

**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**

Interior fire doors play an important role in passive fire prevention. While allowing the passage of users (and their evacuation in the event of a fire), they also compartmentalise buildings thus slowing the spread of a fire and allowing the intervention of the emergency services.

The use of fire doors is made compulsory in a certain number of buildings such as office buildings and community facilities (community housing, schools, etc.). The nature of the doors, the performance thresholds they must reach and their location in buildings are governed by national provisions.

The reclamation of fire doors presents interesting challenges. In the context of buildings undergoing fairly short renovation cycles, it often happens that they are disposed of after only a few years of use while they are still in good condition (their reference lifespan is estimated at 30 years). Their composite nature makes them waste that does not recycle well. In this sense, their reclamation is of a certain environmental interest. Of course, they also touch on a very essential requirement of buildings which should not be taken lightly. To date, the reuse of fire doors has been implemented in several innovative projects.

It is in fact the whole of the door unit which must prove its resistance to fire. For this, each constituent part plays a role. For this, each constituent part plays a role:

- A. The *leaf* (or *door leaf*, that is to say the mobile part). This is generally in the form of a sandwich panel made up of layers of materials resistant to fire and humidity (wood, particles, steel, etc.) between which an insulating material is applied (mineral wool, plaster, perlite, cork, mineral fibre board, particle board, etc.). Likewise, any glazed elements of the leaf are made of fire-resistant glass. The leaf is generally fitted with a series of accessories such as handles, split hinges or hinges, locks, peepholes, etc.
- B. The *fixed frame*. This is made of a material that is sufficiently resistant to fire (steel, solid wood, glued laminated timber or wood-based particles). Depending on the model, it can be accompanied by a fanlight or a fixed glazing element.
- C. Fitting the frame to the wall also involves a *fire resistant gasket* (e.g. rock wool, fire enhanced polyurethane insulation foam, etc.).
- D. Added to this is the principle of adding *intumescent* (or swelling) materials to the leaf structure, to the frame, around the lock and to certain accessories (for example, ventilation grilles). When exposed to heat, these products swell and thus prevent the passage of hot gases and fumes. This phenomenon is also generally accompanied by an endothermic reaction allowing the absorption of heat.
- E. In addition, these doors are generally equipped with a *closing mechanism* that either automatically closes the door each time it is opened or automatically closes it when a fire is detected, although they can be opened to allow evacuation if necessary. These mechanisms can be simple door closers, electromagnetic magnets, thermal fuses, or even panic bar principles.



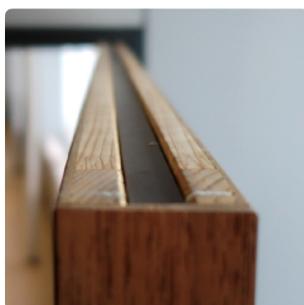
Example of a fire door

- F. Finally, proper installation and careful maintenance of equipment are essential to ensure the desired fire resistance.

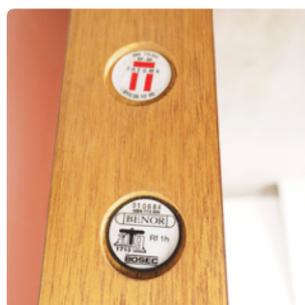
Beyond these main principles, there is a very wide variety of fire door models. They are mainly categorised according to the materials used for the leaf and the frame, the number of leaves (one or more), the opening principle (hinged, pivoting, swinging, sliding), the opening direction (left or right), the closing mechanism in case of fire (automatic, door closer) or the original manufacturer. Fire doors can generally be identified by the conformity sticker located on the edge of the leaf (hinge side) and which mentions their fire resistance performance.



Electromagnetic pad



Intumescent band



Compliance sticker



Automatic door closer

**Product reclamation**

Currently, it is mainly the leaf of fire doors that is recovered for reuse. It is much rarer for the frame to also be recovered.

This is mainly due to the fact that:

- the frames are often difficult to dismantle without damage. In addition, they are also more vulnerable and require excellent transport and storage conditions.
- the dimensions of the new location are not necessarily the same as those of the original location, which may involve alterations to the frame.
- in the event that the door unit is recovered in its entirety, the elements need to be kept together or correctly listed in order to avoid mixing up the elements, which calls for extensive logistics.

Fire doors can be reclaimed on site or be directed to professional reclamation channels. The operations related to the recovery of fire doors concern:

→ **Disassembly test** (or expert opinion). 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, model, dimensions, presumed quantity or the remaining validity of the certificate of conformity. The focal points will be among others:

- the general condition of the batch. Is the framework recoverable? Are the elements in good condition (leaves, frames, locks, hardware, intumescent products, etc.)? What about the presence of compliance stickers and their validity?
- commercial interest (depending on model, quantity, possible repairs, resale potential, compatibility of parts, etc.);
- logistics arrangements (deadline, working time, difficulty in handling, transport, etc.).

→ **Removal.** Careful disassembly 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. It is advisable to remove the free hinges, handle elements, lock cylinders and closing elements (door closers, electromagnetic magnets) to minimise the risk of damage during handling and storage. Lock housings, on the other hand, should be held in place so as not to damage the intumescent material around them. The parts will be sorted by models, qualities and dimensions. Please note, the bulkiness of certain fire doors requires specific lifting arrangements (it is not uncommon to encounter fire doors weighing 100 kg or more!).

→ **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. When the frames are also recovered, care must be taken not to bend them. For mono-block metal frames, a reinforcing slat (wooden) is generally necessary to secure the uprights and prevent their deformation. The parts are stored protected from frost, humidity and bad weather.

→ **Treatments.** Apart from a superficial cleaning of the elements, no specific treatment is generally provided by specialised operators in the reclamation sector. The return to conformity of a reclaimed fire door is generally done when it is refitted by the installer.



Vertical storage

→ **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... Here too, the heavy weight of some fire doors should be taken into account.

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 material. Some suppliers are able to indicate the origin of the product and/or provide documentation on the product purchased (*for more information, see the introductory sheet*).



Hardware

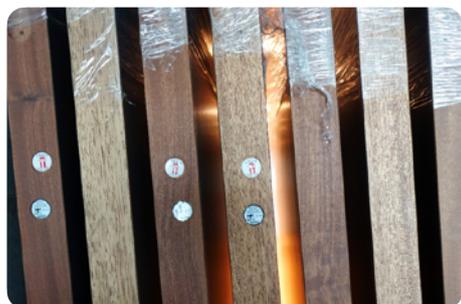


Characteristics and fitness for use

Before being placed on the market, *new* fire-resistant door sets almost always benefit from a control certificate and a technical opinion issued by an accredited body. This guarantees their fire resistance performance and their performance in conventional use, under defined installation conditions and for a set validity. This voluntary certification by producers is not obligatory (to date CE marking is not obligatory for interior fire doors too). It is accompanied by technical notices and installation instructions corresponding to the product tested.

The fire resistance of door sets is evaluated based on destructive tests on installed samples, according to the European test standard EN 1634-1+A1. Based on the results of the test report, the door unit system is then assigned a performance class according to the classification of European standard EN 13501-2 (or national standard still applicable, see box). This classification takes into account the following parameters:

- R = Load bearing capacity or fire stability. Structural elements must not collapse in the event of a fire. This does not apply to fire doors which are non-structural separating elements.
- E = Fire resistance. No slit or opening must allow the passage of flames through the element for a set period of time.
- I = Thermal insulation. The door must minimise the spread of the fire by transferring heat which can ignite elements on the side not exposed to the fire.
- W = Propagation. The door must minimise the spread of the fire by transferring heat which can ignite elements on the side not exposed to the fire.



Until 2016, each European country used its own standards system. For example: Rf 30 / Rf 60 in Belgium for door sets which are fire resistant for 30 or 60 minutes, WBD in the Netherlands, SF / PF / CF in France, FD in the United Kingdom.

Fire doors are classified into four classes: EI1, EI2, E or EW. National regulations determine the required classes according to the type of buildings, the use of the premises, etc. For example, in Belgium, only class EI1 (the most severe) is authorised. Resistance duration requirements also apply (e.g. EI1 30, EI1 60, EI1 90, EI1 120; classification based on the rules specified in standard 13501-2). For certain applications (e.g. stairwell doors in multi-storey buildings), performance regarding smoke tightness can also be expected.

In addition to their suitability for fire resistance, fire doors must be able to meet the requirements for fitness for use as a conventional door. These relate in particular to dimensions, flatness, mechanical performance, acoustics, safety, manoeuvrability, durability, resistance to humidity stress, etc.

In the event of *reclamation*, the fitness for use of fire doors can be assessed according to several additional measures:

1. *Verification based on the original certificate of conformity.* When purchasing a door (or during inventory), it is important to check that the condition of the door corresponds to the indications given in the manufacturer's technical sheet and/or in the certificate of conformity. The conformity sticker mentions the name of the certifying body, the control method, the fire resistance classification (according to the old national classifications or the harmonised European classification), the certificate number and any maintenance checks.

Any alterations made to the doors must scrupulously comply with the directives established in the technical manual accompanying the inspection certificate. These explain what is possible and what is not in terms of milling cylinder holes, replacing the lock box, adding reinforcing plates, drilling the leaf or the frame, replacement of handles and hinges, or even alterations

The inspection certificate and technical notices are generally available from the manufacturer or the certification body (see their website). The validity period can be extended by the producer. Doors installed during the certificate's period of validity are therefore presumed to conform provided that the installation scrupulously respects the directives in the technical manual. If the certificate is no longer valid, it does not necessarily mean that the fire resistance performance of the door is no longer valid, but rather that the manufacturer has stopped producing this type of door and has not renewed the certificate. In the case of large batches, it may be useful to contact a certified inspection body to judge the advisability of recertification. In all cases, it is advisable to seek the advice of the competent authorities in case of doubt about the fire safety of buildings.

to the dimensions of the leaf or the frame, etc. If the leaf must be slightly planed (in order to adjust its positioning in the frame or following the installation of a new floor covering, for example), it is essential that the intumescent bands of the internal structure are not revealed following removal of material.

Particular attention must also be paid to possible water damage. The presence of signs such as damp spots, flatness defects or even damage to the lower edge of the leaf can generally indicate a deterioration of the intumescent products contained in the leaf. Visible intumescent bands can also be checked visually.

2. *Equipment evaluation by an approved installer.* The latter can refit the element (s) according to the required instructions. The installer can also order the framing elements and the hardware necessary for a compliant restoration (see application and installation).

3. *Re-certification.* A re-installed door can also be certified again or in a complementary manner by an approved inspection body before it is put back into service, at the request of one of the parties concerned (builder, architect, contractor, installer, insurer).



Applications and installation

It is generally easier to install a reclaimed leaf (and its hardware) in a new frame and with new hinges. Manufacturers of fire door sets are generally able to supply the elements necessary for a compliant refurbishment. The technical notices that accompany the original inspection certificate provide information on other installation possibilities and application details: compatibility with products from another manufacturer, construction of a custom frame according to the requirements described, compatibility of locks and hinges.

It is strongly recommended that the door be installed by a certified installer who can also provide a placement report and affix a compliance label to the placed product.

In this respect, the re-installation of reclaimed fire doors does not differ from that of new fire doors. It raises the same points of attention and must comply with the manufacturer's instructions, the technical notices accompanying the original inspection certificate, the rules of the art in force and the installation standards. These relate in particular to compliance of the following aspects:

- dimensions of the door (leaf, frame, rabbet, etc.);
- accessories (locks, hinges, locking system, etc.);
- materials (density of wood for the manufacture of custom frames, type and rigidity of the floor covering, etc.);
- making of custom frames;
- tightness between the frame and the structural works (type of insulation, thickness, etc.);
- adjustment of the system (play, distance from the ground, flatness, floor covering, etc.);
- operation in case of fire (operation of the automatic closing system);
- presence and position of the certification sticker (+ maintenance sticker);
- etc.

In order to guarantee the performance of the door unit and its correct operation throughout its lifetime, it is necessary to provide for regular maintenance: cleaning, lubrication of the hardware, replacement of worn parts or missing elements, adjustment of the clearance between the leaf and frame, visual inspection of intumescent bands, minor damage repairs, moisture damage inspection, etc.

Fire doors can also be used as "classic" doors (i.e. not subject to fire resistance requirements). In this case, slight deterioration, alterations or changes in dimensions are of less importance. It is then recommended to remove the certification stickers to prevent the door from being re-installed as a fire door.



Example 1. Before reclamation



Example 1. After reclamation



Example 2. Before reclamation



Example 2. After reclamation



Availability

Fire doors are currently an uncommon product and in little demand on the reclamation market. The physical offer is mainly found with specialised dealers (or demolition contractors) active in urban areas. The available batches are often less than 10 similar pieces. Most of the time, only the leaves and some hardware items are available.

However, it is possible to obtain larger batches during the scheduled release of materials from the demolition/renovation of large buildings. Getting in touch with the companies involved can then lead to the potential reclamation of batches of tens or even hundreds of fire doors.

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 very little depending on the model. They are around 50 to 70 €/unit excluding VAT for intact fire door leaves.

For information, the total budget devoted to the installation of a new standard fire door type EI1 60 is often between 600 and 1,300 €.

Hazardous substances and precautions



Old fire doors (before 1997) are likely to contain *asbestos*.



Find specialised businesses

SALVO salvoweb.com **OPALIS** opalis.eu

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

	kg CO ₂ eq./FU
INIES database (FR) - MALERBA - Individual declaration - Fire resistant wooden door on wooden frame *	44.4
INIES database (FR) - MALERBA - Individual declaration - Fire resistant wooden door on metal frame *	18.6
ASSA ABLOY - Individual declaration - Fire resistant steel door on metal frame *	40.9

* FU (Functional Unit) = square meter of opening area before installation



Reusing 1 m² of standard fire door unit (overall size) prevents the production of ~ 19 to ~ 44 kg of CO₂ equivalent related to the manufacture of a new fire door unit (production phase only). According to sources, this corresponds to the emissions of a trip of ~ 112 to ~ 266 km in a small diesel car.

Warning: these figures should be revised downwards if only the leaf is reclaimed.