

**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, nweurope.eu/fcrbe, futureuse.co.uk).

Non-exhaustive directories of dealers in reclaimed building materials are available on www.opalis.eu and www.salvoweb.com.

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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**Product description**

Having appeared more than 500 years ago, panelled wooden doors, also known as "joinery doors" or "traditional doors", have had many variations over time and are still commonly produced today. They are frequently found on the reclamation market, with a very wide variety of shapes, styles and also of constituent materials (solid wood, semi-solid, plywood, laminate or glued laminated timber, etc.). One of the most common models are single swing doors. The woods most frequently used are oak, ash, pine and other conifers, meranti, walnut, and to a lesser extent exotic woods.

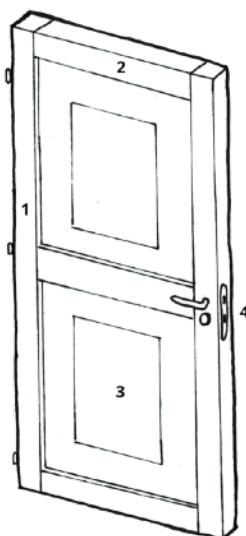
This sheet deals with so-called interior "*communicating*" doors, that is to say without any particular technical characteristics of fire resistance, thermal insulation, sound insulation, burglary resistance nor stability. They are placed between two living quarters which do not have major climatological differences (temperature and atmospheric humidity). This sheet therefore does not apply to exterior doors, landing doors or cellar doors.

In general, a ready-to-use interior *door unit* consists of:

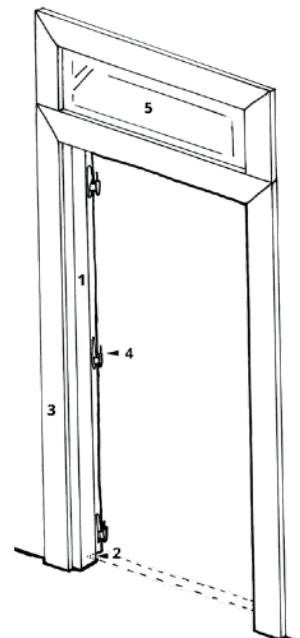
→ **One or two leaves**, also called "door leaves": this is the moving part of the door. These consist of an assembly of uprights and crosspieces (often solid wood or glued laminated wood) and infill elements (often based on solid wood, plywood, particle board or glass panels.). Non-solid elements are usually covered with a sheet of natural wood veneer. The panels of a leaf are generally not secured to the uprights and crosspieces, so that when the wood is working, the panels do not crack. The leaf is generally fitted with a series of accessories such as handles, split hinges or hinges, locks, etc. The number of panels, the shape of the mouldings and the details of the joinery are often characteristic of a style or an era.

→ **A fixed frame**, also called "Dormant frame" or "door frame". This usually consists of different pieces fixed around the opening. It serves as a finish around the opening and allows the leaf to be adjusted as closely as possible to the opening. Depending on the model, it can be fitted with a fanlight or a fixed glazing element.

1. Flush
2. Rebate or flap
3. Joint cover (doorframe)
4. Hinge or hinge plate
5. Imposte



Anatomy of a panelled wooden door leaf



Anatomy of a door frame



Door with 8 panels, of which 6 glazed, painted



Door with 2 solid straight panels, unfinished



Door with 3 panels, 1 of which is glazed, curved style, varnished



Door with 3 solid straight panels, painted

**Product reclamation**

Interior panel doors are mainly found in residential buildings but also in old school buildings, convents, dispensaries, etc.

Most of the time, the reclamation of the door leaves is relatively easy. Careful disassembly of the frames can be more difficult. These depend essentially on the original installation and the nature of the materials constituting the frame. Typically, more recent recomposed woods are more difficult to carefully dismantle than older solid wood components. Frames are also more vulnerable to damage that may occur during transport and storage. In practice, frames are often only recovered when they are of particular interest due to their age, style, character, material composition or even their close consistency with the corresponding leaves (for example, if they have a very specific shape or dimensions).

Interior doors lend themselves well to on site reclamation. They may also be of interest to specialised suppliers active in the reclamation market. Typical steps in a reclamation process are as follows:

→ **Potential assessment.** An "expert eye" generally makes it possible to estimate the potential for reclamation during an on-site visit or based on photos and technical information relating to the manufacturer (for more recent doors), to the model, to the dimensions, to the presumed quantity. The focal points will be among others:

- The general condition of the batch. Are the elements in good condition (leaves, frame, lock, hardware, etc.)? Are there any traces of fungi, xylophagous insects or swelling due to excess moisture? Is the framework recoverable? Have the leaves been modified? Can they be restored or resized? Is there a risk of the presence of dangerous substances (old lead paints)? etc.
- commercial interest depending on model, quantity, possible repairs, resale potential, etc.
- Logistical arrangements, such as deadlines, handling constraints, transport, etc.

→ **Removal.** Careful dismantling must aim to ensure the perfect integrity of the elements (either of the door unit as a whole, or only of the leaf and its accessories). Each element of the same door unit will be correctly listed. Once taken down, it is advisable to remove

the split hinges or hinges, handles, locks, etc. to minimise the risk of deterioration during handling and storage. The parts will be sorted by models, qualities and dimensions. The framing elements can be removed carefully using wood chisels. Recomposed wooden frames are difficult to recover. Particular attention will need to be paid to the glazing elements. It is advisable to carefully store the handles and locks, even if they are defective, in order to be able to find the corresponding model, if necessary.

→ **Inventory.** In order to facilitate the design and installation work, it is advisable to take the measurements of each separate element at the time of removal, and to assign specific numbers to all the elements of the same door unit. It is recommended to list the opening direction of each door. Be careful, even a batch made up of a consistent series of identical doors may have dimensional variations due to alterations made during their use (planing of a door when laying a new floor in a room, for example).

→ **Storage.** The leaves are preferably stored on their edge in suitable racks, using suitable protections (foam strips, foam corners, intermediate sheets, etc.). If they are stored on their long side, it is better to orient the lock upwards. At most professional suppliers, the doors are stored vertically, on wooden blocks. To avoid the risk of deformation or breakage of the glazed elements, it is not recommended to store flat. The frame components and the hardware are stored in separate packages. The elements are ideally stored away from frost, at room temperature (15° C to 25° C), away from humidity and dust (recommended relative air humidity from 40 to 65%). As long as the storage conditions are observed, reclaimed wood doors have excellent dimensional stability.

→ **Operations.** Depending on their condition, the door elements may go through several operations before being put back into operation. Most suppliers specialising in reclaimed doors are able to perform these operations - and some suppliers offer them automatically when the doors are sold. However, sometimes the wood is salvaged or sold in its original condition. It is then up to the buyer to anticipate these stages. In this case, it is important to obtain clear information from the seller, especially on the door's material. For example, semi-solid wood doors look like a solid wood door but do not stand up to all restoration operations as well.



Vertical Storage

• **Surface treatment.** In many cases, the doors do not require any specific treatment, other than a superficial cleaning or any localized touch-ups. However, it may be that the new application requires removing the old top-coat present on the wooden elements (varnish, paint, stain, etc.). This can be done by sanding, scraping, sandblasting, heat or chemical stripping. These techniques require know-how and can damage the material considerably if done by unskilled people. In addition, special precautions must be taken to limit the associated risks, such as toxic fumes from chemical stripping or the toxicity of old lead paints. Several specialised workshops, working regularly with suppliers of antique doors, offer a chemical stripping service by soaking in a caustic soda bath. The reconstituted wood door elements (chipboard, plywood, etc.) do not withstand this operation.



The application of a new topcoat is possible in the workshop or during re-installation: preservative, varnish, stain, paint, etc. A specific curative treatment should be considered if there are xylophagous insects or fungi. These products will be chosen with regard to the desired aesthetics, their environmental impact and their influence on indoor air quality.

- **Carpentry services.** Many specialist dealers have a carpentry workshop and are able to perform operations such as adjusting or resizing the size of the leaves, reworking cross members, replacing damaged panels, surface repairs, manufacturing a new frame, altering the opening direction, fitting a rebate seal, degreasing the edges, milling the hinge and lock locations, drilling the striker hole, etc. Such operations can also be entrusted to a traditional carpenter. These operations are not necessarily suitable for recomposed wood elements.

- **Replacement of hardware.** Replacing hardware items is not always easy. It is relatively easy to replace missing hinges, provided the load specifications are respected (maximum weight per unit, door width, number of components per door). On the other hand, it is more complicated to replace the original handles and locks which have disappeared, or which prove to be unusable. Some specialist dealers are however able to carry out the repair using original parts or copies of old models. The price will depend in particular on the quality of the fittings and the used. It is therefore strongly recommended to keep the defective elements to facilitate their replacement.

→ **Transport and delivery.** All necessary precautions must be taken in order to limit the deterioration of the elements: dividers, protections of the corners and edges, strapping of the parts, etc.

It is advisable to involve specialised professionals to ensure the smooth running of these operations.

Most of the reclaimed building products are sold as is. The conditions of sale may however contain special guarantees specific to the product. In certain cases, an installation service with a ten-year guarantee can accompany the product. Some suppliers are able to indicate the origin of the material and/or provide documentation on the product purchased (*for more information, see the introductory sheet*).



Chemical soaking plant



The sanding of the wooden elements widens the grooves in wood



Panel door stripped and sanded



Replacement of glazing elements



Cracked full panel

Fixing devices

In the event that new hinges, split hinges or pins have to be fitted, these should be chosen with regard to the weight of the door. Otherwise, the door may fall or jam. For more information, it is advisable to refer to the specifications of the hardware supplier.



Resizing

**Applications and installation**

Interior doors with reclaimed wood panels can be used as communicating doors in residential buildings where they are subjected to moderate loads, characterised by a low thermal and hygroscopic gradient between rooms, little or no specific acoustic requirements, non-industrial applications, etc. Some reclaimed doors may also be suitable for more demanding uses. They must then specifically demonstrate their suitability for use.

In all cases, the doors must be compatible with the use of the room where they are installed (see § "Characteristics and fitness for use"). In all cases, reference should be made to the use standards, to the state of the art in force and installation standards.

During the design phase, the reclamation of doors frequently raises the question of dimensions. It is indeed a question of ensuring the correspondence between the dimensions of the openings and those of the doors. Several scenarios are encountered:

- Either the door is pre-existing to the design of the opening. This is the case, for example, where doors have been dismantled in an old building to be used in a new project, still in the design phase. The designer can then rely on the inventory of available doors to customise the new openings.
- Either the opening is pre-existing to the choice of the door. This is the case, for example, of the renovation of an existing building where installation of reclaimed doors is required. In this case, it is a question of finding doors whose dimensions correspond to those of the openings. Specialised suppliers usually have a considerable stock and, most of the time, it is possible to find what you are looking for.

It should be noted that the installation still leaves a certain room for manoeuvre since it is generally possible to adjust the dimensions by adapting the frame somewhat, by slightly planing the leaf or even by completely resizing the door (for as far as the model allows). In any case, these operations benefit from being done well in advance. A detailed inventory showing the respective dimensions of the openings and leaves can greatly facilitate *match-making*.

When the original framing is reused, it often needs to be shortened to accommodate the wall thickness of the new opening (often thinner than an older wall).

When the original frame has not been recovered, it will be necessary to provide a new one. This must be designed taking into account the character of the reclaimed leaf to avoid a break in style in terms of the type of wood, the nature of the finishes, the patina, etc. (unless this break is precisely the desired effect).

When entrusted to a qualified person, the re-installation of reclaimed doors does not differ from that of new doors. It raises the same points of attention:

- dimensions of the door (leaf, frame, rebate, accessibility for people with reduced mobility, etc.);
- required performance (mechanical, dimensional stability, brightness, passage of air under the door, etc.)
- model (one or two leaves, straight edge, overlapping, left opening, right opening, etc.)
- materials (type of wood, wall support, flooring, etc.);
- accessories (locks, hinges, split hinges or pins, handles, rosettes, door stopper, etc.);
- fitting the frames, dimensional tolerances (plumb, squaring, level, etc.), fixing means, support, type of door frame (traditional, renovation, end of site installation, jamb/counter-jamb), etc.;
- adjustment of the system (squareness, level, plumb, play, distance from the ground, floor covering, etc.);
- finish (veneer, varnish, paint, stain, preservative, etc.).

Each door requires an individualized approach. Old doors of the same series can sometimes have more or less pronounced differences.

After ensuring that the doors have been stored in a controlled environment (to ensure that the humidity of the wood is between 8 and 12%), it is recommended that the doors are acclimatised to their new environment by allowing them to rest for 24 hours in the space where they will be installed (more if possible). This is to prevent any deformations occurring when they are already in place.

Good maintenance is essential for the proper functioning and keeping the performance of the door unit throughout its life: cleaning, lubrication of hardware, replacement of worn parts or missing elements, adjustment of the clearance between the leaf and the door frame, minor damage repairs, moisture damage inspection, etc.



Adaptation or replacement of hardware



Reclaimed hardware items

Design tip!

To increase the chances of meeting the offer available on the reclamation market, the specifier can choose to accept doors of different models, as long as they meet the required criteria (dimensions, presence of glazed elements, same type of door, wood, etc.).

Warning! Old doors do not necessarily have the same dimensions as newer standard doors. This should be taken into account during design and construction.

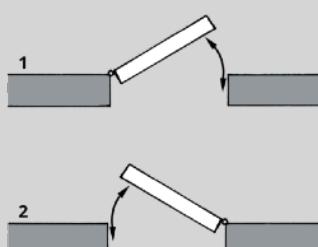
**Characteristics and fitness for use**

The performance expected from interior doors depends on the intended application. This is generally defined by:

- the type of building in which the door is installed: residential, non-residential, public buildings, schools, etc.
- the nature of the rooms to be separated: bathroom, kitchen, classroom, boiler room, etc.
- the nature of the door movement: hinged, pivoting, sliding, etc.

In general, doors without special features must have the basic performance that all doors for non-industrial applications must meet. On a European level, a product standard relating to determining the performance characteristics of interior pedestrian door units is currently the subject of a draft harmonised European standard (prEN 14351-2). Currently, these minimum requirements are governed by national application standards and specifications.

It is not easy to assess the conformity of reclaimed panel doors with these requirements. The relevant characteristics to consider are discussed in the table below. In most cases, however, it can be assumed that reclaimed doors retain their mechanical properties, provided that careful removal has been carried out and contact with a damp environment has been avoided. It is often not economically justified to carry out performance tests, either because the quantity of similar doors to be used is too small, or because the doors have unique characteristics which must be evaluated case by case.

Characteristics	Comments
Opening direction	<p>The opening direction of the doors should be clearly defined. The EN 12519 standard defines the opening direction as the closing direction, while most new door manufacturers determine it in the opening direction.</p> <p>Ex :</p>  <p>1) left opening; 2) right opening</p>
Dimensional tolerance	<p>Wooden doors tend to expand or contract with fluctuations in temperature and humidity. Throughout their working life, reclaimed doors have been subject to conditions that are specific to them and which are not necessarily known. Some deformations are reversible while others are definitely noticeable. Irreversible deformations can be assessed by means of a detailed visual inspection (curvature, flatness, etc.) of the door under normal climatic conditions. In some cases, they can be corrected in the workshop, otherwise they will have to be discarded. It is also advisable to find out about the storage conditions and to acclimatise the doors to their new environment for a minimum of 24 hours before installation (<u>several days if possible!</u>).</p> <p>Regarding the nominal dimensions given by the seller (height, width, thickness, squareness), a maximum deviation of ± 1.5 (thickness) to 2.0 mm (height and width) is commonly accepted at the time of receipt (tolerance class 1). The EN 1529 standard defines these specifications.</p>
Shape stability, flatness, moisture resistance	<p>These characteristics are difficult to assess. They define the degree of deformation (twisting, curvature, warping etc.) of the doors when they are subjected to variations or temperature and humidity gradients without this affecting their operation. In order to overcome this uncertainty, it is advisable to use reclaimed panel doors in interior applications with low stress. It is also advisable to acclimatise the doors to their final environment at least 24 hours before installation (<u>several days if possible!</u>).</p> <p>In damp rooms (bathroom, kitchen, toilet, laundry room, etc.), the opening under the door must be sufficient to allow good air circulation. It is also possible to install a ventilation grid provided for this purpose.</p>
Frequency of use	An interior door must open and close perfectly throughout its life. Normal use should not alter its appearance or function. The involvement of a professional or a craftsman generally makes this performance more reliable.



Characteristics	Comments
Mechanical resistance	<p>Mechanical strength is the ability of a door to withstand unforeseen loads such as kicking or forcing. Although a series of tests makes it possible to assess this performance in the case of new doors (for example: vertical angular load test with open door [NBN EN 947], static torque with open door [NBN EN 948], shocks with a soft and heavy body when the door is closed [NBN EN 949], shocks when the door is closed [NBN EN 950]), it is difficult to envisage applying them to reclaimed doors.</p> <p>However, the experience of a professional or a craftsman generally makes it possible to ensure the overall reliability of a door, with regard to the specific features of the leaf and the frame (weight, thickness and type of wood, and wall thickness, etc.) and the load capacity of the fasteners (hinges, split hinges, etc.).</p>

Regarding the design of new frames for the re-use of reclaimed door leaves, it is recommended to comply with European standard EN 942 which describes the general requirements relating to wood in joinery and with standard EN 14221 which defines the requirements and specifications applicable to wood and wood-based materials in the leaves and frames of interior doors. Specific standards also deal with butted, glued, laminated or recomposed timber.



Reuse of panelled wooden doors © Cyrus Cornut, Grande Halle de Colombelles, WIP. Architects: Encore Heureux (FR)



Reuse of panelled wooden door © Sophie Boone (BE)



Availability

Although there are many types and designs, wood panelled doors are a very common product in the reclamation market. Availability depends on the quantities sought, but it is quite possible to obtain relatively large batches of identical doors.

Frequent	Batch of 1 pièce
Occasional	Batch of 2 to 10 identical pieces
Rare	Batch of > 10 identical pieces

Straight edge or overlapping door

Reclaimed panel door models vary greatly by country. In Belgium and France, for example, the current models are "straight edge" while in the Netherlands and Germany, overlapping models are more common.

Find specialised businesses



salvoweb.com



opalis.eu

Indicative prices (Excl. tax)

Random sampling of the reclamation market in Western Europe (Belgium, France, Great Britain and the Netherlands) made it possible to extract some indicative prices. These vary greatly depending on the models, dimensions, type of wood, finish and suppliers. Oak doors are the most expensive, but pine and pitch pine are also in demand.

→ Supply price:

- Single door leaf not stripped: ~30 €/piece
- Stripped single door leaf: ~60 €/piece
- Door leaf from the beginning of the 20th century not stripped: 100 to 200 €/piece

→ Resizing: 50 to 150 €/piece depending on the complexity

→ Chemical stripping in bath: 50 to 80 €/piece

However, the replacement of missing or defective hardware parts should also be budgeted for.

Even taking into account these operations specific to reclamation logics, reclaimed wooden panel doors are generally a cheap alternative to new products.



Illustrated manual for dismantling doors and accessories for reclamation (in French): <http://re-use.brussels/pdf/deuren-en-toebehoren.pdf>



 Assessing the impact of reclaimed timber construction products on global warming is complex and difficult to generalise. The general principle is that construction timber can confine biogenic carbon. Reclamation is therefore a way of preserving these carbon stocks and preventing it from being released into the atmosphere (which would be the case if the wood was incinerated, for example). The overall environmental assessment of a reclaimed wooden element must, however, also take into account aspects such as the origin of the product, the distance travelled, etc. For more information, it is advisable to consult the specific paragraph devoted to this question in the introductory sheet.

Hazardous substances and precautions

	<p>A lead diagnosis may be necessary to detect the presence of old lead paints on leaves and frames. This diagnosis can be carried out either using a commercially available lead test kit, or by sending a sample of the paint to a laboratory or by having this test carried out by a professional. In this case, it is strongly recommended to strip and/or repaint using a specialised operator. It is strongly advised against using a heat gun, sander or sandpaper to remove lead paint. Chemical stripping will be preferred, with adequate health and environmental provisions.</p>
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