

**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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Carpet tiles

Product Description

Used for interior flooring, carpet tiles (also called modular carpets) find their place in residential applications, office spaces, commercial premises and in the event sector. Their dimensions and modular nature make them similar to raised floor systems (raised floors), on which they are moreover commonly fitted.

The tiles are designed to be easily replaced in the event of localised deterioration. Their theoretical lifespan is 10 to 15 years. Carpet surfaces are however frequently replaced after only 7 to 10 years, especially for aesthetic reasons.

In principle, carpet tiles are quite suitable for reclamation. They are generally easy to dismantle and easy to package. In practice, their reclamation largely depends on their state of wear. In addition, the economic value of reclaimed tiles remains relatively low.

Carpet tiles are a product with many variations, not only in their appearance (colour) but also in their composition. There are different models suitable for different contexts.

Generally speaking, tiles consist of three distinct layers which ensure the overall performance in stain and wear resistance, touch, electro-conductivity, acoustics, fire resistance, etc.:

→ **wear layer**, sometimes called "pile": made up of synthetic fibres (polyamide, polypropylene, polyester, etc.) or, more rarely, natural fibres (wool, goat hair, etc.).

→ **backing fabric**: textile, woven or not, on which the fibres are attached (= first backing), in synthetic or natural materials.

→ **padding** (= second backing): consisting of several layers of materials such as bitumen, PVC, polyolefin, polyurethane, synthetic felt, woven fabric, synthetic foam, latex, etc. The composition of the padding largely determines the acoustic properties of the tiles as well as their method of installation and the choice of glue to be used.

Other parameters are used to characterise the tiles:

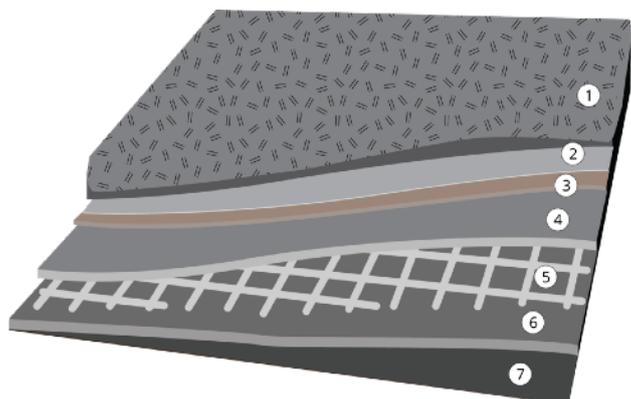
→ **Texture**, depending on the manufacturing process and the density of the yarns: most of the time looped or *tufted*, there are also textures such as cut or ribbed pile, woven, frieze, saxony, needled or even long shaggy hairs.

→ **Variable appearance**: plain, multicoloured, layered, patterned, etc.

→ **Formats**: most carpet tiles have a standard size of 50 × 50 cm and a variable thickness of 5 to 10 mm. Other formats exist but are rather rare.

→ **Weight**: from 3.5 to 5 kg/m².

→ **Type of installation**: carpet tiles were formerly held in place by means of glues or non-permanent binders such as "tack" glue, fixers or even adhesive tapes. Innovations on the back of the tiles have progressively made it possible to market so-called "non-adhesive" tiles, which do not need to be fixed to the substrate and which can be placed freely. These are very easy to dismantle.



- (1) Wear layer
- (2) Backing fabric = first backing
- (3) + (4) + (5) + (6) + (7) Padding = second backing

Anatomy of a carpet tile



Product reclamation

Salvageable carpet tiles are mainly found in office spaces or commercial buildings. They are usually found laid on raised floors or directly on a smooth concrete screed. Recent tiles (<15 years) are often easier to remove. It is possible to reclaim them on site or send them to the few companies active in the recovery of this product. Their reclamation potential will depend essentially on the model, the quantities in place and the general condition of the batch.

→ *Evaluation of potential*: 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 model, manufacturer, quantities, dimensions, etc. The points of attention are among others:

- general condition: wear (often more pronounced where there were office chairs with casters), presence of stains and humidity, cut elements, deformation of edges and corners, etc.
- the installation method: glue, fixatives, loose installation, etc.
- the available documentation (technical sheets, declaration of performance, etc.) and the assessment of the conditions of use.
- commercial interest, depending on model, quantity and the resale potential.
- logistical arrangements, including deadlines, handling, organisation of transport, etc.

→ *On-site performance assessment*: as far as possible, the batches of tiles in place should be studied in detail before the removal and sorting steps, in order to better characterise certain features which will be more complicated to establish once the batch is dismantled (see § Characteristics and fitness for use). In particular, the identification of any discoloured areas or pronounced areas of wear makes it possible to surmise the sensitivity of the entire batch to these aspects.

→ *Removal*: careful dismantling should aim to ensure the integrity of the coverings and workers' safety. As a first step, it is advisable to ensure the absence of dangerous substances (although they are extremely rare, it is not impossible to meet asbestos glues) and to proceed with the de-energisation of the

electrical networks. connected to the floor. In order to facilitate their reclamation, it may be best to clean the tiles in situ. If wet cleaning is planned, it is necessary to allow sufficient drying time before removal.

The carpet tiles are generally removed by means of a flat tool (such as a spatula), slipped between the tile and the substrate to carry out the delicate removal. Depending on the installation method, this operation is more or less easy. *The use of shovels, screwdrivers or carpet strippers is to be avoided* because it damages the edges and corners of the tiles. Similarly, pulling too fast tends to damage the tiles. The recoverable tiles must be completely flat.

In some cases, tiles that were located under heavy static loads or subjected to frequent passage (typically under office chairs) tend to adhere more strongly to the substrate, to the point of sometimes tearing slightly during removal.

In order to guarantee the uniformity of the batches, the tiles removed are sorted by type. Items that are deformed, cut, torn or have a questionable appearance should be avoided. It may be advisable to separate the batches according to the original application (for example according to the premises of origin or the estimated frequency of passage). Self-checking procedures can be implemented during removal.

The means of handling the dismantled tiles must be considered taking into account the load capacity (static and dynamic) of the floors and evacuation exits. The stack of tiles can quickly become large.

The following items are recommended to avoid deformation of the tiles during the handling steps:

- Place a rigid flat panel on the pallet's base.
- Store the tiles flat and in bundles on pallets: generally 4 stacks of 1 m to 1.2 m per pallet.
- Prevent the tiles from overflowing the pallet.
- Prohibit the use of straps and strapping means generating forces likely to deform the tiles.
- Make use of a stretch film to hold the tiles on the pallet, avoiding deforming the corners.

When the presence of glue has not prevented removal, it is still necessary to ensure that any remains of glue do not alter the visible face when the tiles are stacked. Storage on the underside against the underside is therefore to be preferred.

It is strongly recommended to label each pallet at the time of removal to ensure product traceability.



Back of a carpet tile laid without glue.



Movement of tiles using trolleys. The staggered arrangement facilitates handling.



→ **Treatments**: if sorting was not carried out during removal, it can take place in the workshop. Professional resellers of reclaimed carpet tiles generally classify products into three categories, depending on the condition of the batches (see § Reclamation indicators).

→ **Storage**: it is recommended to store carpet tiles at room temperature, away from humidity and dust, avoiding too much sunlight.

→ **Transport and delivery**: the necessary precautions must be taken during transport and delivery in order to minimise the risk of scraps or tangling.

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



Stock from a supplier of reclaimed and surplus carpet tiles (www.sparo.nl)

Marking and original performances

You can generally find printed on the underside of the tiles indications allowing their origin to be traced and the technical sheet describing the initial performance of the product to be found. However, some of this performance may weaken over time. This is especially the case when they depend on chemicals used as flame retardants, anti-stain, anti-static, anti-bacterial or anti-allergic treatments. If the intended use requires precise knowledge of the actual performance of the tiles, it may be necessary to supplement the information available with specific test measurements. These steps must be considered according to the needs relating to the intended use. They must then be integrated into the economic evaluation of the operation and strongly depend on the size of the batch considered.



Stock from a supplier of reclaimed and surplus carpet tiles (www.sparo.nl)



Applications and laying

Reclaimed carpet tiles can be used for applications subject to moderate stress (residential) or more intense (commercial use, office buildings, halls and corridors). They can be placed on different surfaces (wood, concrete, etc.) as long as the ground is level, dry and free of all debris. The choice of tiles must necessarily take into account the expected stresses (see § “Characteristics and fitness for use”). In all cases, reference should be made to the European and national standards relating to the product (e.g. EN 14041 and EN 1307+A3) and to the rules of practice in force (or implementation standards).

The re-installation of correctly sorted and cleaned used carpet tiles is no different from that of new tiles. It raises the same points of attention, in particular: choice of materials and associated performances, installation method (glued, fixed or free), layout and direction of installation, properties and condition of the substrate, grip of the tiles, height on a level with the doors, thermal and acoustic insulation, fire resistance, electric conductivity, expansion joints, underfloor heating, peripheral profiles and precautions, maintenance procedures, costs, etc.

Before laying, it is important to ensure that the tiles are properly acclimatised to the ambient conditions.

In order to reduce the entry of dirt and prolong the life of the carpet tiles, it is useful to provide a protective device at the entrances (doormat, etc.) as well as a maintenance program compatible with the use of spaces. Choosing colours that are less sensitive to stains is also an option.

Acoustic comfort can be improved by a special underlay provided for this purpose. This system should be considered in the case of the reclamation of carpet tiles not provided with integrated acoustic performance.

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

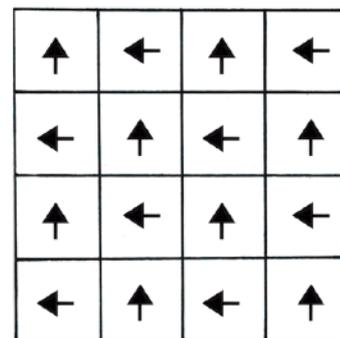
→ *Composition of the batch*: the batch must consist of tiles of the same type and of the same format (including the thickness). Ideally, a batch must also consist of tiles having the same origin in order to guarantee a certain uniformity as to the stresses to which they have been subjected.

→ *Appearance*: colour variations are possible. These variations are mainly due to the original exposure and use. Depending on the desired effect, it is advisable to mix the tiles when laying.

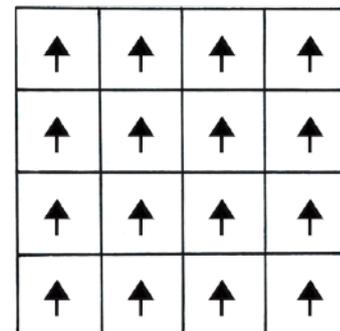
→ *Condition*: reclaimed tiles may show signs of deterioration such as signs of surface wear, stains or knocks.

→ *Quantity*: some suppliers may include surplus when the product is delivered if they are not able to guarantee the absolute uniformity of the characteristics mentioned above. This surplus can also be applied in the case of an on-site salvage scenario. It is also advisable to provide a surplus of tiles on the one hand for the installation of the tiles in the space (for example: 10% more to ensure the cuts on the periphery of the room for a chequerboard installation and 20% more for a diamond installation) and on the other hand to ensure the subsequent replacement and repairs of certain parts.

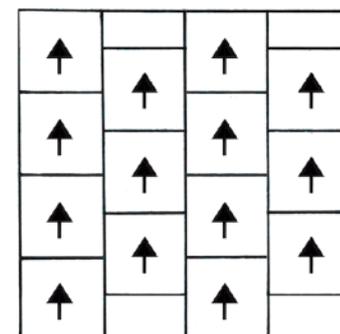
Most professional suppliers are able to ensure that delivered batches meet these requirements.



A.



B.



C.

Examples of types of installation: A. chequerboard, B. parallel, C. staggered joints. The arrows indicate the direction of installation, generally perpendicular to the left of the fibres, and indicated on the back of the tiles.

Design tip!

To increase the chances of meeting the offer available on the reclamation market, the designer/specifier can choose to accept several different batches and distribute them in an organised manner in the building. For example, plan a uniform batch of carpet tiles per space or per floor. Or even, play on a principle of patchwork in spaces that lend themselves well to it.

Think reversible !

At equivalent performance, the choice of loose-carpet tiles or not glued is preferable. Easier to remove, they promote reclamation, both of the covering and of the substrate. In addition, innovative fixing systems allow tiles that do not meet the requirements of loose installation to be held together, without adhering to the substrate (e.g.: repositionable adhesive such as Tac Tiles , etc.)



Characteristics and fitness for use

The harmonised European standard EN 14041 establishes the relevant characteristics (depending on the context) in order to determine the fitness for use of modular resilient, textile, laminate and multilayer flooring.

Standard EN 1307+A3 specifies the requirements relating to the use classification of textile floors. A first distinction concerns the residential (domestic) or commercial (public) nature. Within each of these categories, a second distinction concerns the intensity of use:

- Moderate: room or hotel room
- Ordinary: living room, hallway, waiting room, shop, collective offices
- High: kitchen, exterior rooms in a house, cafeterias, restaurants
- Very high: museums, company restaurants, department stores

Each category is associated with specific performance requirements, in particular in terms of resistance to wear, preservation of appearance or even comfort class. There are other classifications of uses, for example the UPEC classification.

Although detailed for new products, the characteristics developed in these standards may prove useful in considering the specific case of reclaimed carpet tiles. The expected performance can be determined in several (possibly complementary) ways:

- Analysis of the batch in place (for example for discoloured areas, general condition, absence of damp spots)
- Feedback from previous users (for example for antistatic behaviour or walking comfort).
- Original technical documentation (for stable performance over time).
- Standardized test measurements (for example: Vettermann drum, Lisson test).

Relevant characteristics	Comments
Wear resistance Colour fastness, Light stability, Suitability for a wheelchair, Fraying behaviour, Resistance to soiling, Dimensional stability	<p>These characteristics are closely related to:</p> <ul style="list-style-type: none"> • the nature and quality of the materials constituting the tiles. For example: 100% polyamide tufted carpets tend to resist wear and fraying better. • the technicality of the manufacturing process. For example: the backs reinforced with a layer of polyester, polypropylene and/or a glass fabric, have better dimensional stability. • the nature and intensity of the stresses during use. • the relevant evaluation of the batch of tiles used (for example: the identification of discoloured tiles in places of intense light indicate a sensitivity of the entire batch to light. In the same way, if the tiles located in offices show signs of wear due to the chairs with wheels, it is indeed the entire batch that must be classified as sensitive to this stress). • the quality of the tile sorting • the uniformity of the batch of tiles recovered <p>A visual or detailed examination of the batch is often sufficient to estimate them. Examining the batch in place offers useful information.</p>
Walking comfort	This characteristic is closely linked to the nature of the materials and the degree of wear of the tiles. For example, polyamide pile is considered more resistant and has significant walking comfort (spring).
Slippage resistance	The slip resistance performance of an installed floor covering can be affected by the installation, the surface treatment applied during installation, dust accumulation, cleaning and maintenance. If the tiles have been properly maintained during their first life in use, this characteristic can be considered acceptable if they are clean, dry, free of oil, grease and other slippery substances.
Light reflection	This characteristic, evaluated by determining the LRV coefficient (light reflectance value) determines the quantity of light reflected and absorbed by the covering. In general, dark colours absorb light while light colours reflect it, which can result in a need for differentiated artificial light (and therefore energy consumption). The structure of the tiles and their gloss also have an influence.



Characteristics	Comments
Moisture resistance	Depending on their nature, carpet tiles are more or less sensitive to humidity (for example, polyamide pile tiles are more sensitive than polypropylene pile ones). Tiles from damp rooms should be avoided.
Acoustic properties	Determining the acoustic performance of carpet tiles is complex and depends on several factors. It is generally the subject of laboratory tests in use conditions (measurement of impact sound insulation and sound absorption). In general, textile floor coverings mainly absorb medium and high frequencies.
Thermal properties	In general, the influence of a textile covering on the overall thermal resistance of a floor complex is low. However, the thermal conductivity inherent in carpet tiles can influence thermal comfort ("barefoot" feeling) and compatibility with the underfloor heating system. If necessary, this performance can be evaluated by means of specific test measurements or by assessing the initial operating conditions.
Electrical properties	The anti-static behaviour and the electric conductivity define the capacity of carpet tiles to limit the formation of electric charges and to discharge them. These properties depend essentially on the composition of the tiles, the degree of use and the relative humidity of the room. Special products can improve this performance during the production of new tiles or by means of repeated impregnations during their working life. However, the components used as anti-static have a limited lifespan. Only specific tests make it possible to know this characteristic. This is mainly required in sensitive environments such as IT rooms, hospitals and laboratories.
Reaction to fire	<p>Specific requirements for the reaction to fire of claddings are determined by national regulations. These requirements depend, among other things, on the use of the premises (for example: private or community housing, emergency exits, terraces on flat roofs, etc. but also on the ability of users to evacuate the premises in the event of fire (senior citizens' residence, hospital, etc.).</p> <p>The classification of construction products according to reaction to fire is defined by European standard EN 13501-1 (Euroclass) and is assessed in particular on the basis of a test carried out under the final application conditions (e.g.: carpet tile + glue + substrate). By way of example, depending on their composition and their possible treatment with flame retardant products, new carpet tiles are most of the time classified B_{fl}, s1, C_{fl}, s1 (little flammable, a requirement generally required for service sector buildings) or E_{fl} (flammable, sufficient requirement for the residential sector).</p> <p>In the case of reclaimed tiles, it is difficult to determine the fire behaviour without prior laboratory testing. Indeed, depending on the conditions of use and the intrinsic characteristics of the components, it is very likely that the original fire performance has been modified. Many flame retardant treatments are indeed influenced by ageing and no longer guarantee the original performance.</p> <p>To our knowledge, there is no simple solution to improve the fire behaviour of reclaimed carpet tiles. In situ treatment solutions are generally liable to increase soiling, and their duration of action depends on the level of stress.</p>
Hazardous substance content and durability	<p>Many hazardous substances can be found in old carpet tiles (See § Hazardous substances and precautions). It is difficult to quantify their content without test measurements.</p> <p>The composition of more recent tiles has improved markedly in recent years and several labels have been put in place by the industry to provide environmental guarantees to their products. For example : GUT, Blue Angel, Nordic Swan. The guarantees provided are variable (for example Blue Angel and Nordic Swan restrict the use of 51 of the 59 toxic substances identified in the manufacture of carpet tiles, while the GUT label, the most used, bans only 13).</p>



Availability

Given the high level of performance required for their main applications (particularly reaction to fire in the services or commercial sector), carpet tiles are relatively seldom reused in these sectors.

While carpet tile producers have invested a fair amount of effort in organizing the collection of used tiles, they are generally not put back into circulation for reuse. Rather, they end up in traditional waste treatment channels (mainly incineration and landfill and, to a lesser extent, partial recycling).

It is possible that the relative ease for users to resort to these well-organized recovery channels has the consequence of diverting large quantities of potentially salvageable tiles from the reclamation circuits.

In any event, professional dealers who supply reclaimed carpet tiles are relatively rare these days. They are mostly found in Great Britain and the Netherlands. In contin-

ental Europe, the focus is mainly on surplus carpet tiles (overstocks, rejected lots, etc.) and only to a limited extent on used tiles. We should also mention the very frequent presence of large batches of (unsorted) tiles on certain digital platforms in Europe.

In general, availability depends on the model and the quantities sought. As an example:

Frequent	1 → 100m ²
Occasional	200 → 500m ²
Rare	> 500m ²

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 depending on model, condition and quantities available. The selling price is between 3 and 15 € per square meter (about 30% of the new price).

Most of the time, tiles are sold uncleaned, in whole batches or per square meter. The main resellers generally distinguish between 3 distinct qualities:

- A quality or new appearance: no stains, tears or discolourations, all corners and edges in good condition.
- B quality or good appearance: possible slight signs of previous use.
- C quality or worn look

Find specialised businesses



salvoweb.com

opalis.eu

In the United Kingdom:
<https://carpetrecyclinguk.com/find-used-carpet-tiles/>

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

	kg CO ₂ eq./m ²
INIES database (FR) – Generic data– soft carpet flooring *	26.2
INIES database (FR) - UFTM collective data **	9.87
INIES database (FR– UFTM collective data ***	17.4
INIES database (FR) - Individual data - Tarkett (100% recycled) ****	5.35
ICE Database (UK)- Carpet tile *****	13.7

* Indicative value for 1 m² of soft carpet floor covering (tufted, needle punched, flocked) for a reference lifespan of 10 years.

** (Union Française de Carpets et Moquettes): indicative value for 1 m² of floor covering in tufted carpets in removable floating tiles with 100% polyamide pile and a total pile mass of **less** than 750 g/m², for a reference lifespan of 10 years.

*** (Union Française de Carpets et Moquettes): indicative value for 1 m² of floor covering in tufted carpets in removable floating tiles with 100% polyamide pile and a total pile mass **greater** than 750 g/m², for a reference lifespan of 10 years.

**** Indicative value for 1 m² of soft carpet flooring (100% recycled yarn) for a benchmark lifespan of 10 years.

***** Indicative value for 1 m² of polyamide carpet floor covering and total pile mass **equal** to 700 g/m².



Reusing 100 m² of tiles prevents the production of ~ 535 to ~ 2620 kg of CO₂ equivalent related to the manufacture of new tiles (production phase only). According to sources, this corresponds to the emissions of a trip of ~ 3.200 to ~ 15700 km in a small diesel car.



Dangerous substances and precautions

Due to their synthetic composition, carpet tiles almost always contain a number of substances that are hazardous to human health and the environment. Contamination in humans can occur through skin contact, inhalation or ingestion and the consequences are multiple: skin and respiratory allergens, carcinogens, mutagens, risks for reproduction, endocrine disruptors, etc. These toxic substances are harmful to varying degrees at almost all stages of the product's life (manufacture, installation, use phase, upkeep and maintenance, end of life, recycling, landfill, incineration). Although considerable efforts have been made by manufacturers in recent years to bring healthier products to market (including relying on various labels), there are still many barriers to bringing 100% healthy, ecological and totally recyclable products to market. As an indication, here are some dangerous substances that can be found in variable and quantifiably difficult quantities in reclaimed carpet tiles:

→ Volatile organic compounds (VOCs): formaldehydes, phthalates, etc. The harmfulness of these substances is particularly high at the start of installation of the new product or following the use of unsuitable application adhesives. VOC emissions decrease over time. Reclaimed tiles are therefore much less prone to it.

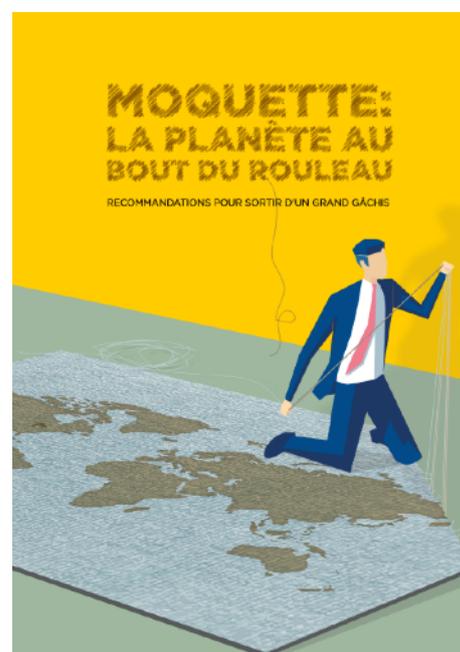
→ Additives used for the specific treatment of carpet tiles: antibacterial agents, flame retardants, anti-soiling, anti-static, etc. These compounds tend to migrate into the ambient air (during cleaning, for example) and into the waste water. Depending on their concentration and persistence, they can affect the health of occupants and the environment in the longer or shorter term.

→ Others: heavy metals (Lead, cadmium), PAHs (Polycyclic Aromatic Hydrocarbons), dyes and colourants, PVC, etc.

For more information :

- *Toxics in Carpets in the European Union*, Anthesis Consulting Group, 2018 (<https://circulareconomy.europa.eu/platform/sites/default/files/knowledge-toxics-in-carpets-eu-review-anthesis-final-study.pdf>)
- *Eliminating Toxics in Carpet: Lessons for the Future of Recycling*, Jim Vallette, Rebecca Stamm, Tom Lent, Healthy Building Network, 2017 (<https://healthy-building.net/reports/1-eliminating-toxics-in-carpet-lessons-for-the-future-of-recycling>)

Most manufacturers of new carpets have adapted their manufacturing processes to incorporate a certain proportion of materials from the recycling of waste such as fishing nets or PET bottles. Some companies have also sought to set up collection channels for used tiles. In practice, however, a large majority of tiles end up in landfill or being incinerated. Their highly composite nature, the possible presence of toxic compounds and the difficulty of separating the various constituent elements strongly hamper the possibilities of recycling.



[To read] *Carpets: The planet at the end of the roll, recommendations for getting out of a big mess*, 2017, Zero Waste and Changing Markets (in French) <https://www.zerowaste.france.org/wp-content/uploads/2018/03/rapport-moquette-zwfrance.pdf>