

Harmful chemicals in building materials for reuse in Stockholm



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Guidance document for reuse centres

Interreg
Baltic Sea Region



Co-funded by
the European Union



SUSTAINABLE WATERS

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Summary

Older construction and civil engineering materials may contain harmful chemicals, which makes careful material assessment necessary when reusing them. To facilitate reuse without contributing to the spread and reuse of the most harmful chemicals, the City of Stockholm has produced this guidance material aimed at everyone who works with reuse, i.e. carpenters, inventory managers, dismantlers, project managers, transporters, environmental coordinators and staff at reuse centres.

Following the recommendations in the guidance ensures that reuse is carried out in a manner that complies with the City of Stockholm's chemical requirements and helps to prevent harmful substances from being returned to the city's buildings and outdoor environments. To facilitate the practical work, the material is supplemented with a concise guide that summarises the most important parts of the guidance (available in Swedish).

In summary, this guidance is one piece of the puzzle, together with policy instruments, clear chemical requirements and resource efficiency requirements, all of which are crucial for the construction and civil engineering sector to contribute to a more resource-efficient, circular and non-toxic society.

1. Introduction

The Environment and Health Department is the government agency responsible for the indoor and outdoor environment in the City of Stockholm. The Department strives to ensure that all residents of Stockholm live in a healthy and clean environment. Within the Department, the Chemicals Centre is tasked with supporting the implementation of chemicals-related measures for the City's various activities. The work is done with the aim of achieving the vision of a non-toxic society. One of the goals of the City of Stockholm's Environment programme 2030 is also for the city to become more resource-efficient and circular.

2. Purpose

This material has been developed to provide guidance for everyone working with the reuse of construction and civil engineering materials within the city, regarding which materials can be reused, and which may contain harmful substances and are therefore not suitable for reuse.

3. Background

One of the goals of the City of Stockholm's Environment programme 2030 is "A resource-efficient, circular Stockholm".⁽¹⁾ The two sub-goals under this heading are "Sustainable consumption and efficient resource utilisation" and "Circular resource cycles". The City has also defined construction and civil engineering materials as one of the particularly important flows in the work on the circular transition and mentions the importance of promoting reuse in the City's activities as an important piece of the puzzle. The environment programme also includes the goal of "A non-toxic Stockholm", for which the Chemicals Centre at the Environment and Health Department is responsible.

In order to contribute to reducing harmful substances in society and to promote a non-toxic environment, the City of Stockholm has developed specific chemical requirements. These requirements apply, among other areas, to children and young people, construction, renovation, and purchasing and procurement. The City thus requires that certain harmful substances are not present in the goods and services it uses and procures.

4. City of Stockholm chemical requirements

The City of Stockholm's Environment programme 2030 sets out a number of goals that the City will work to achieve. One of these is "A non-toxic Stockholm", which is in line with one of Sweden's overall environmental quality objectives, "A non-toxic Environment". To concretise the strategy and the work to achieve this goal, the City

of Stockholm has had a Chemicals Action Plan since 2014. This plan is now in its third edition.(2)

The City's environment programme explicitly states that PFAS, bisphenols and phthalates should be phased out. The City shall "*tighten its requirements and stop purchasing goods and products in which the content of PFAS, phthalates, bisphenols and persistent organic pollutants is known, and gradually phase out these products*".

The Chemicals Action Plan focuses broadly on property criteria rather than on a list of substances to be prioritised for phase-out. The plan uses the Swedish Chemicals Agency's classification of substances (according to PRIO, the priority guide) – phase-out substances and priority risk-reduction substances. It is stated in the plan that phase-out substances should be phased out and that risk-reduction substances should only be used if their use can be considered safe. With regard to phase-out substances, the City also uses the SIN List to identify endocrine-disrupting chemicals, as these have not yet been fully implemented in REACH.(3)

For construction and civil engineering materials, the City of Stockholm uses Byggsvarubedömningen (BVB). The construction and civil engineering materials used must primarily achieve the level *Recommended* or *Accepted* in the system. However, the requirements are higher or more specific in the following cases:

- If there is a risk that small children will be exposed to the material.
- Copper and zinc in contact with water.
- Materials that cause the spread of microplastics.
- Addition of nanomaterials.
- Drinking water distribution.

5. Building materials and reuse

The construction and civil engineering sector accounts for a large proportion of society's resource use and waste volumes. The transition to a circular economy is a central part of international, national and local environmental strategies. The construction and civil engineering sector is often identified as a priority area because it both consumes large quantities of raw materials and generates significant amounts of waste. According to the EU Waste Directive, construction and demolition waste is considered one of the largest waste streams in Europe, which underlines the need for resource efficiency and increased reuse.

The City of Stockholm's goals for circularity and resource efficiency are based on adherence to the waste hierarchy. The waste hierarchy sets out a priority order for managing waste in an environmentally sound manner. The highest priority is waste prevention, followed by reuse and material recycling, then energy recovery, and finally landfilling, which should be avoided. The aim is to make use of as much as possible while minimising losses.

By utilising materials from demolition, conversion and renovation, both resource consumption and greenhouse gas emissions can be reduced. Reuse means that building materials are used in their existing form without first being converted into raw materials through recycling. Examples of building materials that can often be reused are doors, windows, bricks, concrete, bathroom ceramics, metal products and certain wood products. However, for this to be possible, the following conditions must be met:

- the materials are handled with care
- the materials are stored correctly
- there are effective systems for collection and distribution

However, a major obstacle to large-scale reuse is the presence of substances that are hazardous to health and the environment in older building materials. To ensure that reuse does not lead to the spread of harmful substances, knowledge is therefore required among the actors who decide what is suitable for reuse, systematic inventories, guidelines and clear requirements in both construction and civil engineering projects.

By developing effective policy instruments, creating guidelines for professionals and integrating reuse into procurement and construction processes, the construction and civil engineering sector can play a key role in the transition to a sustainable and resource-efficient society.

6. Chemical requirements for reused materials

Investigating the chemical content of building materials is a challenge because it is not possible to test all materials for their complete chemical content and thus determine which materials are suitable for reuse. Unfortunately, this is very rarely possible for construction and civil engineering materials. It is therefore also difficult to know whether reused materials meet the City of Stockholm's environmental requirements. Another aspect is that the chemical requirements for new building materials are difficult to apply to older materials.

However, the City of Stockholm aims to promote circular material flows and increase the reuse of materials instead of discarding them and purchasing new products. This means that, for reused materials, the City has adopted a pragmatic approach in which the requirements for information on chemical content are lower than for newly manufactured goods, while known problematic substances should be avoided.

This is where this guidance comes in, to support decisions on which materials can be reused and which should not be reused due to their content of harmful substances.

7. Method

IVL Swedish Environmental Research Institute's 2021 guide on reusing building products and materials has been a source of inspiration and knowledge in this work.

In addition to the information from this publication, the focus has been on the substances that the City of Stockholm wishes to phase out in its overall goals, i.e. phase-out substances, risk-reduction substances, PFAS, phthalates and bisphenols. Information has also been obtained from other publications (see reference list) where the content of harmful chemicals has been studied and compiled.

All the information has been compiled into a table, organised by type of building component and by the year in which the material was manufactured. Materials that are assumed to contain harmful chemicals should not be reused and are marked with a red cross in the table.

When a substance has been banned by law, it has been assumed that the substance is not included in materials produced after that year. In some cases, the industry itself has phased out substances before the legislation came into force. In these cases, the material has been given a yellow warning symbol, which means that testing or other information should be obtained before the material is reused.

In cases where no knowledge of the content of harmful substances has emerged, the material has been given a green tick, indicating that reuse is both possible and desirable.

8. Substance groups

Below is a summary of the substance groups referred to in the report, their areas of use, additional information, and their overall health and environmental hazards.

Table 1. Table adapted from published report on harmful substances in construction and civil engineering materials and their potential spread.(4)

Substance group	Area of use	Additional information	Health and environmental hazards			
			CMR*	Endocrine disrupting	PBT/vPvB**	Allergenic
Asbestos	Mineral fibres used in building materials such as insulation, pipe bends, roof and wall panels, and joint sealants until they were banned in 1982.	The fibres are highly resistant to heat and chemicals but pose a serious health risk when inhaled as dust, as they can cause asbestos-related diseases and lung cancer. Waste containing asbestos must be treated as hazardous waste and requires a permit.	X			
Bisphenols	Used in the manufacture of polymers and resins, additives in plastics. Included in a variety of consumer products (e.g. surface treatments).	Bisphenol A (BPA) is the most common but is restricted within the EU. Bisphenol F (BPF) and bisphenol S (BPS) have been put forward as alternatives to BPA, but these also have potentially harmful effects.	X	X		
Brominated organic substances	Often used as flame retardants. Found in many consumer goods such as plastics, textiles, furniture upholstery and electronic equipment.	Most have been found to have negative environmental and health-related properties. Polybrominated biphenyls (PBBs) and tris(2,3 dibromopropyl) phosphate are banned in textiles. Five polybrominated diphenyl ethers (PBDEs) are regulated in the POPs Regulation.	X	suspected	X	
Phthalates	Used as plasticisers in plastics. May also be included in chemical products (e.g. sealants).	Phthalates are released from plastic materials because they are not chemically bound. They affect both humans and the environment. Thirteen phthalates are included on the Candidate List.	X	X		

Substance group	Area of use	Additional information	Health and environmental hazards			
			CMR*	Endocrine disrupting	PBT/vPvB**	Allergenic
Isocyanates	Used in the manufacture of polyurethane foam (PUR), synthetic rubber, surface coatings (including paints and varnishes), elastomers and plastics.	Have been linked to serious environmental and health hazards (respiratory and skin sensitisation, occupational asthma). Isocyanates are a large group of chemicals, some subgroups of which are potentially carcinogenic.	X			X
Isothiazolinones	Used as preservatives in products, commonly found in paints, for example.	Highly allergenic, cause skin irritation and allergies, and may pose ecotoxicological hazards, such as effects on microbiotopes and acute toxicity to aquatic organisms.				X
Chlorofluorocarbons (CFCs)/ Hydrochlorofluorocarbons (HCFCs)	Have been used as refrigerants in refrigeration and freezer systems, heat pumps and similar applications. Global bans are in place.	Have a long lifespan in the atmosphere and deplete the ozone layer.			X	
Chlorinated paraffins (CPs) - Short-chain	Used for their softening and flame-retardant properties in plastic products, sealants, paints and certain textiles.	The short-chain types are the most problematic from a health and environmental perspective.	suspected		X	
Chlorinated paraffins (CPs) – Medium-chain		Medium-chain chlorinated paraffins were added to the Stockholm Convention's list of banned substances in May 2025.			X	
Chlorinated paraffins (CPs) - Long-chain			suspected	suspected	suspected	
Organophosphates (OPEs)	Used as pesticides, flame retardants, plasticisers in plastics and textiles.	OPEs have been put forward as alternatives to strictly regulated brominated organic substances. Some OPEs are on the Candidate List or REACH Annexes XIV/XVII due to their hazardous properties to health and the environment.	X	X	X	

Substance group	Area of use	Additional information	Health and environmental hazards			
			CMR*	Endocrine disrupting	PBT/vPvB**	Allergenic
Metals (metallic)	Occur in pure form or in alloys, for example as lead and copper in brass alloys and nickel in stainless steel. May occur as surface coatings, for example galvanised surfaces.	Leaching of metals from alloys and surface treatments depends on the type of alloy and the surrounding conditions.	X			X
Metals (in compounds)	Added to plastics as stabilisers, fillers, pigments and flame retardants. Metals may be present in inorganic colour pigments based on, for example, cadmium, lead, chromium, titanium, mercury and arsenic. Hexavalent chromium compounds are also found as contaminants in cement and concrete products.	The health effects of accumulation in the body are numerous, including organ damage, damage to the nervous system and complications in foetal development. Certain metals (mercury, lead) are no longer permitted for use in paints, but other metals (chromium) may still be present as pigments. Cr(VI) is on the REACH Authorisation list, Annex XIV.	X		X	
PAHs	Polycyclic aromatic hydrocarbons (PAHs) are found in coal, tar and petroleum and are formed during incomplete combustion of organic material.	16 PAHs are included on the Candidate List.	X	suspected		some
PCBs	A group of industrially produced, persistent and fat-soluble organic compounds. Polychlorinated biphenyls (PCBs) were used in sealants, paints and plastics until they were banned in new products in 1978 and completely banned in 1995 due to their toxic and environmentally hazardous properties.	PCBs are linked to serious health and environmental risks, such as effects on the immune system, the endocrine system, fertility and development, as well as an increased risk of cancer. Waste containing PCBs must be treated as hazardous waste.	X	X	X	

Substance group	Area of use	Additional information	Health and environmental hazards			
			CMR*	Endocrine disrupting	PBT/vPvB**	Allergenic
PFAS	Widely used in various goods and products such as water- and dirt-repellent coatings, textiles and plastics. Also found in chemical products such as lubricating oils, paint, sealants, floor polish and in gaseous form in heat pumps.	The PFAS group includes over 10,000 substances. All PFAS are persistent and do not break down naturally in the environment. They have been linked to health hazards such as effects on the immune system. The EU is preparing a general ban on PFAS under REACH.	suspected	X	X	
Organotin compounds	Included in sealants and used as stabilisers in plastic materials.	Organotin compounds are very dangerous to aquatic organisms and accumulate in the environment.	X	X	X	

* CMR (Carcinogenic, mutagenic and reprotoxic substances): May cause cancer, genetic defects, and/or damage fertility or the unborn child.

** PBT/vPvB (*Persistent, Bioaccumulative, Toxic / very Persistent, very Bioaccumulative*): Substances that are persistent, bioaccumulative and toxic or very persistent and very bioaccumulative.

Candidate List (SVHC): The substances on the Candidate List have properties that may cause serious and lasting effects on human health and the environment, known as substances of very high concern (SVHC substances). There are specific requirements for manufacturers and importers of SVHC substances and products containing SVHC substances. The substances on the Candidate List will be further assessed for possible inclusion on the Authorisation List (REACH Annex XIV).

REACH Annex XIV: List of SVHC substances that are banned from use in the EU and require special authorisation before they can be used.

REACH Annex XVII: Regulates the use of substances in products. Covers both the use of the substance in a product and the marketing of a product containing the substance (imported products). For example, a substance may be permitted in general under REACH, but prohibited in textiles under Annex XVII.

Stockholm Convention: Regulates persistent organic pollutants globally.

POPs Regulation: Regulates persistent organic pollutants (POPs) in the EU.

9. Industry associations

In order to increase understanding of how the industry works with reuse, a survey was conducted in which 13 Swedish industry associations were contacted and asked to respond to questions regarding guidelines, product identification and views on chemicals in reused materials.

Responses to the questions were received from five industry associations: TMF (the Swedish Federation of Wood and Furniture Industry), Svenska Träskyddsföreningen (the Swedish Wood Preserving Association), BKR (the Swedish Ceramic Tile

Council), Svensk Ventilation (the Swedish Ventilation Association) and YBG (Yrkesmässig Behandling av Gipsbaserade skivor). Several of these industry associations have guidelines for the reuse of products and materials. The guidelines focus primarily on the performance and function of reused products. Another important aspect that is highlighted is that solutions for flows of reused materials are required and that policy instruments and economic incentives for using reused products are needed to drive development forward. In general, reuse guides rarely focus on requirements and assessment of the content of harmful substances.⁽⁵⁾ In particular, there is a lack of assessment of chemicals for which legal requirements have been introduced in recent years (e.g. PFAS, brominated flame retardants, chlorinated paraffins).

One example of an industry association working to increase reuse is the Swedish Wood Preserving Association. Pilot studies in sorting to separate older impregnated wood containing harmful substances from newer impregnated wood that can be reused have been carried out using XRF analysis.⁽⁶⁾ The trial is being scaled up in collaboration with Swedish Waste Management.

10. Reuse, Ulvsunda case

Bryggeriet i Bromma is a major redevelopment project involving the former Pripps brewery industrial site in Ulvsunda, Bromma. The area is being transformed into a hub for sports, culture, offices, retail, and visitor experiences. Development of Bryggeriet i Bromma began in early 2024 and is being carried out in stages over several years. The project is being run with the aim of reusing materials and building components as much as possible.

To gain an insight into how the reuse of building materials works in practice, a visit was made to Bryggeriet i Bromma. During the visit, representatives from S:t Erik Markutveckling and Ebab were interviewed and shared challenges and solutions related to reuse and material management on site. The dialogue highlighted the importance of careful inventory and sorting to identify which materials can be reused safely and efficiently.

For materials and products on site, an environmental inventory is first carried out to identify products that contain harmful substances. The project aims to reuse the structural frames of buildings as much as possible. Construction products and materials are tested for substances such as PCBs, asbestos, PAHs, mercury and heavy metals. If harmful substances are found, the materials must be sorted as hazardous waste. Emission analyses have been carried out in indoor environments to ensure that requirements are met. If PCBs are identified, these parts of the product are removed with a safety margin. Experts are consulted for the assessment of materials, and BVB is used as a source of product information. For certain substances, such as PFAS, analyses are not carried out routinely.

The next step is a reuse inventory, in which the condition and dimensions of products are documented. Products are marked with a QR code to enable traceability in the project. After that, products are dismantled and reused within the framework of the project. Older building components and installations from the 1960s and 1970s rarely meet today's fire, noise or environmental requirements. Many older products also have different dimensions from those used today, which makes reuse more difficult. The lack of CE marking also makes reuse more difficult.

For this project, certain materials are easier to reuse. These include soil products, suspended ceilings, fixtures and ventilation pipes. These usually pose little chemical risk and are technically uncomplicated. The more complicated products to reuse are technical products such as automatic doors and older plumbing products. These often lack CE marking or do not meet current dimensional requirements. Insulation and asphalt are rarely reused because they are too dirty or have a high risk of containing harmful substances such as tar. Certain indoor materials are rarely reused. For example, older plastic mats almost never meet current indoor environment requirements.

In summary, age and substance content are decisive factors in determining whether building products, installations and materials can be reused in Ulvsunda. Older materials usually require testing and functional requirements must be verified before reuse is possible.

11. Building materials – reuse potential per building component and year of construction

The table below has been produced as a guide for the reuse of building products and materials in existing buildings. The aim is to provide an overview of which materials are suitable for reuse, which should be avoided and in which cases special caution or analysis may be required. The table is structured so that building components and material types are listed together with information about the years in which they may have been manufactured, whether they can be reused, and what risks need to be taken into account. This makes it clear which materials can be considered safe and which may contain harmful substances depending on the year of manufacture.

The year of construction plays a central role in the assessment, as many building materials have changed over time as various chemicals have been banned or restricted. Examples of this are asbestos, which was common in construction products until it was banned in 1982, PCBs in joint sealants, which were used until the end of the 1970s and were completely banned in 1995, and CCA-impregnated wood, where arsenic and chromium were used until such wood preservatives were banned in 2007. Insulation materials and plastics have evolved, with chlorofluorocarbons (CFCs) being gradually banned in the 1990s. Differences in the chemical content of materials mean that the year of construction is key to determining whether reuse is possible or not.

The assessments on which the table is based draw on legislation and bans, data from industry associations, IVL's 2021 guide on reusing building products and materials, and recent studies and analyses of the content of building materials. The years given are based on when the bans came into force. Reuse of products and materials is only recommended for the product's original intended use. The assessment does not take into account the functional quality of the materials. Assessment of strength or technical performance needs to be done separately from assessment of the content of harmful chemicals.

The assessment of reuse potential is divided into three levels.

- ✔ - Reuse suitable.
- ⚠ - Reuse possible but with limitations. Testing may be required.
- ✘ - Not suitable for reuse.

Where there is uncertainty about the contents, appropriate analysis methods or tests are suggested to ensure that the product does not contain harmful chemicals.

The table can be used both as an initial aid for inventorying and sorting in reuse projects and as a starting point for determining when more detailed analyses or special precautions are required.

Table 2. Occurrence of building materials based on age and reuse potential. Figures in the text are references (see 14 . References for a complete list). Substance groups are cross-referenced to Table 1.

Building element	Year of construction	Reuse	Information
Groundworks and foundations			
Paving stones			
- Concrete	-2025	✔	Concrete has a natural metal content. These pose no risk during the operational phase, and concrete slabs of all ages can be reused.(7)
- Natural stone such as granite, slate, limestone	-2025	✔	Stones of natural origin contain metals that do not pose a risk during the operational phase. Natural stone of all ages can be reused.(7)
Clay pavers	-2025	✔	Bricks are made from fired clay. Bricks contain naturally occurring metals, but these do not pose any risks during the operational phase. Bricks of all ages can be reused.
Impregnated/preservative-treated wood	-2007 2008–2025	✘ ✔	Until 2007, impregnated wood often contained arsenic and chromium (CCA impregnation) as wood preservatives. Both chromium and arsenic

Building element	Year of construction	Reuse	Information
			<p>have been banned in wood preservatives since 2007.(8) Previously, pentachlorophenol and organotin compounds were also used as wood preservatives. These were banned and phased out in the late 1970s and mid-1990s, respectively.(9) Older types of impregnated wood treated with the above agents should not be reused but handled as hazardous waste.</p> <p>Creosote has also been used as a wood preservative. Creosote may only be used for industrial impregnation of, for example, railway sleepers and utility poles, and only in EU countries where the need outweighs the risks (including Sweden). Reused creosote-treated wood must not be used indoors, in playgrounds, parks, furniture or for cultivation.(10) Creosote can usually be identified by its brownish-black colour and tar-like smell.(11)</p> <p>Newer wood preservatives are based on copper compounds. Copper-impregnated wood with standard impregnation is not hazardous waste and can be reused. There are exceptions, for example fence posts that have a high sapwood content and contain higher concentrations of wood preservatives.(11)</p> <p>XRF analyses can be performed to identify whether wood contains chromium and arsenic and thus determine whether reuse is appropriate.(6)</p>
Bitumen or tar-based waterproofing	-2025	✗	Bitumen-based waterproofing membranes contain PAHs and hydrocarbons. Asbestos may also be present in waterproofing membranes produced before 1982.(7) There is also a risk of PFAS being present.(12) Due to the high risk of harmful content, reuse is not recommended.(12,13)
Frame and load-bearing components			
Concrete	-2025	✓	Concrete has a natural content of metals. These do not pose a risk during the operational phase. If concrete has been in contact with joint sealants, precautions are required. Joint sealants may contain PCB , chlorinated paraffins , lead and brominated flame retardants , among other things. Concrete parts without residues of sealants, paint or joint sealants can be reused.(7) If contamination is suspected, chemical analyses should be carried

Building element	Year of construction	Reuse	Information
			out to ensure that the material does not contain harmful substances.
Lightweight concrete	1929–1975	✗	Lightweight concrete / alum shale–based concrete (“blåbetong”) is a uranium-containing concrete that was banned in 1975. Alum shale–based concrete consists of grey-blue blocks manufactured from alum shale. It was commonly used in structural frames and basements, particularly during the 1960s and 1970s. Alum shale–based concrete emits radon during the operational phase of a building. It can be distinguished from other types of concrete by means of gamma radiation measurements. Alum shale–based concrete should not be reused.(7) Newer lightweight concrete is based on sand, lime and cement and does not emit radon. Newer lightweight concrete can be reused.(13)
	1976–2025	✓	
Reinforcing bars	–2025	✓	Reinforcing steel is used to reinforce concrete. The metal itself does not normally contain any harmful substances. Older reinforcement (prior to the 1960s) may be of poorer quality. Reinforcing steel can be reused.
Wood (non-impregnated and unpainted)	–2025	✓	Untreated wood does not contain any harmful chemicals and can be reused.
Steel profiles	–2025	✓	Steel naturally contains metals that pose no risk during the operational phase. Steel profiles of all ages can be reused.(7) However, it is important to take into account any surface treatments that may contaminate the material.(13)
Roofing			
Sheet metal	–2025	✓	Sheet metal naturally contains various metals. These do not pose a risk during the operational phase. Asbestos may be present adjacent to or as bonded insulation on sheet metal roofs. In such situations, precautions must be taken when handling asbestos. Clean sheet metal can be reused.(7)
Clay roof tiles	–2025	✓	Clay roof tiles are made from clay that is fired in a kiln. Clay naturally contains metals and poses no risk when reused. If tiles are glazed, there is a risk that the glaze contains lead , in which case the material should not be reused. Testing is recommended if there is any uncertainty. Untreated roof tiles of all ages can be reused.(7,13)
Concrete roof tiles	–2025	✓	Concrete naturally contains metals. These pose no risk during the operational phase, and concrete

Building element	Year of construction	Reuse	Information
			tiles of all ages can be reused.(7) However, PFAS may be present in surface treatments(12) . Testing is recommended to ensure that no harmful substances are present.
Roof panels			
- Plastic	-2015 2016–2024 2025	✗ ⚠ ✔	PVC roof panels may contain cadmium as a pigment. Cadmium was banned in hard PVC in 2011.(14) Lead has also been used as an additive in plastic. Lead as a pigment was banned in Europe in 1989,(15) but lead as a stabiliser in PVC was not restricted until 2024.(16) Phthalates are also commonly found in PVC. Older phthalates have been used extensively and have recently begun to be replaced by alternative plasticisers. Roof panels can also be made of plastics such as polycarbonate or glass fibre reinforced polyester. Bisphenols , mainly bisphenol A, are found in polycarbonate plastics.(17) XRF analysis is recommended to ensure that no harmful metals have been added. Chemical analyses are recommended to ensure that no other harmful substances are present before the product is reused.
- Fibre cement sheets	1930–1982 1983–2025	✗ ✔	Fibre cement contains cement and a reinforcing fibre. Asbestos was commonly used as reinforcement in roofing sheets (eternit sheets) between 1930 and 1982.(7) Newer sheets are made from other types of reinforcing fibre, such as cellulose or plastic fibres. Asbestos-free fibre cement sheets can be reused.
Waterproofing			See Bitumen or tar-based waterproofing
Facade			
Facade components			
- Brick	-2025	✔	Facade bricks are made from fired clay. Residues of older joint sealants on bricks can pose a risk. Until the end of the 1970s, joint sealants containing PCBs were used. In 1995, a total ban on products containing PCBs came into force.(18) As an alternative to PCBs, chlorinated paraffins were used in sealants until 1990. In 2013, short-chain chlorinated paraffins (SCCPs) were banned in the EU by the POPs Regulation. Medium-chain chlorinated paraffins (MCCPs) may still be present in joint sealants. Since 2025, MCCPs have been included in the Stockholm Convention's list of banned substances.(19)

Building element	Year of construction	Reuse	Information
			If contamination with PCBs or chlorinated paraffins is suspected, laboratory analyses must be carried out. Clean bricks can be reused.(7)
- Concrete	-2025	✓	Concrete has a natural metal content. These do not pose a risk during the operational phase. If concrete has come into contact with older joint sealants, there is a risk of contamination with PCBs , chlorinated paraffins and brominated flame retardants . Concrete may be surface-treated with PFAS .(12) Testing is recommended to ensure that no harmful substances are present. Clean concrete tiles of all ages can be reused.(7,20)
- Fibre cement			See Fibre cement sheets
Wood	-2025	✓	Panel wood is usually spruce in Sweden. Impregnated spruce is used to a fairly limited extent in Sweden.(21) If it is suspected that wood has been impregnated, see more under Impregnated/wood-preserved wood . Panel wood is usually primed. Older paints used may contain heavy metals such as lead . Products containing lead should not be reused. See more under painted surfaces . Risks of exposure exist primarily during renovation work such as sanding and sawing painted wood.
Bricks	-2025	✓	Bricks consist of fired clay. Bricks contain naturally occurring metals, but these do not pose any risks during the operational phase. If bricks have been in contact with joint sealant, there is a risk that PCB , chlorinated paraffins or brominated flame retardants may have contaminated the material. Provided that there is no contamination, bricks of all ages can be reused.
Ceilings and walls			
Wooden panels (chipboard, plywood, glued laminated timber)	-1980	✗	Older chipboard may contain high levels of formaldehyde. Industry standards began to limit formaldehyde content in the 1980s, and legal requirements for limitation came into force in 1991. Older chipboard should therefore not be reused. Newer wooden panels can be reused.(13) If high levels of formaldehyde are suspected, chemical testing is recommended. In 2026, stricter requirements will come into force on how much
	1981–1991	⚠	
	1992–2025	✓	

Building element	Year of construction	Reuse	Information
			formaldehyde wood-based products are allowed to emit.
Insulation			
- Mineral, glass and stone wool	-2025	✓	The chemical content of older and newer materials does not differ greatly. Health risks arise, for example, during dismantling if dust is generated. Older mineral wool may be contaminated by dust from other materials, for example. If the material is functional, it can be reused, provided that it has not been contaminated by nearby materials.(7,13)
- Polystyrene	-2015 2016-2025	✗ ⚠	<u>Chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs)</u> have been used as blowing agents in extruded polystyrene (XPS). It is not possible to identify fluorocarbon-containing cellular plastic with the naked eye; laboratory analysis is required.(22) Between 1970 and the end of the 1990s, CFCs and HCFCs were used in cellular plastic, but were subsequently banned. It is mainly during the processing of XPS that freons are released into the atmosphere and contribute to the depletion of the ozone layer. Materials with round beads usually do not contain CFC/HCFC. Expanded polystyrene (EPS) has a more open structure and the blowing agents used have largely been released into the environment during manufacture.(23) Pentane is now often used as a blowing agent in EPS. <u>Brominated flame retardants</u> have been used in both XPS and EPS. Until 2015, HBCDD was used extensively. Today, HBCDD is banned under the POPs Regulation, along with most other brominated flame retardants, but other harmful substances may still be present in insulation boards.(7,20) Chemical analyses are recommended to ensure that insulation boards do not contain hazardous chemicals before they are reused.
- PUR	-1997	✗	

Building element	Year of construction	Reuse	Information
	1998–2025	⚠	<p>CFCs and HCFCs have been used as blowing agents in rigid polyurethane boards. See above for information about blowing agents in boards. CRF and HCFC were banned in 1991 and 1997, respectively.</p> <p>Insulation boards often contain various flame retardants that can be harmful, such as TCPP.(24) They may also contain other organophosphates and isocyanates.(25)</p> <p>Newer boards can be reused if the content of additives such as flame retardants can be verified. It is mainly during processing that harmful substances such as isocyanates and organophosphates can be emitted, and this risk should be taken into account when reusing.(25,26)</p>
Sandwich panels	–1982 1983–2025	✗ ⚠	<p>Asbestos may be present in older sandwich panels, and precautions are required if asbestos content is suspected. PCBs may also be present in joint sealants, and CFCs and brominated flame retardants in insulation materials. See more under polystyrene and PUR insulation boards. Reuse of older elements is therefore not recommended.</p> <p>If the contents of the material are unknown, testing for harmful substances is recommended before reusing sandwich panels.</p>
Plasterboard	1930–1982 1983–2025	⚠ ✅	<p>Older plasterboards may have been in contact with asbestos-containing insulation (especially between 1930 and 1982).(7) If asbestos contamination is suspected, the material should not be reused. Newer plasterboards can be reused.</p>
Glass walls	–2025	✅	<p>Older glass walls with insulating glass may contain asbestos and PCBs in sealants, both in the sealant inside the insulating glass and in the sealant applied around the window frame.</p> <p>Chlorinated paraffins may also be present. PCB was banned in new products in 1978 and short-chain chlorinated paraffins were banned in 2013.(18,19) Medium-chain chlorinated paraffins were not added to the Stockholm Convention's list of banned substances until 2025.(19)</p> <p>Glass walls made of non-insulating glass rarely contain PCBs, but chlorinated paraffins may still be present.</p>

Building element	Year of construction	Reuse	Information
			<p>The glass material itself does not pose a risk when reused. Surface treatments with PFAS may be present.</p> <p>Glass sections with residues of harmful substances should not be reused but should be sorted as hazardous waste. Testing is recommended before reuse if contamination is suspected.</p>
Tiles and clinker tiles (glazed and unglazed)	-1980 1981–2025	<p>⚠</p> <p>✓</p>	<p>Glazed tiles may contain lead as a pigment in the glaze. The glaze forms a hard surface. The material itself is considered inert, but worn or damaged tiles may release lead.(27) Unglazed tiles are more porous, but do not usually contain lead as a pigment.</p> <p>Lead is not strictly prohibited as a pigment in tiles and clinker, but the industry began phasing out lead in the 1970s.</p> <p>Grout and tile adhesive used for installing tiles and clinker may contain asbestos, PCBs, chlorinated paraffins, brominated flame retardants and PFAS. If residues of asbestos and PCBs are present, the material should not be reused. Tiles and clinker may also have been surface-treated with, for example, water-repellent products that may contain PFAS.</p> <p>Before reusing old tiles and clinker, testing is recommended, both to ensure that the tiles do not contain lead and to verify that there is no contamination from harmful substances in the grout residue. (7,12) New tiles and clinker can be reused.</p>
Flooring			
Plastic			
	-2025	✗	

Building element	Year of construction	Reuse	Information
- Carpet (PVC, linoleum)			<p>Older floors from before 1982 may contain asbestos in either the adhesive, filler material or cardboard.</p> <p>Cadmium and lead were previously used as pigments in PVC.(7) Both are now banned.(15) POPs substances may also be present in plastic carpets, such as short-chain chlorinated paraffins (banned in 2012), brominated flame retardants (some banned in 2019) and the PFAS substances PFOA and PFHxS (banned in 2023).(20) New restrictions on lead in PVC came into force in 2024, imposing requirements on both new and recycled PVC materials.(16)</p> <p>PVC and linoleum may also contain high levels of other PFAS.(13,28) Phthalates are also common.(17) Older phthalates have been used extensively and have recently begun to be replaced by alternative plasticisers. There is also a risk of organophosphates being present in PVC.(29) There are also risks associated with the surface treatment of the floor.</p> <p>Due to the high risk of harmful substances being present, reuse is only recommended if information about the product's contents is available and it can be ensured that the substances it contains do not pose a risk to health and the environment.</p>
- Click flooring (vinyl/laminate/parquet)	-1991 1992–2025	✗ ⚠	<p>Vinyl may contain high levels of PFAS.(13,28) Phthalates are also commonly found.(17) Older phthalates have been used extensively and have recently begun to be replaced with alternative plasticisers. There is also a risk of organophosphates being present.(29)</p> <p>Older glued floors (laminate and parquet) can emit high levels of formaldehyde and should not be reused. See more under Wooden boards.</p> <p>Chemical tests can be carried out to ensure that the content meets requirements before the material is reused.</p>
Textile carpets	-2025	⚠	<p>Carpet rolls where the entire carpet is glued are difficult to reuse. Older adhesives may contain harmful chemicals.</p> <p>Textile carpets can be loose or glued with weak glue. There are risks associated with the surface treatment of the carpet, such as PFAS and flame retardants.(28) PFAS are widely used in textile</p>

Building element	Year of construction	Reuse	Information
			carpets as dirt and water repellents, and are added to the carpet either directly during the manufacturing process or as a surface treatment afterwards.(12) Chemical tests can be carried out to ensure that the content meets requirements before carpets are reused.
Wood			
- Oiled	-2025	✓	Oiled floors can be reused.(7)
- Painted, varnished	-2025	⚠	Wear and tear on floors increases the risk of exposure to harmful chemicals that may be contained in paint and varnish. When reusing, it may be appropriate to sand off old paint and repaint before reusing the product. See more under painted surfaces .
Tiles and clinker tiles			See Tiles and clinker tiles (glazed and unglazed)
Concrete	-2025	⚠	Porous materials such as stone and concrete in flooring materials are often treated with sealants or varnishes to create a water-repellent protective barrier. PFAS may be used as an additive in these. Testing is recommended to ensure that no harmful substances are present.
Windows and doors			
Windows			
- PVC frames	-2015 2016–2024 2025	✗ ⚠ ✓	Hard PVC may contain cadmium and lead as pigments and stabilisers. Cadmium was banned in hard PVC in 2011.(14) Lead as a pigment was banned in Europe in 1989,(15) but lead as a stabiliser in PVC was not restricted until 2024.(16) However, the industry voluntarily phased out lead as a stabiliser, and most PVC produced in the EU did not contain lead after 2015.(30) New restrictions on lead in PVC came into force in 2024, imposing requirements on both new and recycled PVC materials.(16)
- Insulating glass	-1982 1983–2025	✗ ⚠	In older windows, asbestos may be present in the window putty. This applies in particular to windows manufactured between 1940 and 1982.(7) PCBs can be found both in the sealant inside the insulating glass and in the joint sealant applied around the window frame. Chlorinated paraffins , asbestos and lead can also be found in joint sealants. PCBs were banned in new products in 1978 and short-chain chlorinated paraffins were banned in 2013.(18,19) Medium-chain chlorinated paraffins were not added to the Stockholm

Building element	Year of construction	Reuse	Information
			Convention's list of banned substances until 2025.(19) Windows containing asbestos, PCBs or chlorinated paraffins should not be reused but should be sorted as hazardous waste. Testing is recommended before reuse to ensure that no harmful chemicals are present. See also under painted and powder-coated surfaces.
- Non-insulating glass	-2025	⚠	In windows without insulating glass, there is less risk of the sealant containing PCBs than in windows with insulating glass. However, sealants may contain chlorinated paraffins , PCBs , asbestos and lead . Caution should be exercised when reusing and testing should be performed to ensure that no harmful substances are present. See also painted and powder-coated surfaces.
- Leaded glass	-2025	✗	Windows with leaded glass should not be reused because lead-containing products pose a risk of spreading lead into the environment.
Windowsills	1930–1982 1982–2025	✗ ✓	Asbestos was used between 1930 and 1982 in the manufacture of windowsills. In appearance, they are similar to marble or other stone materials, which can make them difficult to distinguish from harmless materials.(7) Windowsills made of stone, marble or other natural materials can be reused.
Interior doors	-1980 1981–1991 1992–2025	✗ ⚠ ✓	Interior doors are usually made of wood fibre material. Older glued wood panels can emit high levels of formaldehyde. See more under Wood panels . Painted surfaces may also contain harmful metal pigments or PFAS . See more under Painted surfaces . The contents of surface treatments should be verified before reuse.
External doors			
- PVC	-2015 2016–2024 2025	✗ ⚠ ✓	Hard PVC may contain cadmium and lead as pigments and stabilisers. Cadmium was banned in hard PVC in 2011.(14) Lead as a pigment was banned in Europe in 1989,(15) but lead as a stabiliser in PVC was not restricted until 2024.(16) However, the industry voluntarily phased out lead as a stabiliser, and most PVC produced in the EU did not contain lead after 2015.(30) New restrictions on lead in PVC came into force in 2024, imposing requirements on both new and recycled PVC materials.(16)

Building element	Year of construction	Reuse	Information
- Wood with metal inserts	-2025	✓	<p>Metal alloys such as aluminium alloys and sheet metal also contain other metals as alloying elements. These do not pose a risk during the operational phase.</p> <p>Wood may be painted with metal-containing paints. See more under painted surfaces. The contents of surface treatments should be verified before reuse.</p> <p>Wooden and metal doors can be reused.(7)</p>
Fire doors	1930–1976 1977–2025	✗ ⚠	<p>Asbestos was commonly used as insulation in fire doors until the late 1970s. Asbestos may be found around the lock case or as insulation behind sheet metal throughout the door.(7)</p> <p>There is also a risk that PCBs, brominated flame retardants and chlorinated paraffins are included. Newer doors often consist of stone wool, plaster or other non-combustible materials. However, harmful substances may still be present in joints, seals and surface layers.</p> <p>As fire doors contain components made of a variety of materials, testing is recommended before products are reused.</p>
Handles and accessories (fittings, door closers, levers)	-2025	✓	<p>Handles and accessories are usually made of various metals, such as stainless steel, brass and aluminium. Alloy metals pose little risk during the operational phase and metal products can be recycled. For surface-treated products, see more under painted and powder-coated surfaces.</p> <p>Plastic handles such as PVC may be present. Older PVC may contain pigments based on harmful metals. See more about harmful content in PVC under doors. If it is suspected that older plastic is present, testing is recommended before reuse.</p>
Installations and secondary components			
Gutters and downpipes			
- PVC	-2015 2016–2024 2025	✗ ⚠ ✓	<p>Hard PVC may contain cadmium and lead as pigments and stabilisers. Cadmium was banned in hard PVC in 2011.(14) Lead as a pigment was banned in Europe in 1989,(15) but lead as a stabiliser in PVC was not restricted until 2024.(16)</p>

Building element	Year of construction	Reuse	Information
			However, the industry voluntarily phased out lead as a stabiliser, and most PVC produced in the EU did not contain lead after 2015.(30) New restrictions on lead in PVC came into force in 2024, imposing requirements on both new and recycled PVC materials.(16)
- Metal	-2025	⚠	Cast iron gutters manufactured before 1970 may contain lead used as jointing material, as well as and tar (which contains PAH) used for corrosion protection.(7) Copper gutters may pose a risk of copper leaching into the environment and should not be reused.(31) New sheet metal gutters without surface treatment can be reused. Painted metal may contain high levels of PFAS .(28) See more under painted and powder-coated surfaces.
Gates and fences			
- Metal (unpainted)	-2025	✅	Metal that has not been surface treated should not pose any risk during the operational phase and can be reused.
- Metal (painted)	-2025	⚠	See more under painted and powder-coated surfaces.
- Wood			Untreated wooden structures can be reused if functional requirements are met. If the wood is impregnated, it must be checked to see if the impregnating agent contains chromium and arsenic . See more under Impregnated/wood-preserved wood .
Kitchen units (excluding worktops)	1930–1982 1983–2025	⚠ ✅	Asbestos may be present in joint sealants and adhesives in structures built before 1982. PCB may also be present in joint sealants. Surfaces may be painted with lead-containing pigments . See more under painted surfaces. Older plastic parts may contain phthalates and chlorinated paraffins . Older chipboard may emit formaldehyde above permitted limits. See more under Wooden boards . Precautions must be taken when reusing older units. Testing is recommended if harmful substances are suspected. Newer kitchen units can be reused.
Sinks (stainless steel)	-2025	✅	Stainless steel sinks usually contain metals such as nickel and chromium. These pose no risk during the operational phase and products can be reused provided that the product is free of sealant residues.(7)

Building element	Year of construction	Reuse	Information
Cable ladders	-2025	✓	Cable ladders usually consist of metal alloys such as stainless steel, galvanised steel or aluminium. The metal content poses no risk during the operational phase. Untreated cable ladders can be reused. If surfaces are treated or painted, PFAS or metals may be included. See more under painted and powder-coated surfaces.
Sanitary facilities, kitchens and wet rooms			
Bathroom ceramics (washbasins, toilet seats)	-1980 1981–2025	⚠ ✓	Ceramics may contain lead as a pigment in the glaze. The glaze forms a hard surface. The material itself is considered inert, but worn and damaged material can release lead.(27) The industry began phasing out lead as a pigment in the 1970s. Older bathroom ceramics may contain residues of asbestos and PCBs in seals and joints.(7) Before reusing older bathroom ceramics, testing is recommended to ensure that they do not contain lead or contaminants. Newer washbasins and toilet seats without residues of other materials can be reused.
Tiles and clinker tiles			See Tiles and clinker tiles (glazed and unglazed a de)
Metal fittings	-2025	✓	Taps, kitchen worktops and other metal fittings may contain metals such as nickel and chromium. These should not pose any risks during the operational phase.(7) Clean metal parts without any residue from joint sealants can be reused.
Flooring (plastic)	-2025	✗	See Carpet (PVC, linoleum)
Surface treatments			
Painted surfaces	-2025	⚠	

Building element	Year of construction	Reuse	Information
			<p>Painted surfaces may contain pigments based on lead compounds. Before 1970, lead was a common additive in paints.(32) Lead was banned as a pigment in Europe in 1989.(15) Cadmium has also been used as a pigment in paint, often to achieve strong yellow and red colours. Cadmium has been banned in paints since 1982.(33) Painted surfaces have also been shown to contain high levels of PFAS.(28)</p> <p>Older paints generally pose a greater risk of containing harmful metals, organotin compounds and banned PFAS substances. Newer paints may instead contain isothiazolinones and other PFAS substances.(28,34)</p> <p>The content of harmful metals or PFAS poses only a minor risk during the operational phase. It is mainly during wear and tear, damaged surfaces or renovation that harmful substances are released.</p> <p>When reusing, it may be appropriate to test surfaces to ensure that they do not contain harmful substances. Painted surfaces can also be sanded to remove old paint and then repainted before the product is reused.(7)</p>
Powder-coated surfaces	-2025	⚠	<p>Powder-coated surfaces have a high risk of containing PFAS.(17,35) This poses the greatest risk if the material or coating is damaged, as the risk of exposure increases. If the coating is intact, the risk of leaching is lower.</p> <p>Materials with powder-coated surfaces can generally be reused, but clearly damaged products should be avoided.</p>

12. The future of reuse

Several initiatives are available on the market to facilitate the reuse of building materials. Tools for digital traceability and innovative sorting methods are creating new opportunities for circular flows. With increased knowledge about the content and environmental impact of materials, both property owners and building contractors are better equipped to choose reused components instead of new production.

Non-destructive analysis methods provide a relatively simple means for ensuring that the content of building materials meets requirements. X-ray fluorescence (XRF) is an

established and rapid method that can be used to identify elements. The technique is particularly valuable in a reuse context as it makes it possible to determine whether materials are safe to circulate further. For example, handheld XRF instruments can be used to detect metals in wood in order to distinguish older impregnated wood, which may contain chromium and arsenic, from newer, copper-containing products. Similarly, XRF can confirm the alloy content of metal materials, thereby facilitating reuse. The method can also identify lead in paints and surface coatings on doors, windows or panels for an efficient and safe sorting process.(36,37)

Artificial intelligence is increasingly being used to assist with sorting and assessment. Studies have been conducted using machine learning to identify which building components contain harmful substances. Data from building registers and hazardous waste inventories is used to train an AI that can then predict the presence of harmful substances. The method has been tested for asbestos, PCBs, CFCs and mercury.(38)

AI has also been used to sort wood materials at recycling centres. The technology is based on cameras and sensors that analyse the surface and identify patterns, colour and structure, making it possible to distinguish untreated wood from impregnated wood, as well as to distinguish newer types of impregnation from older ones, which often contain harmful substances. Through machine learning, the system becomes better at detecting deviations and harmful substances. This makes the technology useful when receiving demolition wood, where it is often difficult to determine the quality or content of the material through visual inspection alone. This type of technology enables recycling centres to reduce misclassification, increase the proportion of safely reusable wood and, at the same time, relieve the burden on staff in the sorting process.(39)

Another example of an AI tool for simplifying the reuse process is the Fenix project. The project is developing a prototype for an online AI service where users can ask questions about the reuse of building materials directly to their BIM models and get clear answers, which facilitates sustainable decisions in construction projects. The service will optimise the choice of reused materials, improve access to building information and thus support climate goals.(40)

13. Recommendation for increased reuse

An important step is to develop clear procedures and disseminate the knowledge provided in this guide to professionals working with reuse, so that it is clear which materials can be reused without risk. At the same time, training and information dissemination need to be strengthened to increase knowledge about the risks associated with older building materials and the chemicals they may contain. In order to create a more secure basis for decisions on reuse, it would also be desirable to make greater use of testing and sampling to analyse the chemical content of materials.

The development of PFAS tests, for example, is progressing rapidly at present, as the issue of PFAS is highly topical. Hopefully, in a few years' time, it will be possible to easily test materials for PFAS content in a simple manner.

The knowledge provided by this guide is an important piece of the puzzle in enabling the City of Stockholm to work towards achieving all of its goals. However, it is well known that the problem of harmful chemicals in recycled materials may be more extensive than described here. Only well-known substances that are harmful to the environment and health are listed here, but there may be other substances in reused materials that the City does not want to allow into its operations and that would not be accepted in newly manufactured products.

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