

**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**

The shelves are referred to here as being natural stone panels, relatively thin and slender, and generally arranged on a horizontal plane. They are typically found at the foot of window frames (Figure 1), over certain fireplaces (Figure 2) or as radiator covers.

Like other natural stone materials, the shelves are interesting for reclamation: relatively resistant, they have beautiful finishes and are suitable for various transformations. These elements can be found at certain providers of architectural antiques and old materials, or even in classified ads. The stocks appear to fluctuate quite a lot.

In itself, it is possible to reuse these shelves for other purposes, for wall covering for example (see the sheet dedicated to natural stone wall covering slabs).

Reclaimed shelves have many variations. These relate in particular to the following characteristics:



Marble window shelf



Black marble fireplace shelf



Radiator shelf

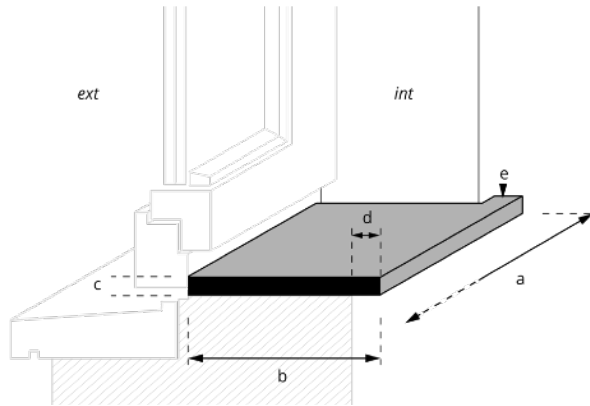


Figure 1. Geometry of stone window shelves

- a. Shelf length
- b. Shelf width
- c. Shelf thickness ~ 2 cm
- d. Overhang
- e. Lug

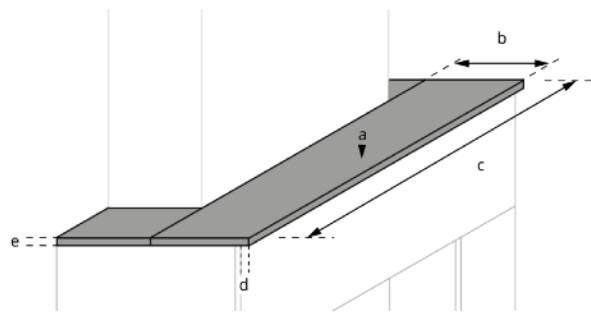


Figure 2. Geometry of stone fireplace shelves

- a. Mantelpiece
- b. Shelf width
- c. Shelf length
- d. Overhang
- e. Shelf thickness ~ 2 cm

→ **Geological nature.** Many types of rocks were used in the manufacture of shelves. Among the most common, we find marble, granite, blue stone or slate, in all their local variations.

→ **Dimensions.** Usually the reclaimed shelves have variable lengths, widths between 10 and 50 cm and fairly thin thicknesses of about 2 to 5 cm. Other dimensions are possible.

→ **Profiles.** Different shelf profiles can meet (see Figure 3), although rectangular formats are the most common. Among these, variations in angles (straight, rounded, lugged) and edges (straight, chamfered, rounded, etc.) are possible.

→ **Fixings.** Different fixing methods exist and are sometimes combined: embedding, interlocking, sealing using mortar or plaster, etc.

- Window shelves can be placed in the space left between the two walls or embedded in the masonry.
- The fireplace shelves are fitted to the fireplace mantel and/or fixed to the support.

In general, they have a slight protrusion (overhang) compared to the thickness of the wall or the fireplace mantel.

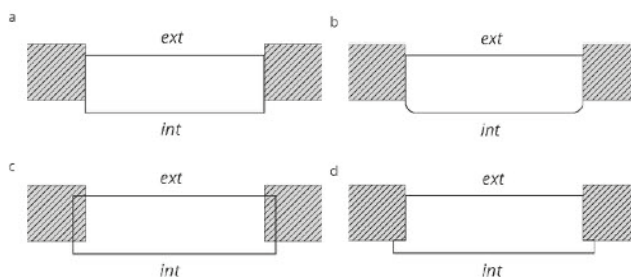


Figure 3. Commonly found window shelf profiles

- a. Rectangular shelf "loose" placed between 2 walls
- b. "Loose" shelf with rounded corners
- c. Shelf built into the masonry
- d. "Loose" shelf with "lugs"



## Natural stone shelf

→ **Appearance.** The diversity of the rocks is reflected in a wide range of colours: black, grey, beige, ochre, brown, pink, red, etc. The variations are almost endless! A specific vocabulary makes it possible to designate the encrustations of the stone (veins, grains, strata, flames, stains, etc.).

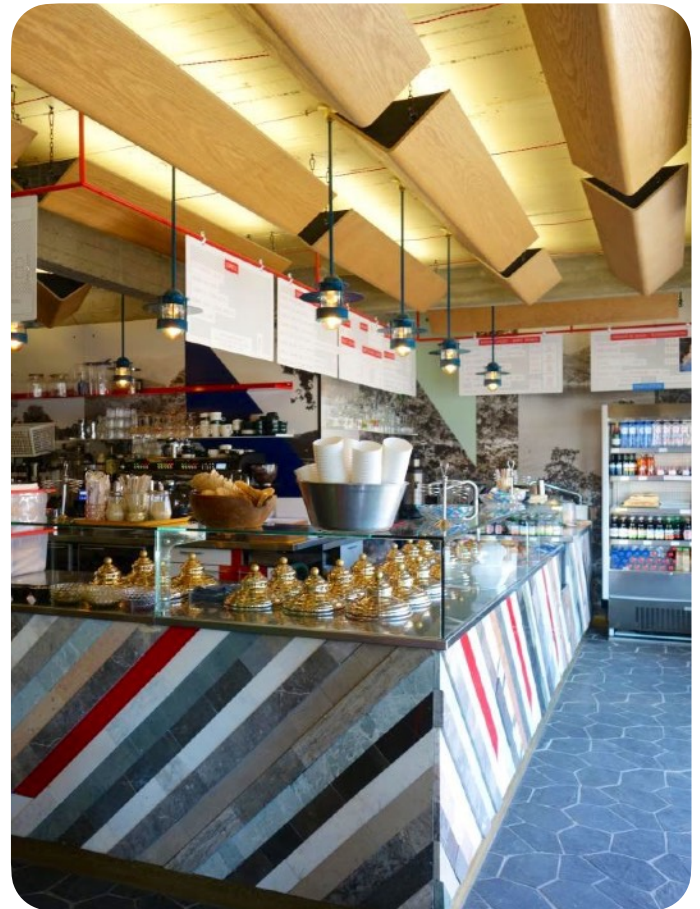
→ **Texture and finish.** Smooth finishes (honed or polished stone) are generally used to facilitate maintenance.



Variation in colour and grain of the stone shelves.



Wall covering from window shelves (BE). © Manugryson architecten



Reuse of window shelves, finishing of the Gaston Glacier counter. Brussels (BE) Interior by Lionel Jadot.





**Material reclamation**

**Shelves in good condition are a good candidate for reuse, either on-site or through the professional channels of material resellers. These professionals are usually able to ensure the smooth running of the following operations:**

→ *Disassembly test* (or expert opinion). A disassembly test makes it possible to ensure the feasibility and profitability of a removal. An “expert eye” generally makes it possible to estimate the interest of a batch based on plans, photos, historical documents or by an on-site visit. The focal points for shelves will be among others:

- the general condition of the batch and the laying method: condition of the stone, formats and dimensions, nature of the laying bed, characteristics of the joints, hanging and embedding mode, window frame fixing, etc.
- commercial interest, depending on the type of stone, period, style, quantity, etc.
- logistics arrangements: especially in terms of deadline, working time, handling, transport, etc.

→ *Removal*. The careful dismantling of shelves must ensure the safety of the workers and the integrity of the recovered elements. The risk of deterioration is high since the elements are thin and generally bonded and/or embedded. The rate of loss strongly depends on the type of rock, the original conditions of use, the type of installation (see *Figure 3*), the thickness of the slabs and the care taken in dismantling:

- if the shelves are laid “loose”, the expected recovery rate is around 75%;
- if the window shelves are inserted under the frame or under the cheeks of the window openings, the recovery rate is of the order of 50%.

The removal of a **window shelf** is done as follows:

- Cut the sealant between the window and the shelf using a cutter.
- Free the recessed ends: demolish the ceiling installation, the small masonry elements and any metal profiles.
- Use a crowbar to unseal the shelf from its horizontal support, taking care not to lift it too much so as not to break it.
- Slide the shelf into the horizontal position to extract it. This operation can be tricky depending on how deep the shelf is under the frame, the rigidity of the frame, the type of stone, etc. In addition, it is easier to recover the shelf if you do not want to preserve the other elements. Otherwise, it is advisable to first recover the frame before proceeding with disassembly.

The careful disassembly process is similar in the case of **fireplace shelves**. The recessed edges are released before proceeding with the lever loosening. The other stone cladding elements, constituting the mantelpiece, can also be recovered. Usually in marble, the plates are interlocked or fixed with copper staples and bonded to the substrate with plaster. It is advisable to dismantle the assembly respecting the interlocking direction, generally starting from the top.

**Radiator shelves** are often held in place by metal fittings and are easily retrieved.



*Release of shelf ends*



*Release of shelf ends*



*Removed elements*

**Dangerous substances**

Some shelves may have been in contact with dangerous substances such as **asbestos** window sealants or other asbestos elements. In this case, removal should only be considered after the asbestos removal work.



*Black marble fireplace*



*Dismantling the mantelpiece*



*Removed elements*



## Natural stone shelf

→ **Cleaning and sorting.** The shelves will be sorted by quality, colour, size and degree of cleaning. Cleaning with a brush and water may be considered to remove traces of plaster or fixing mortar as well as scraping off any sealant residue using a suitable blade, taking care not to scratch the surface. There are products to repair small cracks and breaks (mineral mortar, stone grafts, etc.). These can be considered for damaged shelves.

→ **Operations.** Most of the time, stone shelves can be reused as they are after a rough cleaning. In certain cases, additional operations on the material can be considered before its installation. For example :

- **Sawing:** the shelves can be sawn to make their dimensions consistent and facilitate their installation.
- **Cleaning and finishing:** the visible face of some more porous stones may be stained or have changed colour during use due to atmospheric pollution or the growth of mosses. Their restoration to original condition is not always possible. It depends on the depth of encrustation, which varies according to the type of pollution and the type of stone. It is advisable to contact a professional to know the compatible products and the appropriate treatment methods. Several techniques are possible: water polishing (different pressures and temperatures), use of chemicals (oxalic acid, polishing chemicals, polishers), mechanical cleaning (sanding, polishing, sand-blasting, projection of fine particles, micro-sanding , etc.) or even, in very specific cases, use of laser, latex or poultices.

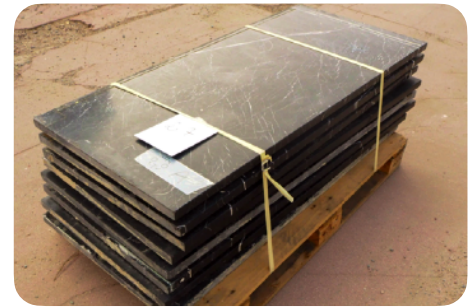
The choice of a suitable cleaning technique will depend essentially on the following aspects: nature and hardness of the stone, fineness of its grain and other surface aspects, presence of alterations, type and degree of soiling, desired result.

→ **Storage and packaging.** The shelves are generally packaged and strapped to a pallet horizontally. Ideally, they are separated by wedging elements in order to limit the risk of damage. The wedges/separation wood must not be treated, be very dry and not contain tannins which could stain the stones. Metal straps should be avoided as there is a risk of staining the stone (rust). Ideally, the shelves are stored indoors because outdoor conditions can mar the surface appearance of some polished natural stones and compromise their reuse. The packaging must take into account the large mass of the elements. Appropriate means of transport and lifting are also required.

Reclaimed natural stone shelves are generally sold by batch or by piece. Most suppliers are able to provide indications on their main characteristics (type of rock, nominal dimensions and tolerances, finish, intended applications) and, in certain cases, their origin.



Cutting stone elements



Pallet packaging



Vertical storage





## Applications and installation

**Reclaimed shelves can be reused in their original function or reused for other purposes. The thinness of the elements makes it possible to apply them as wall covering, as decorative wall lights or even as a worktop.**

The majority of the points of attention related to the installation of reclaimed stone shelves are similar to those linked to new shelves - in particular, and in a non-exhaustive way: type and dimensions of the elements, type of laying bed, type of grouting, finish, softening of edges, etc.

It is up to the designers to rely on the regulations in force, the rules of practice and the national and European standards relating to natural stone products. Furthermore, adequate installation requirements must be specified to cover the wide variety of possible applications of reclaimed shelves.

In general, finding a batch with very specific characteristics can be complicated. It is often preferable to identify one or several batches of raw reclaimed shelves and to consider additional treatment and processing operations. The expertise of professionals can be invaluable in this regard.

The following characteristics can be described and specified when drafting the technical requirements related to the delivery of a batch of reclaimed shelves:

→ **Format.** The identified batch must correspond to the constraints of the desired dimensions. Shelves with defects such as broken corners may be used provided that a rectangle corresponding to the surface of the desired shelf can fit into the intact part. Depending on the case, it is also possible to provide for the possibility of covering a significant length in several pieces. This makes it possible to value intact fragments of smaller size.

→ **Nature of the stone.** The choice must correspond to the intended use, in particular in terms of resistance to acids, absorption (especially for kitchen worktops). It is possible to combine the types of stones but the installation can be more complicated.

→ **Hue.** By nature, natural stones have a wide variety of colours and appearances. Depending on usage requirements (for example, in the context of heritage renovation), it is possible to specify this characteristic by referring to a general hue or to a specific colour.

→ **Condition.** In addition to traces of mortar, plaster, paint and mastic residues, reclaimed shelves may show minor alterations such as signs of surface wear, chips, scratches, light cracks, stains, etc. These deteriorations can influence the technical and aesthetic performance of the shelves, as well as their re-installation, but do not constitute a major obstacle to reclamation (see § "Characteristics and fitness for use"). Where appropriate, certain surface treatments, or even cutting, can make it possible to correct these alterations. It is up to the designer/specifier to define the degree of imperfection tolerated, according to the defined use and the installation conditions, by specifying the degree of acceptable alterations (for example: surface scratching tolerated on the visible face, broken corners and edges tolerated on non-visible parts, etc.). However, the batch must not contain any elements showing cracks or major damage compromising its solidity on the useful part.

→ **Texture et finish.** Depending on the requirements (functional and aesthetic) and the type of rock, the appearance of edges, corners (e.g. chamfered, rounded, etc.) and the surface (e.g. polished, honed, rough, etc.) should be specified. Window shelves are usually polished or softened at the outset.

→ **Quantity.** Some suppliers may include surplus when the product is delivered if they are not able to guarantee the absolute uniformity of the characteristics mentioned above. This surplus can also be applied in the case of an on-site salvage scenario because some shelves will probably be damaged during disassembly.

Most professional suppliers are able to ensure that delivered batches meet these requirements. A control test procedure based on a contractual sample and sampling upon receipt can be set up.

Most of the reclaimed building materials are sold as is. The conditions of sale may however contain special 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 the *Introductory sheet*).



Sealant and cutting for housing the shelf  
© Frédéric Uyttenhove



Scratches on the shelf surface



Shelf cracking in its centre

### Design tip!

To increase the chances of meeting the offer available on the reclamation market, the designer/specifier can choose to combine different batches of stone (formats, type of stone, original use, etc.) and distribute them in an organised manner in the building. For example, plan a uniform batch of shelves per space or per floor.

The designer/specifier can also play on a patchwork principle, in particular for the use of shelves as wall cladding. Different batches can be grouped together and cut into different sizes. This flexibility in the supply and in the choice of layout makes it possible to cover much larger areas.



**Characteristics and fitness for use**

There is no harmonised standard specific to stone shelves, but several standards and test methods make it possible to determine the properties relating to natural stones (EN 12407 - Petrographic examination, EN 1936 - Determination of real density and apparent density, and of total and open porosity, EN 12371 - Determination of frost resistance, etc.). Although they relate to new materials, these documents can be useful in determining the relevant characteristics (depending on the project) related to the reclamation of shelves.

For a different use of shelves as wall cladding, please refer to the characteristics and fitness for use described in the sheet dedicated to natural stone wall cladding slabs.

Characteristics	Comments
<b>Geological origin and petrographic description</b>	The reclaimed shelves come from works that may have been made from batches of multiple origins. If it is possible to visually characterise the type of rock present, it is however more difficult to affirm with certainty that their geological origin is identical, unless there are records that allow it to be attested (for example: a certificate of origin, archival documents, etc.). This is all the more true for the batches made up of elements of various origins.
<b>Bulk density and open porosity</b>	<p>These characteristics are specific to each stone. The density [kg/m<sup>3</sup>] gives an indication of the degree of compactness of the stone. In general, the more compact a rock, the less porous it is.</p> <p>The open porosity of a stone [% by volume] corresponds to the proportion of pores connected to each other and accessible to water. This characteristic influences in particular the degree of resistance to stains and soiling. It does not directly affect its freezing (it is rather its capacity to return the absorbed water that matters at this level).</p> <p>This information can be estimated based on general technical documentation relating to natural stones. If necessary, these characteristics can be measured more precisely by an identity test as defined by the test EN 1936.</p>
<b>Geometric characteristics</b>	These characteristics can be found out by taking simple measurements. They are closely linked to the degree of sorting and cleaning of the reclaimed slabs as well as to the transformation operations undertaken on the material. In the case of shelves intended to be re-machined or re-cut, it is advisable to define with the supplier the dimensional tolerances applicable to each of the dimensions (width, thickness, length, etc.) the type of stone and the functionality of the works. The requirements in terms of flatness and straightness should also be detailed.
<b>Flexural strength</b>	The flexural strength R <sub>f</sub> [MPa] is a mechanical characteristic which provides information on the capacity to resist bending forces in use. It varies according to the type of stone and is generally determined by means of bending tests as per standard EN 12372. This characteristic can be checked in the event of a large overhang of the shelves.
<b>Thermal deformation</b>	Natural stone is subject to dimensional variations under the effect of temperature. This deformation is expressed in [mm/mK] by the coefficient of thermal expansion. In the case of shelves subject to large temperature variations (shelves above a radiator, a fireplace, etc.), it may be relevant to determine its extent (EN 14581: 2005). For certain marbles and, to a lesser extent for certain granites, the anisotropic thermal expansion of the stone can cause granular decohesion leading to significant deformation of the shelves.
<b>Resistance to impact</b>	The impact resistance of a hard body depends on the characteristics of the stone but also on its installation system and its substrate. The test described in standard EN 14158: 2004 consists in dropping a steel ball on the element installed in its actual conditions of use. For reclaimed shelves, we can also rely on the condition of the shelves still installed. If many shelves subjected to similar stresses are broken or deteriorated, it can be assumed that even intact shelves are liable to break in turn. These shelves alone should not be extracted without keeping all the information on the condition of the batch.
<b>Reaction to fire</b>	In accordance with Commission Decision 96/603/EC, natural stones are considered to belong to class A1 of reaction to fire (see EN 12 058 for exceptions). However, be careful with the use of filler sealants, which can affect this performance.



Characteristics	Comments
<b>Susceptibility to staining</b>	<p>To assess this characteristic, we differentiate between internal staining caused by the reaction of certain constituents of the stone (metallic minerals or organic materials present in the stone), from accidental staining caused by contact with a staining product.</p> <p>Internal staining is first and foremost an aesthetic concern for the material and it is therefore appropriate for the project developer to define the acceptable characteristics with regard to the intended use.</p> <p>The sensitivity to staining is also directly related to the porosity value of the stone. The higher the porosity, the more easily the stone absorbs liquids and pollution, the more sensitive it is to staining. A porosity of less than 4% is generally satisfactory in order to limit the risks of soiling. It is also possible to visually identify the degree of soiling of the reclaimed slabs by observing the visible face of the unprocessed (sawn) elements. Where appropriate, there are surface treatments to improve this performance by slowing the infiltration of greasy substances into the stone's pores.</p>

**Availability**

Some vendors of architectural antiques or stone items may have these types of items in stock. There are also shelf models on the material resale sites between individuals but generally in small quantities (<10 pieces).

**Indicative prices (Excl. tax):**

A non-exhaustive sampling of the reclamation market in North West Europe (Belgium, France, Great Britain and the Netherlands) made it possible to extract some indicative prices. The price of the shelves varies greatly from one offer to another, it depends on the availability of the format, the type of stone, as well as the degree of sorting and cleaning required.

- Window shelves in natural stone ~ 40 -110 €/m<sup>2</sup>
- Cutting services: ~ 40 €/h

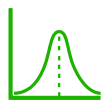
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**Embodied carbon (Cradle to gate - production A1-A3)**

	kg CO <sub>2</sub> eq./m <sup>2</sup>	kg CO <sub>2</sub> eq./kg
OEKOBAUDAT (DE) database - Thinkstep individual data - Granite slabs *	31,80	0,6
OEKOBAUDAT (DE) database - Thinkstep individual data - Marble slabs *	16,3	0,3
OEKOBAUDAT (DE) database - Thinkstep individual data - Limestone slabs *	14,9	0,3

\* Indicative value for a façade cladding of 1 m<sup>2</sup>, 2 cm thick and with a basis weight of 52 kg/m<sup>2</sup>.



According to the sources and types of stone, reusing 100 m<sup>2</sup> of reclaimed natural stone shelving prevents the production of ~1490 to ~3180 kg of CO<sub>2</sub> equivalent related to the manufacture of new shelving (production phase only). This corresponds to the emissions caused by a small diesel car during a trip of ~ 9 000 to ~ 19 000 km.