35 to 45 €/m<sup>2</sup>

**Hazardous substances and precautions**

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Examples of reused steenschotten  
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