

**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).

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Product description

Sheet metal radiators and convector heaters are very common heating elements in central heating installations. These are devices in which hot water circulates and which return the heat through convection and/or radiation. They have a lower thermal inertia than cast iron radiators.

The first models of radiators, in cast iron, were gradually replaced, from the 1970s, by models made from sheet steel. More recently, devices made out of aluminium (lighter, faster temperature rise) and stainless steel (good corrosion resistance) have appeared on the market.

Sheet steel radiators come in a wide variety of shapes: section radiators, panel radiators, 'designer' radiators, baseboard heaters, towel radiators, vertical tube radiators, etc. The reuse of cast iron radiators differs from sheet metal appliances and is covered by the Cast iron radiators sheet.

The most common and cheapest heaters are panel radiators, both on the new and reclaimed market. They consist of one to three plates in which water circulates vertically (radiant heat), possibly reinforced by convection slats (convection heat). Depending on the number of panels and the number of convector elements, panel radiators are classified into several types (Figure 1). Decorative elements (front panel, side panels, upper grille) can complete the equipment.

The replacement of a heating appliance is more often linked to the replacement of the heating production system or to an aesthetic choice than to a malfunction of the appliances. Sheet metal radiators are most often used in single-family homes and medium-sized administrative buildings.

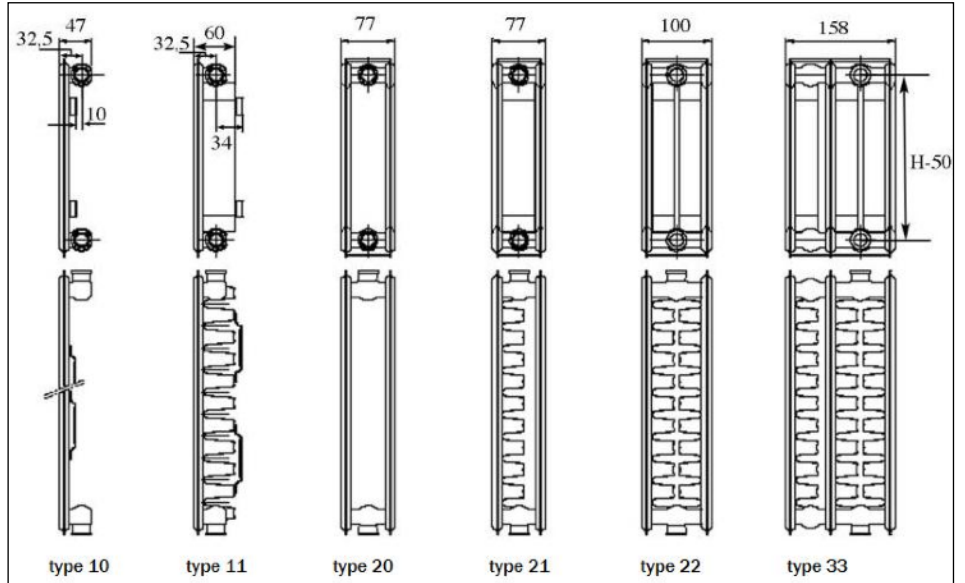


Figure 1: Types of panel radiators





Sheet steel, stainless steel, and aluminium radiators

Product reclamation

If the appliances do not find a new use directly on site, they can be sent to professional reclaimed channels. However, there are only a few operators capable of salvaging batches of sheet metal radiators/convectors. Their interest will depend essentially on the model, the quantities and the general condition of the batch.

→ **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 photos or existing technical information (manufacturer, model, dimensions, power, etc.), or through an on-site visit. The focal points will be among others:

- *general condition of the batch: are the appliances damaged? Dirty? Is the coating layer in good condition? Rust spots or water under the radiator can indicate a leak and spherical welds can betray a radiator that has frozen.*
- *Condition of the accessories: is the thermostatic valve working correctly? Condition of thermostatic valve stem and gland? Condition of the trim elements and the upper grille? Condition of the fixing bracket? Compatibility with new accessories?*
- *Commercial interest (depending on model, quantity, resale potential, ease of maintenance, etc.);*
- *Logistic arrangements (deadline, working time, handling, transport, etc.).*

→ **Dismantling**: careful dismantling should aim to ensure the integrity of the installation, the appliance and its accessories. After having drained the installation, it is recommended to first remove the thermostatic valve and the mounting brackets. Radiators that have had frozen water, or have cracks, traces of rust or deformation at the welds, are likely to be leaky and must be set aside. The radiators will be sorted by qualities, colours and dimensions. The specific mounting brackets will be retained.

→ **Storage**: the radiators should preferably be stored in a vertical position on a flexible support (wood) to avoid scratches and knocks. They will be filled with water (+ caps) to limit internal oxidation and stored in a dry place, protected from frost and protected from dust.

→ **Treatments**: in general, used sheet steel radiators are sold without any treatment other than surface cleaning. Unlike cast iron radiators, used sheet steel radiators very rarely benefit from a leak test and pressure resistance.

→ **Transport and delivery**: the necessary precautions must be taken during transport and delivery in order to limit knocks and scratches (interlayer protection, corner protectors, strapping of pallets, etc.).

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



Certain sheet steel radiator models can be confused with cast iron radiators.





Applications and installation

As a general rule, the choice of heating appliances must take into account the expected stresses (see § 'characteristics and fitness for use') and factors such as aesthetics, thermal comfort, etc. In all cases, reference should be made to the European and national standards relating to the product (EN 442-1) and to the rules of practice in force (or implementation standards).

The design of a heating system based on reclaimed radiators differs from the design with new elements. Instead of ordering radiators that deliver the exact power required, you have to deal with appliances available on the reclamation market. The design must therefore be flexible with regard to the size and possible number of radiators.

→ **Power required:** this data determines the heat requirement of the rooms to be heated. This is determined by the climatic zone in which the building is located, the type and volume of the rooms, the general insulation of the building, the operating mode of the heat production, etc.

→ **Nominal power of a radiator:** this parameter determines the capacity of a radiator to emit heat. It is ascertained by the type of radiator (material, dimensions, number of panels and fins, level of contamination, etc.) and by the operating mode of the heat production. This information is sometimes available from the original manufacturer. In the event that the manufacturer is not known or that the calculation conditions are modified (for example in the case of an operating mode at low temperature), it is possible to obtain this information from charts available on the Internet or by calling a professional.

→ **Sizing of the radiators:** this calculation takes into account the required power, the nominal power of the radiators and their size, the available space, etc. In the absence of a thermal performance test, it is advisable to increase the dimensions of reclaimed radiators by 10%.



The reuse of reclaimed sheet radiators is no different from that of new radiators. They lend themselves to the same variety of installation methods (wall bracket, support feet). They raise the same points of attention, in particular: thermal power, connection possibilities, sealing of the radiator and connections, conformity of the accessories (thermostatic valves, bleed screws, plugs), aesthetics, safety (rounded corners), heat reflecting surface behind the radiator, etc. To facilitate installation, the designer/specifier will ensure that radiators meeting the following characteristics are used.

→ **Types and dimensions:** they must correspond to the needs expressed by the designer/specifier in order to obtain the desired thermal power.

→ **Condition:** reclaimed sheet steel radiators must not have cracks or alterations at the welds but may present alterations such as traces of superficial wear, stains, defective accessories, etc. Specialised workshops are able to carry out stripping and repainting.

The presence of corrosion sludge or lime deposits inside radiators is frequent and is sometimes responsible for a decrease in thermal performance. It is therefore recommended to properly clean the inside of a used radiator before putting it back into operation (chemical or mechanical sludge removal/descaling).

→ **Quantity:** to increase the chances of meeting the offer available on the reclaimed market, the designer/specifier can choose to split the batch with different models.

→ **Accessories:** connection parts, washers, valves, thermostatic valves, drain valves and fixing systems may be specific. If they need to be replaced, ensure the compatibility of the appliances with new accessories. Some accessories are sometimes available from professional dealers.

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).



Illustrated manual for dismantling a radiator (in French): <https://reuse.brussels/nl/radiateurs-et-vannes-thermostatiques/>



Characteristics and fitness for use

The harmonised European standard EN 442 establishes the relevant characteristics (depending on the context) to be observed in order to determine the fitness for use of radiators and convector heaters. Although detailed for new materials produced from 2002 onwards, these characteristics may prove useful in considering the specific case of reclaimed radiators.

Characteristics	Comments
Reaction to fire	The reaction to fire of a sheet metal radiator depends primarily on the thickness of the surface coating. The original paint coat generally complies with the standards in force (thickness < 1 mm and surface density 1 kg/m ²). In the absence of proven additional paint coats, reclaimed radiators can be classified as non-combustible and belong to the European reaction to fire class A1 without prior testing.
Emission of hazardous substances	A lead diagnosis may be necessary to detect the presence of old lead paints on radiators (before 1990). In this case, it is strongly recommended to strip and paint the radiators. Specialised workshops are able to provide this service.
Sealing and pressure resistance	The radiator must be able to withstand a pressure 1.69 times the maximum operating pressure. Unlike cast iron radiators, used sheet metal radiators are very rarely pressure tested. It is therefore advisable to visually inspect the radiators to detect the possible risks of leaks. Information on storage conditions and the risk of freezing before removal is relevant in this regard (to be requested from the supplier or to be noted on site).
Surface temperature	/
Thermal power and characteristic curve	<p>The exact thermal power of a used radiator cannot be calculated according to the tests described in standard EN 442-2. It is ascertained by the type of radiator (material, dimensions, number of panels and fins, level of contamination, etc.) and by the operating mode of the heat production. This information is sometimes available from the original manufacturer. In the event that the manufacturer is not known or that the calculation conditions are modified (for example in the case of an operating mode at low temperature), it is possible to obtain this information from charts available on the Internet.</p> <p>The presence of corrosion sludge or lime deposits inside radiators is frequent and is sometimes responsible for a decrease in thermal performance. It is therefore recommended to properly clean the inside of a used radiator before putting it back into operation (chemical or mechanical sludge removal/descaling). It is also advisable to increase the dimensions of reclaimed radiators by 10% when calculating the sizing of radiators.</p>
Corrosion resistance	For new products, this characteristic is tested by verifying the absence of surface corrosion after 100 hours of exposure to humidity. This characteristic is therefore closely linked to the degree of sorting of reclaimed sheet metal radiators. A visual or detailed examination is often sufficient to estimate it.
Resistance to small impacts	/



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

	kg CO ₂ eq./FU
INIES database (FR) – Generic data *	197
UNICLIMA – Collective declaration **	98.3

* Indicative value for FU (Functional Unit) = 1000 W hot water radiator for a reference life of 50 years.

** Indicative value for FU (Functional Unit) = 1000 W hot water radiator for a reference life of 50 years. Steel radiator consisting of type 21 or 22 tubes or panels. Surface treatment and finish coating with anti-corrosion epoxy paint. Mass: 31.74 kg.



Considering a required thermal power of 10 kW for an average home of 100 m², reusing 10 sheet radiators of 1000 W can prevent the production of ~ 983 to ~ 1 970 kg of CO₂ eq. related to the manufacture of new radiators (production phase only). This corresponds to a journey of ~ 5 900 to ~ 11 800 km in a small diesel car.

Availability

Sheet metal radiators are an uncommon product on the reclamation market. Their availability depends on the quantities required. As an example:

Frequent	Batch of 1 piece
Occasional	Batch of 2 to 5 identical pieces
Rare	Batch of > 5 identical pieces

Tip!

To increase the chances of meeting the supply available on the reuse market, the designer/specifier may choose to split the large areas into smaller batches (e.g. with different models in each room).

Indicative prices (excl. tax)

The prices observed vary greatly depending on the model and the original manufacturer. Designer radiators, in aluminium or stainless steel are the most popular. Panel radiator models that are easy to maintain (removable faces and grilles) are generally more expensive.

→ Standard panel radiators: €40 to €150/unit

→ Designer radiators: €150 to €200 /unit

At these prices, it is sometimes necessary to provide for a supplement for the replacement of washers or certain accessories, stripping and repainting, sludge removal/ descaling, etc.

Hazardous substances and precautions

Lead: a lead diagnosis may be necessary to detect the presence of old lead paints on radiators (before 1990). In this case, it is strongly recommended to strip and paint the radiators. Specialised workshops are able to provide this service.

Find specialised businesses



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