

**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

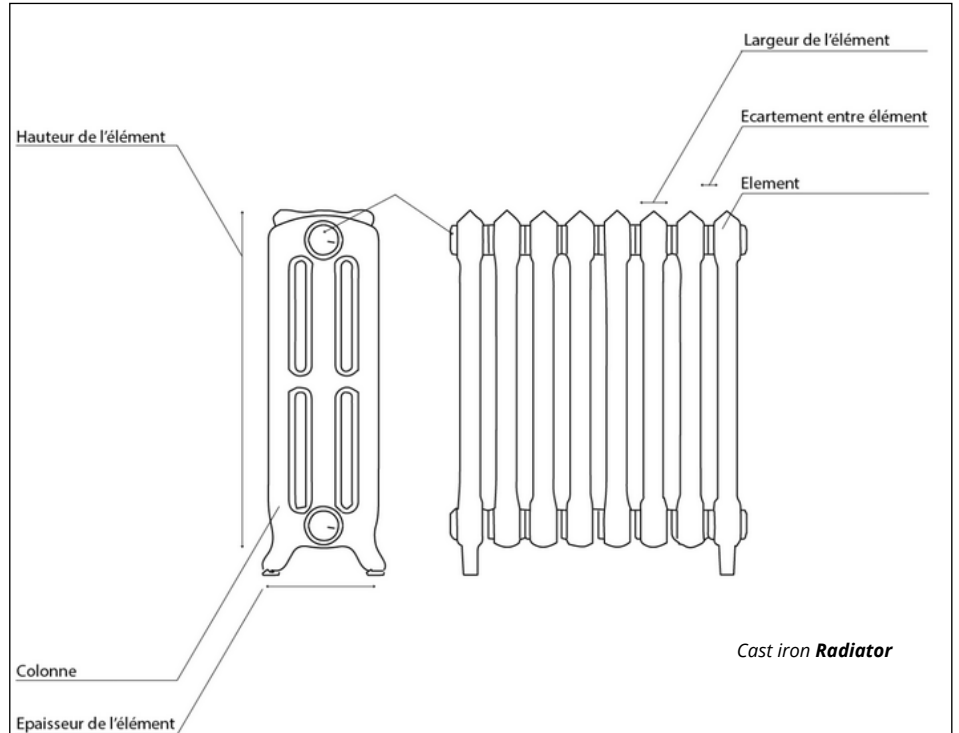
Cast iron radiators appeared on the market in the second half of the 19th century. Between 1910 and 1970 cast iron hot water central heating radiators were produced on a large scale, before pressed steel radiators started to take over in the 1960s. Cast iron radiators are still frequently found in private homes, schools, hospitals or administrative buildings of these periods. Column radiators, panel radiators or hospital radiators are among the most common types available on the market. Each type comes with a large variety of styles and dimensions.

As a general principle, hot water circulates in the columns and gives out heat by radiation and convection (in a proportion that depends on their type, finish and colour). The sections vary in size depending on the model. The individual elements are connected by threaded connectors which are best dismantled for thorough cleaning and restoration. Heat output is modified by adjusting the number of sections. This requires skills, experience, tools and pressure testing equipment.

Cast iron radiators adapt well to new heat production systems (low temperature boiler, heat pump, etc.). Although heavy and fragile, they have been enjoying a resurgence in popularity since the 1970s, especially for the pleasant heat they give off and their energy savings. Their cost is relatively high. Warranties are offered by some dealers.

→ **Types:** there are a fairly wide variety of types, from 1 to 9 columns, flowery, smooth, screen, round, corner models, plate warmers, etc. The dimensional characteristics of the individual elements are in the order of H [34 to 105] cm × W [7–22] cm × D [5–6.5] cm. The individual elements weigh from 3 to 13 kg and give a heat output of 35 to 240 W depending on the type of boiler, operating temperature water, room temperature, outside air temperature, the colour and finish of the radiator.

→ **Colours:** it is common to find refurbished cast iron radiators that are coated with an anti-rust primer (raw finish, matte anthracite grey). The type and colour of the paint influence the proportion between radiant and convected heat. Matt finishes black or dark colours give the most radiant heat output,



Graphic representation of a cast iron radiator © ROTOR et SIXIEME CONTINENT

while light-coloured and metallic finishes give out the least radiant heat (rendering a radiator into a convected air heater). The use of low VOC eco-friendly paints should be preferred over polyurethane paints, to avoid contaminating old radiators.

→ **Accessories:** specialist dealers are generally able to supply new valves, reducers and adaptors for modern plumbing sizes, cast iron feet for footless radiators and wall mounting brackets.

Did you know?

It is now possible to electrify old cast iron radiators by adding an insulated electrical resistance.



Column radiators - 'Classic' style



Column radiators - 'Flowery' style



Panel radiators



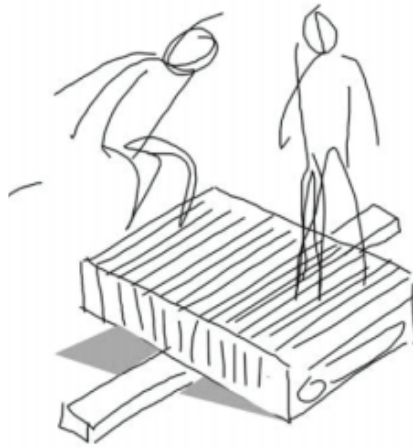
Product reclamation

Cast iron radiators are readily found; their recovery is relatively easy, and represents a great opportunity for reuse. Specialised operators can assist you with a complete overhaul and upgrading of radiators in the event of reuse on site. These same operators are also likely to buy and/or sell batches of reclaimed cast iron radiators while ensuring the smooth running of the following operations:

→ *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 badly damaged? Rust spots or water under the radiator can indicate a leak or betray a radiator that has frozen.;*
- *commercial interest (depending on model, quantity, possible repairs, resale potential, etc.);*
- *logistics arrangements (deadline, working time, difficulty in handling, transport, etc.).*

→ *Reclamation*: careful dismantling should aim to ensure the integrity of the appliance and its accessories. After having drained the installation, it is recommended to first remove the valve and the mounting brackets. The radiators will be sorted by models, qualities and dimensions. The specific mounting brackets will be retained. The heavy weight of some cast iron radiators will require special lifting arrangements. Most of the specialised operators do not carry out the removal themselves and only carry out a ground floor collection/delivery, to the front door.



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→ *Storage*: Since cast iron is less prone to corrosion than steel, and radiators will undergo a complete overhaul, they will usually be drained of their water, stored horizontally and temporarily stacked outside. However, prolonged storage outdoors can complicate the subsequent dismantling of the elements and heavy stacking can cause microcracks due to the heavy weight of the radiators. After overhaul, cast iron radiators will be stored vertically, without stacking, protected from frost and bad weather.

Although it is technically possible to recompose cast iron radiators from individual sections, it is not advisable to break them into several fragments when removing them. Although this method is sometimes recommended to limit handling loads, it is always preferable to refer to the advice of the professional who will take care of their restoration.

If necessary, a precise cut can be considered to separate the elements.



© LIONEL BILLIET

The presence of lead paint on old cast iron radiators is common. In this case, a thorough overhaul of the radiators and their stripping is highly recommended.



Selective removal



Storage before revision



Storage after revision (preferably vertically)



→ **Treatments:** Specialist operators usually subject used cast iron radiators to a thorough overhaul. Several methods for this exist. Most of the time, radiators will undergo the following treatments:

- chemical stripping to remove the old paint (sometimes toxic!);
- sludge removal to eliminate the sludge present inside the columns and guarantee optimum thermal performance;
- high pressure cleaning;
- sodablasting/sandblasting suitable for removing rust residues without drilling the elements;
- (resizing if necessary – by adding or removing elements – to meet the need for thermal power);
- (replacement of nipple seals if necessary);
- (tapping and replacement of outlet plugs if necessary);
- anti-rust primer;
- polyurethane finish paint according to RAL colour chart (powder coating is not advised);
- leakage check by pressurising from 4 to 8 bars.

→ **Transport and delivery:** cast iron is very fragile and is not that resistant to knocks. The necessary precautions must therefore be taken during transport and delivery in order to limit knocks and scratches (interlayer protection, corner protectors, transport in vertical position, strapping of pallets, etc.). The heavy weight of some radiators should be taken into account. Painted radiators sometimes come with a touch-up pen.

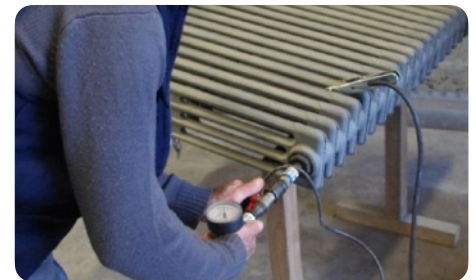
It is advisable to involve specialised professionals to ensure the smooth running of these operations.



Chemical pickling



Replacement of outlet plugs © LIONEL BILLIET



Pressurisation test © DECAPFONTE



High-pressure cleaning



Painting



Delivery of the revised radiators. © LIONEL BILLIET



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 cast iron radiators differs little from a design using new elements. Thanks to their modularity, it is possible to completely reconfigure most of the classic radiators. Resizing rare models is very difficult, if not impossible. It is also possible to order a 'bespoke' reclaimed cast iron radiator. Most specialist dealers can assist you in the design and choice 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 determined by the type of radiator (model, dimensions, number of elements) and by the operating mode of the heat production. This information is available from dealers for the most common models. 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 (I.e. <http://radiateur-fonte.com>, <https://www.radiastyl.fr>).

→ **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.

The reuse of reclaimed cast iron radiators is no different from that of new radiators. They lend themselves to the same variety of installation methods (wall mounting bracket, support feet). They raise the same points for consideration, in particular: thermal power, connection possibilities, sealing of the radiator and connections, conformity and compatibility of accessories (thermostatic valves, bleed screws, plugs), aesthetics, safety (rounded corners), heat reflecting surface behind the radiator, weight of radiators, 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 cast iron radiators that have undergone an overhaul must be airtight, free from rust and compatible with the desired connection system.

→ **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:** outlet plugs, nipple washers, valves, taps, bleed screws and fixing systems can be replaced and brought up to standard. Most of these accessories are available in new (contemporary or reissue) or reclaimed versions from professional resellers.

Most of the reclaimed building product are sold as is. In the particular case of cast iron radiators, a **warranty up to 20 years** may accompany, depending on the service provider. Some suppliers are also able to indicate the origin of the product and/or provide documentation on the product purchased (for more information, see the *introduction sheet*).



Caserne de Reuilly, Paris Habitat - In situ reuse of 85 cast iron radiators. © ROTOR and SIXIEME CONTINENT



New valves - old style reissue



Dealer's showroom



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 convectors. Although detailed for new products produced from 2002 onwards, these characteristics may prove useful in considering the specific case of reclaimed cast iron radiators.

Characteristics	Comments
Reaction to fire	The reaction to fire of a cast iron radiator depends primarily on the thickness of the surface coating. The thickness of the paint layer applied by spray gun by professional dealers is less than 1 mm (surface density < 1 kg/m ²); reclaimed cast iron radiators can therefore be considered to be non-combustible materials and belong to the European reaction to fire class A1 without prior testing.
Release of hazardous substances	The presence of lead paint on old cast iron radiators is common. In this case, a thorough overhaul of the radiators and their stripping is highly recommended. The paints used for reconditioning radiators must comply with the standards in force (in particular VOC).
Sealing and pressure resistance	The radiator must be able to withstand a pressure 1.69 times the maximum operating pressure. Reclaimed cast iron radiators are generally sold after passing a seal test (4 to 8 bar). A 5 to 20 year waterproof warranty is generally offered by resellers.
Surface temperature	/
Thermal power and characteristic curve	<p>The exact thermal output of a used cast iron radiator cannot be calculated according to the tests described in standard EN 442-2. It is determined by the type of radiator (model, dimensions, number of elements) and by the operating mode of the heat production. This information is available from dealers for the most common models. 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 can be responsible for a decrease in thermal performance. It is therefore recommended to remove sludge from the radiators before re-installation. This operation is carried out by specialised operators.</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 correct application of an anti-rust primer to stripped radiators.
Resistance to small impacts	This characteristic concerns the coating layer. Correct application of two-component polyurethane spray paints is recommended. Powder coating is prohibited because it would damage the nipple seals.
Superficial defects	The radiator must be free from burrs that could cause injury. Specialised operators check and correct these faults.

It is advisable to carefully examine the conditions under which cast iron radiators are serviced (this information can be requested from specialist operators).



Availability

Cast iron radiators are a very common product in the reclamation market. However, availability depends on the quantities required. As an indication, for classic cast iron radiators (1920-1970), we can find batches of compatible radiators (identical modular system) in the following quantities:

Frequent	Batch of 1 to 10 pieces
Occasional	Batch of 11 to 20 pieces
Rare	Batch of > 20 pieces

Older, highly decorated radiators are often rare items. Note that at some specialist dealers, radiators are only renovated once sold.

Embodied carbon or Global Warming Potential

It is relatively difficult to estimate the ecological impact of reusing cast iron radiators since there is to our knowledge no data on this subject. However, the following elements can provide food for thought:

→ In view of their success, cast iron radiators on the reclamation market in Europe are likely to have travelled great distances. Reclamation suppliers source from large areas and some popular models sometimes come from the United States.

→ The impact of radiator renovation operations is not negligible and must be taken into account (painting, stripping, etc.).

→ The replacement of cast iron radiators with new, lighter sheet steel radiators is subject to debate. Cast iron radiators have a slow rise in temperature and good thermal inertia, unlike common sheet metal radiators. In general, the energy consumption of radiators is highly dependent on the overall insulation of the building and the desired thermal comfort.

→ The impact of the production of new or recycled cast iron is not negligible.

Indicative prices (excl. tax)

A non-exhaustive sample of the Western European reclaim market (Belgium, France, UK, and the Netherlands) has allowed us to extract some indicative prices.

The prices observed vary greatly depending on the models, dimensions, total radiator power, finish and suppliers. Prices are generally given per modular element. To find out the indicative price of a radiator, simply multiply by the number of elements that make it up.

Supply price (painting included, excluding antiques):

→ Flowery/smooth models: €70–110/element

→ Classic models: €15–35/element

→ Curtain models: €20–25/element

Renovation price (painting included):

→ Flowery/smooth models: €20–45/element

→ Classic models: €10–30/element

Valves (new, reissue): €60–150/kit

Fixing brackets (feet or wall): €10–15/piece

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).

Hazardous substances and precautions

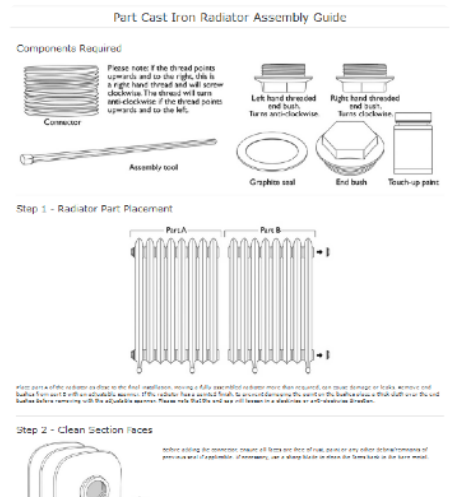
Lead: a lead diagnostic may be necessary or mandatory (i.e. in France) to detect the presence of old lead paints on cast iron radiators. In this case, it is strongly recommended to strip and/or repaint the radiators through a specialised dealer.

Find specialised businesses



salvoweb.com

opalis.eu



An illustrated manual for assembling a cast iron radiator <https://www.carron.uk.net/radiators/part-radiator-assembly-guide/>

Nombre de colonnes	Hauteur avec pied cm	Hauteur sans pied cm	Épaisseur élément cm	Longueur élément cm	Poids élément kg	Puissance watt ▲ T 50°K
2	41,5	36,5	6,8	5,5	2	37
	61,5	56,5			2,9	49
	76,5	71,5			3,2	57
	91,5	86,5			3,9	69
4	105,5	100,5	14,6	6	4,8	81
	35	29,5			2,9	44
	45	40			4	62
	65	60			5,4	88
6	80	75	22,3	6	6,4	110
	95	90			7,8	128
	107	102			9	145
	35	29,5			4,1	64
6	45	40	22,3	6	5,6	91
	65	60			7,8	127
	80	75			9,5	159
	95	90			11,5	191
	107	102			14,7	220

Example of a power table: <http://radiateurfonte.com>, <https://www.radiastyl.fr>