

**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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**Material description**

Solid clay bricks (called "bricks" in the rest of the document) are obtained by firing moistened clays, mixed, shaped by pressing or stretching, moulded or pre-formed, dried and finally fired at a temperature of 850 to 1200° C. It is a craftsman or industrially manufactured ceramic material, the technical properties of which depend essentially on the composition of the mixture, the firing temperature and the technical skill used in its manufacture. Although mechanised from the 19th century, the manufacturing process has remained similar for over 6000 years. Until World War II, the majority of bricks were produced regionally, from local clays.

Under normal conditions, bricks are traditionally used for the construction of load-bearing or decorative masonry, protected or not. Clay bricks generally exhibit very good durability. However, external factors can affect their properties during their use: structural constraints, bad weather, various pollutants, etc.

Protected and unprotected masonry

Protected masonry is a wall which is not exposed to water and which is not in contact with soil and groundwater. This is the case for interior walls and exterior walls covered with an appropriate coating or protected by cladding.

Unprotected masonry is a wall exposed to rain and frost and which may be in contact with soil and groundwater. This is the case for exterior walls without protection or with limited protection (for example, a thin layer of plaster).

Whether or not it is protected is independent of the structural role (load-bearing or non-load-bearing masonry).

A large part of the bricks present on the reclamation market were produced between 1800 and 1970 and mainly come from masonry walls with lime mortar (or other soft mortar). From 1970, the use of cement-based mortars made their reclamation more difficult, if not impossible. Other factors such as the use of hollow or perforated bricks, which are lighter, as well as the lowering of the firing temperature of the bricks due to the oil crisis of 1973 limited their potential for reclamation.

Despite this, large quantities of reclaimed solid bricks from dismantling are available from professional suppliers, mainly in Belgium, Great Britain and the Netherlands. There is a great diversity of models there, which often reflect historical regional specificities. Several criteria make it possible to distinguish reclaimed bricks:

→ *Production methods, including:*

- Hand-moulded (also called "handmade"). These bricks are generally rough and uneven in appearance.
- Mechanically moulded: same as the previous ones, with a more or less pronounced depression at the level of the installation face ("Frog" in the United Kingdom).
- Stretched (or extruded, mechanical, "wire cut"): clay is pressed through a mould into a continuous mass and cut into regular sized pieces. The appearance of these bricks is often smoother and more even.

→ *Origin.* Reclaimed bricks are often referred to by the region where they were produced (e.g. Beerssesteen and Scheldesteen in Belgium, IJzelsteen in the Netherlands, Accrington in Great Britain, etc.) or by the type of kiln in which they were fired (e.g. Paepsteen, Klampsteen, Veldovensteen, portable kiln, etc.).

→ *Formats.* There is a wide variety of models, usually associated with a manufacturer and/or a region of origin. For example: rijnformaat (BE) (180 × 85 × 50 mm), derdeling (BE) (160 × 80 × 40 mm), boerkes (BE) (170 × 90 × 65 mm), waalformaat (BE) (210 × 100 × 50 mm), Spaanse Moef (BE) (210 × 50 × 100 mm), Imperial bricks (UK) (225 × 110 × 65 mm), etc.

→ *Appearance and colours.* Depending on the model, reclaimed bricks have a smooth or rough texture, with straight or rounded/blunt edges. Solid bricks are not perforated, but may have more or less pronounced recesses (in the case of mechanically moulded bricks, for example). The colours are often yellow, orange, red, brown, purple, grey or blue. In some cases, the faces or ends may show traces of paint. Slight traces of residual mortar or sand may also remain.

The firing of bricks in traditional kilns was less uniform than in modern kilns. A batch resulting from the same firing could therefore have bricks with different characteristics depending on their position in the kiln and their exposure to heat. The better fired bricks exhibited darker colours and better mechanical performance (frost resistance, compressive strength, etc.). They were intended for load-bearing and unprotected masonry uses. Less fired bricks were intended for less demanding uses, such as interior partitions. This sorting was based on the know-how of bricklayers and masons. Nowadays, most new bricks are fired in tunnel kilns which ensure a more even heat distribution. Their performance is determined by means of standardised tests.



Boomse Klampsteen hand moulded reclaimed brick (BE)



Beerssesteen-type extruded reclaimed brick (BE)



Accrington type mechanically moulded reclaimed brick (UK)



Varieties of reclaimed bricks on the Belgian market. From g. to d., from the top: 1. (Boomse) Handmade Klampsteen or Klinkaard (rijnvorm). 2. (Boomse) Klampsteen or Klinkaard handmade (derdeling). 3. Papesteen (rijnvorm). 4. Papesteen (derdeling). 5. Blue papesteen (derdeling). 6. Beerse steen or machinale Klinkaard (rijnvorm). 7. Beerse steen or mechanical Klinkaard (Beerse 65). 8. Beerse steen or mechanical Klinkaard (waalfmaat). 9. Handmade Poldersteen (moef) or Brugse moef/poldersteen. 10. Damse Poldersteen (moef) or Damse (abdij) moef, Kuststeen. 11. Spaanse moef. 12. Brusselse Klampsteen. 13. Scheldesteen. 14. Scheldesteen (dik). 15. Veldovensteen.

Currently, reclaimed bricks are mainly used for decorative non-load-bearing masonry, indoors or outdoors. Some models are very popular. There are also cases of use of reclaimed bricks for load-bearing masonry. Reclaimed brick is also commonly used for landscaping.

In this document, we do not deal with clay paving bricks, refractory bricks, hollow, perforated or honeycomb bricks, enamelled or coated bricks, or sand-lime masonry products.

Tip

Do not confuse solid masonry bricks with paving bricks. Despite strong similarities, these are produced from a particular clay composition and high firing temperatures. They are naturally very resistant to frost, pressure, wear and aggressive agents such as road salt and cleaning products. For more information, see the dedicated sheet.

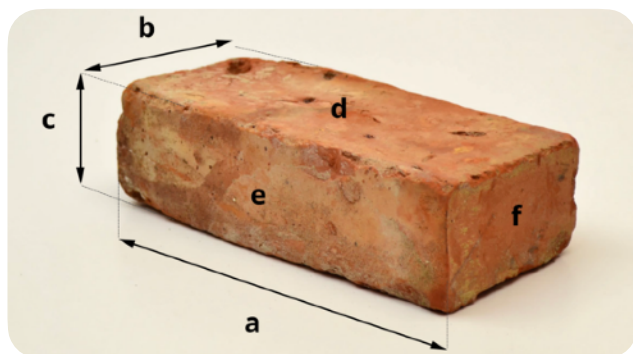


Paving bricks

Do not mix up...

Some contemporary bricks are called “manual” in reference to their appearance, although they have actually been pressed by machines. These days hardly any bricks are truly hand-moulded in Europe.

The success of reclaimed bricks has led some manufacturers of new bricks to produce bricks imitating the appearance of old bricks using artificial ageing techniques: knocks on the edges, pounding, false traces of mortar, etc. So check the origin of the bricks with the supplier!



- a. Length
- b. Width
- c. Height (thickness)
- d. Laying face
- e. Face
- f. End

“Anatomy” of a solid masonry brick



Material reclamation

The reclamation of bricks must always be done in compliance with the safety rules applicable to demolition works. If the bricks do not find a new use directly on site, they can be sent to professional reclaimed channels. Often, operators who salvage bricks are also active as demolition contractors. Trade terms can then be negotiated depending on the value of the bricks.

→ *Dismantling test* (or expert opinion). In practice it 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 will be among others:

- the general condition of the batch and the method of installation (type of mortar, damage, etc.)
- Commercial interest (depending on model, quantity, salvage and resale potential, specific regional particularities, etc.)
- logistics arrangements (deadline, working time, handling, transport, etc.).

In order to more confidently determine the salvage potential of bricks and to estimate the rate of loss, a dismantling and cleaning test is usually performed on a sample of several dozen bricks.

Limitations to the reclamation of bricks.

Certain factors can limit or even compromise the reclamation of bricks.

- *Original applications* . Bricks found in stables (smell of ammonia), basement walls, foundations, cesspools, cisterns and chimneys are not salvaged because the permanent damage caused by the moisture and/or pollution during their working life prevent them from extending their life in a safe and correct manner.
- *Mortar* . Removal of leftover mortar is necessary to reuse the bricks. In general, soft mortars such as lime, ash, clay-based mortars and cement/lime bastard mortars are relatively easy to remove. Cement-based mortars and adhesive mortars, which have become widely used since the 1970s, make cleaning more difficult. These mortars are more resistant but also more adherent. Technically, their elimination is not impossible but, in practice, it is generally too expensive and affects the profitability of reclamation. In addition to the age of masonry, the two types of mortar can often be distinguished visually: lime mortars are lighter and often beige, cement mortars darker and grey.

→ *Removal*. Careful dismantling should aim to ensure the integrity of the bricks and a certain uniformity of the batches. First, the surface coatings (plaster, ceiling installations, etc.) are removed mechanically. Then the actual disassembly can be done manually or, for larger volumes, using a grapple crane, paying particular attention to ensuring that the bricks are laid smoothly on the ground or in a container. Even a drop from a low height can be enough to break a perfectly reusable brick. Bricks that break or spontaneously pulverize during dismantling are automatically discarded.

If the bricks to be dismantled show variations (for example, according to their exposure), it is recommended to list these and to make a precise distinction at the time of removal.

→ *Treatment*. Apart from cleaning up the mortar remains and qualitative sorting, reclaimed bricks generally do not undergo any treatment. Cleaning can be carried out on site or at a specialist. Removal of mortar remains or dirt (foams, etc.) is done manually or mechanically, brick by brick, using a hatchet, a chisel, a steel brush or a scraping machine or vibrating plates. In order to facilitate the installation of reclaimed bricks, only slight traces of surface mortar or thin layer of cement are tolerated. For this reason, hollow or perforated bricks do not lend themselves well to these operations and are therefore rarely reclaimed.



Crumbling brick, unsuitable for reclamation



Variations in colour and appearance of old brick models



Traces of paint and slight remains of mortar



Demolition and reclamation on site. Renovation of the Tour A Plomb, Brussels. © BVDA - Bernard Van Damme Architecte



Manual cleaning of mortar remains



Mechanical cleaning of mortar remains



Solid clay brick

The bricks are sorted during cleaning according to a check:

- **visual:** the bricks are inspected and the items showing significant damage are rejected. Bricks can be irregular, but must have at least one face and one end in good condition. When paint remains are present on the surface of a brick, the opposite face or end must be in good condition. Bricks unsuitable for reuse because of their former use can often also be recognised visually (e.g. bricks with burn marks from old chimneys or fireplaces).
- **olfactory:** bricks emitting foul odours (ammonia, fuel oil, etc.) are eliminated.
- **auditory:** to check that a brick is intact, solid and non-porous, it can be tested by tapping lightly with a hard object or tool. A “dull” sound indicates an internal fracture, a “clear” sound means that the brick is unaltered. This rudimentary inspection is usu-

ally carried out by qualified personnel, who have long-standing expertise in the field.

- **mechanical:** the bricks are rubbed in order to check the porosity. A brick that is peeling is usually too porous.

The bricks are sorted by models, qualities, possible deterioration, colours and dimensions. The total proportion of bricks recovered depends on the condition of the original masonry. It is often in the order of 50 to 70 %. Bricks that break during disassembly and cleaning are largely unusable. However, it is possible to keep a small amount of half or three-quarter brick for the joints and angles, depending on the type of assembly planned during their re-installation. Some professional suppliers are also able to deliver these incomplete formats.

→ **Complimentary tests.** A series of simple techniques can be deployed for in-depth diagnosis in situ.



◀ **Karsten's Pipette** is a simple test to estimate the water absorption of bricks. A glass tube filled with water is hermetically attached to the surface of the brick. A graduated scale indicates the amount of water that penetrates in a given time. © [Plate-Forme Maison Passive](#)



▲ The moisture content (water content) of bricks can be measured with a **moisture meter** or with a simple **carbide bomb** test. This measurement makes it possible to assess the porosity of the bricks. © [dmelaser.com](#)



◀ The **rebound hammer** (or **Schmidt hammer**) is a portable piece of equipment used to non-destructively estimate the strength/hardness of certain materials. An elastic impact force is sent to the material to be tested, the unabsorbed energy is then returned and quantified by the apparatus. An analysis of the data by means of charts or calibration curves then makes it possible to compare the samples to be tested. © [proceq.com](#)



▲ To a certain extent, the compressive stresses (and therefore the compressive strength in situ) can be estimated by means of a **flat cylinder**. This technique consists of making a groove in the masonry at the level of a horizontal mortar joint in order to insert a flat cylinder placed under pressure. However, this technique is not suitable for all types of mortars and the results should be interpreted with caution by experienced persons. © CSTC, *Guide pour la restauration des maçonneries: 1ère partie, Stabilité des ouvrages*, 2002



▲ **Indicator strips** are used to determine and quantify the presence of soluble salts in masonry (nitrates, chlorides, sulphates).

© [technichem.be](#)



Solid clay brick

→ **Storage.** The bricks are ideally stacked in an offset manner, and stored on pallets (500 to 1000 pieces/pallet depending on the model). Complete pallets do not exceed 1 m in height and are shrink wrapped, to ensure their stability during transport and to protect them from weather and dust. When the bricks are cleaned and reclaimed on site, it is also possible to store them in piles on level, dry ground. It is essential to protect them from rain and rising damp from the ground, so that they are dry when re-installed.

→ **Transport and delivery.** The necessary precautions must be taken during transport and delivery in order to minimise breakage (strapped, shrink wrapped pallet, etc.).

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

Tip

It is recommended to purchase a sufficient quantity of bricks from the outset. Each delivery of reclaimed bricks has a unique composition. The bricks of a subsequent delivery may therefore have different dimensions and colours.



Storage of dismantled bricks before sorting and cleaning, at a professional dealer



Storage of sorted and cleaned bricks on covered pallets

Reclaimed brick facing

Some suppliers offer facing tiles made from reclaimed bricks. The original bricks are sawn lengthwise into pieces 25 to 40 mm thick. The edges are sold separately and their characteristic patina is retained.



Facing bricks © [BCA matériaux anciens](#)



Showroom of a reseller of reclaimed bricks. Enhancement of the different models, with joints of varying nature and thickness



Facing bricks © [franck.be](#)



Facing bricks © [BCA matériaux anciens](#)

Did you know?

Danish reclaimed brick dealer Gamle Mursten has initiated a procedure to obtain CE marking for certain types of bricks common to the Danish market. To do this, an accredited European body was tasked with adapting the harmonised standards developed in the context of industrial production to the specificities of reclaimed products. This provided Gamle Mursten with clear guidelines for establishing a Declaration of Performance (DoP) for the most common types of reclaimed bricks. In addition to the commercial advantage associated with CE marking, this process allows construction professionals to have reliable data on certain characteristics of reclaimed bricks (for example: compressive strength, frost resistance, absorption rate, flexural and traction strength). An environmental declaration of their products (EPD) is also available.



Mechanised sorting and packaging of reclaimed bricks © [Gamle Mursten \(DK\)](#)



Applications and installation

Reclaimed solid clay bricks are mainly used in masonry of protected or unprotected structures such as exterior façade claddings, interior wall cladding and partition walls. They can also be used in load-bearing masonry, exterior masonry (low walls, etc.), interior paving and decorative masonry. Their use is not recommended for exterior paving (for this use, refer to clay paving or terracotta clinkers).

As a general rule, the choice of bricks must take into account the expected stresses (see § Characteristics and fitness for use) and urban planning regulations. Depending on the application, it is advisable in all cases to refer to the conception standards in use (e.a. EN 1996: Eurocode 6 for the design and calculation of masonry structure), to the European and national standards relating to the product (e.a. EN 771-1+A1, etc.), to the rules of practice in force and to the installation standards. According to the regulations in force, it is also necessary to take into account seismic, thermal and acoustic requirements, fire resistance, waterproofing, etc.

The reuse of a complete batch of reclaimed solid clay bricks in good condition is no different from that of new bricks. Broadly speaking, they raise the same points of attention, in particular: properties and condition of all the masonry elements (cavity wall, composite wall, fittings, wall ties, etc.), choice of mortar, joints, brick-laying, finish, climatic and meteorological factors, insulation, attachment and console system, safety factors during sizing, costs and installation times, etc.

Due to greater dimensional variability through their irregular surface, reclaimed bricks are often "wild bond" (or irregular) laid and with wide mortar joints (10 to 12 mm), but other solutions are possible, depending on the model. Glued installation is not recommended.

The integration of reclaimed bricks into load-bearing masonry requires compliance with mechanical requirements. In general, the mechanical performance of masonry depends on the nature of the elements, the type and thickness of the mortar joint and the resistance of the materials. In this regard, the choice of mortar must also take into account the characteristics of the bricks (porosity, initial water absorption, humidity level, specific weight, adhesion, etc.) and the requirements related to the masonry (climatic exposure, resistance, etc.).

Think reversible!

The use of a lime mortar or a bastard mortar (lime-cement), without resins or additives, facilitates future dismantling. This bonding method must be considered with regard to the application of the bricks, and requires special precautions during installation. For more information, refer to standard EN 998 (1-3): Definitions and specifications of masonry mortars. Some producers of new bricks are interested in the question of reversibility and offer solutions in this direction. Feel free to contact them.

Once completed, several finishes are applicable to the masonry: sanding of the remains of paint and mortar present on the reclaimed bricks, application of a lime plaster/whitewash, or even according to requirements, application of a waterproofing coating.

To facilitate laying, the designer/specifier will take care to use batches with a certain degree of uniformity in terms of the following characteristics:

→ **Batch composition.** The batch must consist entirely of the same model of clay bricks. In most cases, professional suppliers offer batches of uniform bricks, but from different origins. In on-site reclamation, the characterization of the batches is carried out based on a detailed inventory of the products, in relation to their original application and their installation mode. This information generally makes it possible to define the potential risks and the criteria necessary for the distribution and uniformity of the batches with regard to the intended application. The focal points will be among others:

- **Brick Information:**

- Type, make, model, manufacturer, year of production, dimensions, technical sheet, visual appearance and possible deterioration, etc.

- **Original application information:**

- Type of work, year of construction, geographical location, specificities (seaside, roadside, mountain area, etc.)

- Types of application (protected, unprotected, facing, load-bearing wall, etc.) and location in the structure.

- Specificities (orientation of unprotected walls, foundations, insulated wall, interior vs exterior, foundation, stables, etc.)

- **Installation information:**

- Types of joints, mortars, fastening and fitting systems, water repellent treatments and injections against humidity, renovations, etc.

→ **Dimensions.** The dimensions of the bricks must be uniform. The dimensional tolerance will be determined by the designer/specifier according to the installation constraints. Generally speaking, the brick faces that are too irregular can be hidden by directing them towards the non-visible side of the masonry. For bricklaying requiring half bricks, the desired quantities should be specified. It is recommended to check in advance which types of bricks are available in which formats.

→ **Colour.** Variations in colour and appearance are frequent. In the case of reclaimed clay bricks, these variations are mainly due to the production method and the origin of the batches. Palletized bricks from professional dealers are generally mixed enough to obtain a good aesthetic result. In case of doubt, the different pallets can be mixed again during placement.

→ **Cleaning.** Despite thorough cleaning, surface mortar residues are inevitable, especially for hand-moulded bricks. The traces of cement mortar are often more visible. These can give an aesthetically interesting appearance to the wall. If necessary, it is possible to provide a finishing treatment a posteriori (e.g.: sandblasting, plaster/whitewash, etc.).



→ **Condition.** In addition to traces of mortar residues, reclaimed bricks may show minor alterations such as signs of surface wear, chips, cracks, craters, or light flaking, stains, traces of paint, remains of moss, traces of efflorescence, etc.

These deteriorations can influence the technical and aesthetic performances of the bricks, as well as their reinstatement, but do not constitute a major obstacle for reuse (see § *Characteristics and fitness for use*). 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.

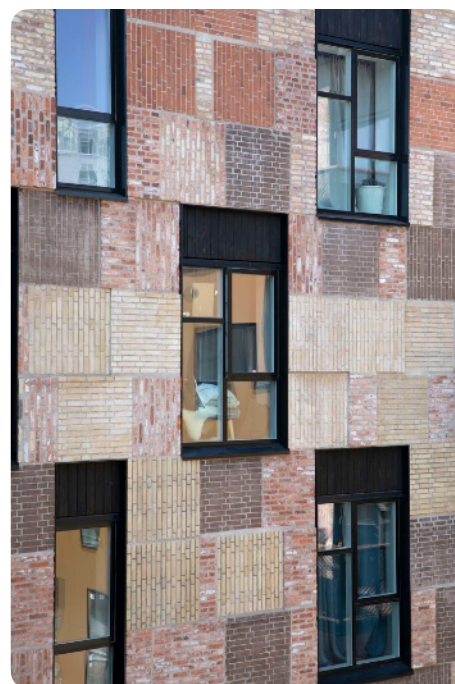
→ **Quantity.** Some suppliers may include a 5% surplus when the product is delivered if they are not able to guarantee the absolute uniformity of the characteristics mentioned above. This surplus can also be applied in the case of an on-site salvage scenario. To limit the risk of not finding the model, special attention should be paid to the quantities ordered.

Most professional suppliers are able to ensure that delivered batches meet these requirements. Generally, 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).

Some models of old bricks are renowned for their excellent technical characteristics, linked in particular to the quality of the clays, to the firing temperatures (historically higher than that of today) and to the know-how of the old brick makers. The persistence of constructive works that are sometimes centuries-old (and even thousands of years) clearly attests to the durability of old bricks. Today, this largely empirical knowledge and based on a more direct relationship with the material, which is still found among many old brick specialists, struggles to gain recognition for its validity in the normative frameworks of the construction sector, based on a more statistical and depersonalised approach. The advice of specialists remains extremely valuable in choosing a brick model suited to the requirements of the intended use.

Design tip!

To increase the chances of meeting the offer available on the reclamation market, the designer/specifier can choose to split large surfaces into smaller quantity batches, for example, by providing combinations of formats and patterns in the masonry. In this case, the compatibility of the models must be determined in advance, both at the technical level and at the design level.



Reuse of brick modules. The Resource Rows.
© Lendager Group (DK)

Did you know?

An alternative to salvaging bricks “individually” has been explored by the Danish company Lendager Group. Their “Resource Row” project (2019) is a housing complex in which brick modules from several demolition sites have been integrated into the façade. The variations in pattern and orientation of the modules contribute to the unique character of the building.



Characteristics and fitness for use

Most of the time, it is complicated, if not impossible, to simultaneously demonstrate all the technical performance associated with batches of reclaimed bricks. This is explained by a significant variability within the batches, in particular due to:

- the brick production process (heterogeneity of clay mixtures, variable and seasonal natural drying conditions, uneven heat distribution during brick firing, etc.).
- the unequal distribution of the stresses applied to the masonry of the same building during the life of the work. For example, local variability of exposure to frost and humidity, variability of mechanical or physicochemical stresses, etc. To a certain extent, it is possible to separate the elements at the time of removal based on

simple characteristics (e.g. masonry exposed and not exposed to frost and humidity, elimination of sensitive areas such as stables, tanks or foundations, etc.) but the degree of uncertainty generally remains at a more local level.

- the mix of supply sources. The suppliers of reclaimed bricks usually put together batches of similar bricks from different buildings. Bricks that have undergone different stresses are therefore mixed during the sorting and cleaning process.

This variability does not generally pose a problem for applications subjected to low stresses. It is even, in a certain respect, a factor allowing an increase in the quantities of reclaimed bricks.

On the other hand, reclaimed bricks are less suitable for applications for which a

great homogeneity of certain technical characteristics is essential (for example: compressive strength). In this case, the use of laboratory tests can provide answers, as long as the sampling is representative of the batch. Design strategies such as oversizing and robustness of details can also be an alternative to performing expensive tests.

The harmonised European standard EN 771-1+A1 defines the relevant characteristics (depending on the context) and the performance requirements to determine the fitness for use of new solid clay bricks. Although detailed for new bricks with identical intended use, these characteristics can also be useful in assessing the suitability of reclaimed bricks. The table below comments on these for exposed and unexposed, load bearing (L.) and non-load bearing (N.L.) masonry applications.

Characteristics	Exposed		Unexposed		Comments
	L.	N.L.	L.	N.L.	
Density					This parameter is commonly used for the calculation of the performance of stability, sound insulation, thermal insulation, fire resistance, water vapour permeability. It can be estimated simply by using scales and a meter, or it can be determined with precision in the laboratory.
Dimensions (length, width, thickness)	x	x	x	x	These characteristics are closely related to the degree of sorting and cleaning of the bricks. A visual or detailed examination of the batch is often sufficient to estimate them. In general, the degree of dimensional tolerance of reclaimed bricks is higher and is compensated by the use of thicker joints or by an adapted design (for example "wild" or irregular bond).
Surface condition	x	x	x	x	Ditto. Minor damage is not considered a defect as long as it does not prevent correct placement and affect the mechanical properties of the brick. The surfaces that may be coated must have sufficient roughness to allow the product to adhere.
Structural integrity	x	x	x	x	The structural integrity of bricks can be determined quite simply by means of visual or auditory tests.
Porosity and water absorption	x	x			<p>The porosity of used bricks varies considerably between models, ranging from very little absorbent to very absorbent. In general, the porosity is between 5 and 20%, mainly depending on the temperature at which they were fired. Porosity influences water absorption and the level of fouling. Water-repellent finishing treatments can limit this factor.</p> <p>The initial water absorption rate makes it possible to determine the good compatibility between a mortar and a brick, depending on the level of adhesion required. This characteristic is important for load-bearing masonry and exposed masonry subjected to horizontal loads (wind pressure, earthquakes, etc.)</p> <p>These parameters can be tested in the laboratory or estimated under in situ conditions (see karsten pipette, moisture meter, carbide bomb).</p>
Frost resistance	x	x			<p>In general, bricks which have been subjected to numerous freeze/thaw cycles without being damaged have already proved this aptitude. Therefore, special attention should be paid to the application and the original climatic zone, especially if the bricks are reused as unprotected masonry.</p> <p>In case of uncertainty, specific laboratory tests can be performed. In the absence of tests, bricks from protected masonry are not recommended for exterior applications.</p>



Characteristics	Exposed		Unexposed		Comments
	L.b	N.L.b	L.b	N.L.b	
Fire resistance	x	x			Fire resistance is assessed according to the construction system. It is determined according to the thickness and the characteristics of the various constituent layers. The basic rules in this area are given in standard EN 1996-1-2 (Eurocode 6).
Reaction to fire	x	x	x	x	Commission Resolution 2000/603/EC provides that masonry bricks with an organic matter content of less than 1.0% may be classified, without prior testing, in reaction to fire class A1. In case of uncertainty, bricks can be classified according to EN 13501-1.
Compressive strength	x	(x)	x	(x)	<p>This characteristic is particularly important in load-bearing masonry. The average compressive strength of a batch of reclaimed bricks can be determined in the laboratory, and then used for the calculation according to Eurocode 6. For information, the dispersion of the sampling results should not be too great. It is therefore advisable to work from batches of unmixed bricks.</p> <p>For non-load-bearing facing masonry, carried out according to the rules of practice, the compressive strength is generally not considered to be an essential criterion.</p> <p>To our knowledge, the tests carried out on several old models of reclaimed bricks result in a high compressive strength, mainly due to the high firing temperatures. Most suppliers of reclaimed bricks have a good knowledge of the models and their empirical mechanical properties. They can provide helpful advice.</p> <p>The compressive strength of masonry also takes into account the type of mortar used.</p> <p>This parameter can also be estimated in situ (<i>see flat cylinder technique</i>).</p>
Flexural and shear bond strength	(x)	(x)	(x)		These characteristics are relevant to assess where the masonry is subjected to horizontal forces (long spans of wall, wind pressure, seismic region) and particularly in the case of load-bearing masonry. They can be calculated from tabulated values according to the type of masonry element and the type of mortar (Eurocodes 6) or by laboratory tests (EN 1052-2 and EN 1052-3).
Thermal properties	x	x			<p>Relevant characteristics to assess whether bricks contribute to the thermal performance of the building envelope. Thermal values can be determined according to tabulated data (from density data), measurements, calculations, or a combination of the three. Refer to standard EN 1745 - Masonry and masonry products - Methods for the determination of thermal properties.</p> <p>Generally speaking, bricks, like most clay products, have relatively high thermal inertia which helps to regulate the temperature of the indoor climate.</p>
Moisture expansion	x	x			Clay products are generally dimensionally stable.
Efflorescence	x	x			<p>The appearance of efflorescence on the surface of used bricks is mainly caused by the transport of soluble components through the brick by rain.</p> <p>Most of the time, the exposed bricks have generally had time to evacuate their soluble salt content during their working life (beware of bricks subjected to sea spray). However, the exterior application of unexposed (interior) bricks or that have been in contact with the ground may cause the appearance of efflorescence.</p> <p>The type of mortar used, the degree of exposure of the masonry to humidity (infiltration, installation of wet bricks, etc.) and the microporosity of the bricks also influence the appearance of efflorescence. It is useful to know that Portland cement-based mortars are more likely to cause efflorescence to appear.</p> <p>However, the risk can be controlled thanks to a well-thought-out choice of materials and architectural details as well as careful installation.</p>



Characteristics	Exposed		Unexposed		Comments
	L.b	N.L.b	L.b	N.L.b	
Water vapour permeability	x	x			This characteristic is to be assessed for exposed and isolated masonry. The resistance coefficients to water vapour diffusion can be taken from tabulated values (EN 1745), depending on the density of the bricks considered or from test measurements.
Content in active soluble salts	x	x			<p>This characteristic can influence efflorescence as well as the resistance of cement-based joints. In general, bricks coming from unprotected masonry have evacuated a large part of the soluble salts that they could have contained. To avoid using bricks with too high a soluble salt content, it is recommended not to re-install bricks that have been in contact with the ground (foundations, cellars), or from stables, old fireplaces, septic tanks, foundations at the edge of the road (snow melt salts), etc.</p> <p>The soluble salt content can be laboratory tested or using indicator strips.</p>
Toxicity	(x)	(x)	x	x	In the outset, clay bricks are not likely to contain dangerous substances. However, during their lifetime, they could have been contaminated in various ways (mould, finishing treatments, painting, absorption of contaminated water, etc.). In the absence of a precise determination method, it is advisable to avoid the reclamation of bricks from cesspools, foundations, oil tanks, stables, etc. (+ see § Hazardous substances and precautions).



Bricklaying of a façade with three different models of reclaimed bricks. Chiro Itterbeek (BE). © ROTOR



Availability

Almost all reclaimed bricks sold by specialist suppliers are sorted, inspected, cleaned, palletized and ready for delivery. Several Belgian suppliers have reported an interesting development on the reclaimed brick market. In the past, so-called “hand-made” bricks were the most popular. These are irregular-looking bricks, often one hundred years old or even two hundred years old. Since the 1990s, the frequency of dismantling of very old buildings has declined while the demand for reclaimed bricks has persisted. The consequence of this was to lead salvage operators to take an interest in more recent types of solid bricks, qualified as “mechanical” (extruded) bricks. These date from the first half of the twentieth century and have a more regular appearance. These more recent reclaimed bricks have gradually found a place on the market. Because they are more common in dismantling, they are also less expensive than hand-made reclaimed bricks.

Indicative prices (Excl. tax, for private customers)

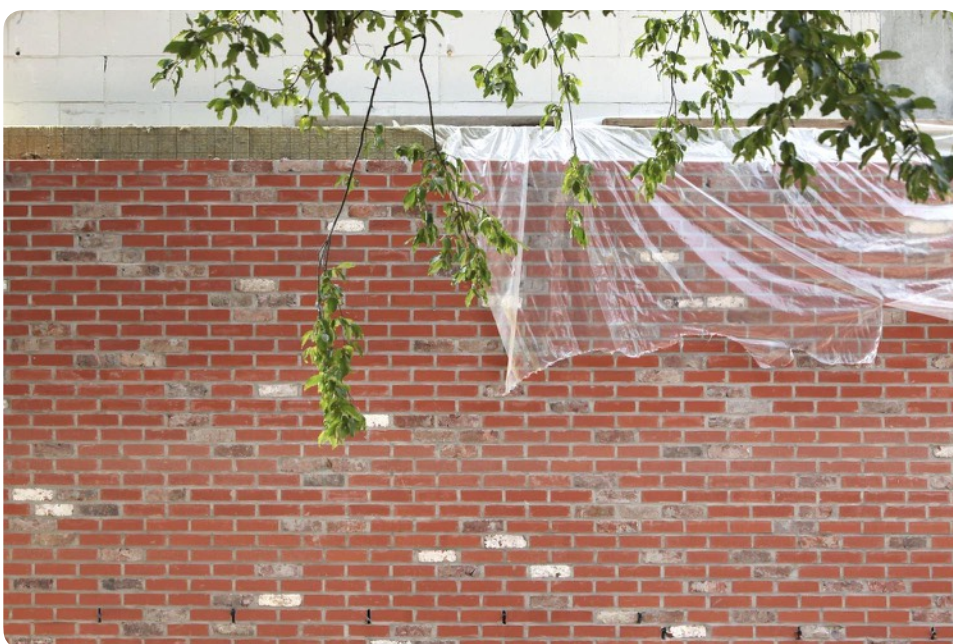
Random sampling of the reclamation market in Western Europe (Belgium, France, Great Britain and the Netherlands) made it possible to extract some indicative prices. These vary according to the models and their dimensions, the quality of the batches and their rarity.

- and-moulded bricks: from 0.30 to 0.60 €/pc
- extruded bricks: from 0.25 to 0.35 €/pc

Find specialised businesses



In the UK:
http://www.brickdirectory.co.uk/html/reclaimed_and_renovation_brick.html



Mixture of reclaimed bricks and new bricks. Folklore Museum, Mouscron (BE). © V+ architectes

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

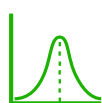
	kg CO ₂ eq./m ²	kg CO ₂ eq./kg
CTMNC (FR)- Collective declaration*	41.6	-
TERREAL (FR) - Individual declaration **	72.9	-
INIES database - Generic data ***	23.2	-
ICE Database (UK) – Clay Brick****	-	0.45
GAMLE MURSTEN (DK) - Reclaimed brick	-	0.0027

* Indicative value for a facing masonry of 1 m² in clay bricks (mortar and ties included). Valid for exposed bricks whose mass per m² is between 75 kg/m² and 186 kg/m².

** Indicative value of 1 m² masonry in hand-moulded solid brick (136 kg/m²), (mortar and ties included)

*** Indicative value for a 1 m² wall made of small clay masonry products (thickness between 15 and 25 cm)

**** Indicative value for a clay brick (specific weight 2.13 kg/brick)



According to the sources, reusing 100 m² of reclaimed clay bricks prevents the production of ~ 2 320 to ~ 7 290 kg of CO₂ equivalent related to the manufacture of new bricks (production phase only). This corresponds to a trip of ~ 13 900 to ~ 43 700 km in a small diesel car. Based on the data collected, we can estimate (in a simplistic way) that the impact of the reclamation of bricks on the global warming index is up to 150 times less.



Hazardous substances and precautions

Cement dust can contain silicon or quartz particles which can be harmful to health. It is recommended to provide the necessary protective equipment when dismantling and cleaning the bricks (FFP3 masks).

Dry rot, is a wood-eating fungus that thrives and attacks wood in humid or poorly ventilated conditions, which can cause structural damage. Although it does not attack masonry, the fungus produces spores that can infiltrate bricks and mortars near attacked woodwork. The use of reclaimed bricks can therefore be a source of propagation if the hygrometric conditions are poorly controlled.



Interior wall facing in reclaimed bricks. Zonnige kempen. (BE)



Extension of a single-family house. Reclaimed brick façade cladding. Brussels (BE) © Sophie Boone for VLA-Architecture

LE BATI BRUXELLOIS SOURCE DE NOUVEAUX MATERIAUX

Fiche produit-application : briques de terre cuite destinées à être réemployées en parement
Mai 2021

Logos: UCLouvain, CSTC, VUB, and others.

Read more!

Product sheet-application: clay bricks for re-use in facing. *The Brussels Building: Source of new Materials (BBSM)*. May 2021. (In French).
<https://www.bbsm.brussels/wp-content/uploads/2021/06/annexe-17-WP6-fiche-produit-application-briques-de-terre-cuite-parement.pdf>

Read more!

Diagnostic and performance evaluation methodology for the re-use of bricks - *Fondation Bâtiment Énergie (FBE)*. December 2020 (In French).
<http://www.batiment-energie.org/doc/70/FBE-ECB-enjeu-A-brique-V5.pdf>

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Méthodologie de diagnostic et d'évaluation des performances pour le réemploi de briques

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