# Resource and waste guidelines for construction and demolition

BYGGFÖRETAGEN

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| Version | Principal changes |
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| April 2019 | Revision of industry standards with a focus on a circular economy. Adjustment of fractions, sub-fractions and sign colours on the basis of the Swedish Recycling Industries' Associations article structure of fractions that can be used as standard for purchasing and statistics for waste management during construction and demolition; BEAst. Extensive revisions to large parts of the material. |
| May 2017 | Legislative update in main document together with appendices 1, 3, 4, 7 and 14.<br>Updating of basic level for construction on the basis of updated legislation on packaging waste.<br>Updating in texts on load carriers/construction pallets in main |
| October 2016 | Adjustment in Appendix 4. Changed so that window frames with glass may not be placed in the wood fraction. |
| November 2015 | Updating with regard to asbestos in window putty. Added references. |
| March 2015 | Updating with regard to freon blown insulation |
| Januar y 2015 | Updating with regard to new legislation and guidance from the Swedish National Board of Housing, Building and Planning about |
| May 2013 | First version under the Swedish Construction Federation. New title: Resource and waste guidelines for construction and demolition<br>Extensive updates regarding legislative changes and new knowledge, addition of actions for reuse in relation to material inventory and demolition and addition of suggestions for requirement setting and recommendations for ways of working to prevent waste. |
| March 2007 | First version. Title: Waste management during construction and demolition – the Ecocycle Council's guidelines |

## Foreword

The construction and property sector represents a significant part of society's material use and of the waste flow. To contribute to streamlining material use and thereby to reduce society's load on the environment in order to achieve sustainable development, waste minimisation and good waste management are crucial. We will achieve a circular economy together.

The first version of these guidelines was drawn up by Ecocycle Council for the Building Sector[1] in 2007 as one of the measures to reduce the amount of landfill according to the construction sector's environmental programme. The guidelines were formulated as an industry standard for waste management within the construction and property sector. In spring 2013, a revision was undertaken when the Swedish Construction Federation signed a transfer agreement with the Ecocycle Council and took over responsibility for continuing to keep the guidelines updated. At the same time, the material became web-based in order to facilitate updating and to constantly offer current material to users. Always download the latest version from the Swedish Construction Federation's website

This edition clarifies the importance of circularity and collaboration throughout the value chain. Those of us signing and responsible for these guidelines are representatives for all actors in the construction value chain. We see these basic principles as crucial in achieving sustainable development within the construction and property industry. The guidelines therefore represent the adoption of a position regarding resource efficiency, and give us a shared language in all phases of a building's life cycle.

We encourage all actors in the construction and property industry to use the guidelines as their basic level and to participate in continued development and collaboration aimed at long-term and sustainable social development.

The Swedish Construction Federation has engaged Tyréns as consultants for the process of monitoring and ongoing updates.

Stockholm, 10/05/2019

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1 The Ecocycle Council for the Building Sector was founded in 1994 as a non-profit organisation with approximately 30 representatives of the constructed, property and technology industries. The council was wound up in 2014.

# Summary

These guidelines aim to improve resource efficiency and waste management within the construction and demolition industries. The guidelines are a tool for fulfilling the requirements in the Swedish Environmental Code's general rules of consideration and the waste hierarchy, contributing to achieving Sweden's environmental objectives and for meeting general expectations from society for an increased circular economy in terms of the industry's material and waste management. In some cases, therefore, the guidelines exceed the requirements in the legislation.

The guidelines contain normative industry texts (i.e. the construction industry's agreement about how resource and waste management should take place during construction and demolition) for the following stages:

- Material inventory prior to demolition, together with procurement of inventory
- Reuse, waste sorting at source and waste management, together with procurement of contractors for demolition
- Design, waste sorting at source and waste management, together with procurement of contractors for construction

The normative industry texts have appendices which contain descriptions of how the waste should be managed in practice, industry-wide designations for a number of waste fractions and colours for signs for containers and other waste receptacles.

A summary follows of what the normative industry texts entail.

- All actors in a construction or demolition project shall participate in the design process and the work to manage material and waste for a circular economy.
- Material inventory shall always be carried out before demolition. Products for reuse, together with materials and products which will become hazardous waste during demolition, shall be documented in terms of quantity and position. Requirements are set for inventory consultants and for the implementation and reporting of the inventory.
- A material and waste management plan should be drawn up for all construction and demolition projects. In the case of refurbishment and demolition, this should contain information from the material inventory. The material and waste management plan shall be supplemented by the contractor with information about the planned management of hazardous waste and other waste. The contractor shall report statistics and follow up for the waste management process. The plan can be used as information for the inspection plan used for planning or demolition permission or notification.
- Hazardous and electrical waste should first be removed as far as possible and then handled separately and disposed of in a safe manner (this is also a legal requirement).
- Products for reuse and waste should be sorted according to the basic level for construction or demolition as stated in appendices 2 and 3 to the guidelines. If the waste is sorted into fewer fractions than is required for the basic level, this must be specifically justified.
- Waste for landfilling or post-sorting should be minimised.
- Waste should be handled according to the waste lists appended to the guidelines.

In addition to the normative industry texts, the guidelines also contain recommendations, supplementary information and assistance including recommendations for AF texts and forms.

# Contents

# 1 Introduction

These are the construction industry's **Guidelines for resource and waste management during construction and demolition**. The first version of the guidelines was published by the Ecocycle Council in 2007.
The guidelines are updated on an ongoing basis. The latest major update was carried out in 2019. Always download the latest version from the Swedish Construction Federation's website

## 1.1 The role of the resource and waste guidelines

The guidelines aim to improve resource management within the construction and demolition industries. They are a tool for fulfilling the requirements in the Swedish Environmental Code's general rules of consideration and the waste hierarchy and for meeting expectations from society for an increased circular economy in terms of the industry's material and waste management.

The aim is for material and waste management in construction and demolition projects to be carried out according to the waste hierarchy and the Swedish Environmental Code's general rules of consideration[2]. In some cases, therefore, the guidelines exceed the requirements in the legislation. One example of this is the guidelines' requirement for a waste management plan, which is not a legal requirement in itself but is a way of fulfilling the Swedish Environmental Code's requirements. The plan can also be used as information for the inspection plan used for planning or demolition permission or notification.

The guidelines have two functions. The guidelines' requirements should be used as industry standards in contractual texts about material inventory, demolition, design and construction. The guidelines should also provide support through the recommendations, information texts and assistance contained in them.

By contractors, property owners, designers, building material manufacturers, construction, demolition and waste contractors, recycling companies and consultants being aware of and applying the guidelines, it is possible to achieve the overall purpose of the waste hierarchy; to prevent and reuse material and products, increase material and energy recovery and deal with hazardous waste in an environmentally friendly manner.

## 1.2 Limits

The guidelines only cover the management of waste and material for reuse and recycling from the demolition and construction of buildings, but the principles for waste management can also be applied within the civil engineering sector. Construction and demolition also affect land, and comments are therefore included about actions relating to land, but the guidelines do not provide tools or normative industry texts for this.

[2] Chapter 2 of the Swedish Environmental Code (1998:808)

# 2 Definitions

The guidelines employ a number of terms which are explained here. The meaning of these terms may be slightly different in other contexts.

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| **Waste** | Any object, material or substance that the owner disposes of, intends to dispose of or is responsible for disposing of (Section 1, Chapter 15 of the Swedish Environmental Code[3]). |
| **The waste hierarchy** | The prioritisation order for prevention and management of waste stated in the framework directive for waste and which is integrated in Swedish legislation through Chapter 2, Section 5 and Chapter 15, Section 10 of the Swedish Environmental Code.<br>The prioritisation order is:<br>1. Prevention<br>2. Preparations for reuse<br>3. Material recovery<br>4. Other recycling, e.g. energy recovery<br>5. Disposal<br><br>The order applies on condition that it is environmentally justified and financially reasonable. |
| **Waste owner** | The organisation which has the right of disposition of the waste, in other words the organisation which can make the decision about the waste and actually do something about it, for example transfer it to another body or handle it in some way. The waste owner's responsibilities are defined in Chapter 15, Section 11 of the Swedish Environmental Code. |
| **Waste code** | Six digit code according to Appendix 4 in the Swedish Waste Ordinance[4] which designates a particular waste type (previously called EWC code). |
| **Waste producer** | Anyone carrying out activities which give rise to waste (the original producer) or anyone who by means of pretreatment, mixing or other procedures changes the nature or composition of the waste (the Swedish Environmental Protection Agency's regulations (2004:10) on landfilling). |
| **Waste type** | Waste can be divided into a large number of classes on the basis of the industry or type of waste. The types are stated in Appendix 4 to the Swedish Waste Ordinance and are designated by a waste code. Waste class is often used as a synonym for waste type. |

3 SFS 1998:808

4 SFS 2011:927

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| **Disposal of waste** | Disposal of waste means that the waste is handled according to one of the D codes in Appendix 3 to the Swedish Waste Ordinance or in some other way that means that the owner disposes of the waste without it being recycled or transferred to someone who collects or transports it. One example of disposal of waste is landfilling. |
| **Normative industry texts** | The normative industry texts are the construction industry's agreement about how resource and waste management should take place during construction and demolition. These can be applied when creating contracts. |
| **Combustible waste** | Such waste that burns without the addition of energy after the combustion process has begun (Section 3 of the Swedish Waste Ordinance). |
| **Construction and demolition waste (construction waste)** | Waste that occurs during construction and demolition works (during demolition, construction, extension, rebuilding, renovation and building measures relating to property management). |
| **Property developer** | Anyone who, on their own account carries out or has carried out design, construction, demolition or ground work (1:4 PBL). |
| **Construction** | All types of construction, i.e. new construction together with the incorporation of materials and products during alterations (rebuilding and extension) and maintenance. |
| **Circular economy** | "A circular economy can be described as an economy where waste essentially does not occur, but where resources can be retained in society's ecocycle or in a sustainable manner returned to nature's own ecocycle"[5] |
| **Landfilling** | Disposal procedure that involves waste being placed in a landfill site (Section 4, Swedish Waste Ordinance). |
| **Landfill** | Site for the disposal of waste. Landfill does not refer to a place or facility where waste<br>1. is transshipped in order to be prepared for onward transport to another place where it is to be recycled, treated or disposed of,<br>2. is stored before it is recycled or treated, if the storage takes place for a period shorter than three years, or<br>3. is stored before it is disposed of, if the storage takes place for a period shorter than one year (Section 5, Swedish Waste Ordinance). |

5 From value chain to value cycle – how Sweden can achieve a more circular economy. (Från värdekedja till värdecykel -så får Sverige en mer cirkulär ekonomi.) SOU 2017:22, page 57, Section 3.4

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| **eBVD** | Abbreviation for electronic building material declaration. A format and system for declaring the contents of building products, for example with chemical contents, raw materials and with specific chapters for demolition and waste management. eBVD provides traceability and is administered by the Federation of Swedish Building Material Producers Organisations[6]. |
| **Electrical waste** | Waste which consists of electrical and electronic products. See Section 6.4.5 on electrical waste or Section 8 of the Swedish Waste Ordinance for a definition of such products. |
| **Energy recovery** | Through energy recovery, waste that cannot be reused or recycled in another way can provide electricity and district heating as fuel in a heating plant. |
| **Hazardous waste** | Waste marked with an asterisk (*) in the list in Appendix 4 to the Swedish Waste Ordinance. The Swedish Environmental Protection Agency may also make announcements that other types of waste are to be considered as hazardous waste. For waste with double inputs (which can be both hazardous and non-hazardous waste), assessment shall be carried out according to sections 11b and 13b of the Swedish Waste Ordinance and EU ordinance 1357/2014. |
| **Hazardous substance** | A substance that has been classified as or will be classified as hazardous according to regulation (EC) No. 1272/2008 on the classification, labelling and packaging of substances and mixtures. |
| **Prevention of waste** | Actions taken before a substance, material or product has become waste which lead to a reduction in:<br>• the quantity of waste, including through the reuse of products or extension of a product's lifetime,<br>• the negative impact on the environment and people's health through the generated waste, or<br>• the quantity of hazardous substances in materials and products<br>The definition can be found in Chapter 15, Section 2 of the Swedish Environmental Code and is based on Article 3 of the framework directive for waste[7].<br><br>Prevention of waste can more practically be defined as actions to reduce the quantity or hazardousness of waste. |
| **Waste handling** | The collection, transport, recycling, disposal of or other physical dealing with waste or actions which do not involve physical dealing with waste but which are intended to ensure that waste is collected, transported, recycled, disposed of or changes owner or holder (Chapter 15, Section 5, Swedish Environmental Code). |

6 https://byggmaterialindustrierna.se/byggvarudeklaration-ebvd1-0/
7 2008/98/EG

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| **Inert waste** | Waste that does not undergo any significant physical, chemical or biological changes. Inert waste does not dissolve, burn or react physically or chemically in any other way, nor does it break down biologically or affect other materials it comes into contact with in a way that can cause damage to the environment or people's health. The total leachability and total pollutant content in the waste, together with the eco-toxicity of leachate, should be negligible and may not jeopardise the quality of surface or groundwater. (Section 3a, Ordinance on the landfill of waste[8]) |
| **Inspection plan for demolition** | The plan for inspection of a construction or demolition action with information on<br>1. the inspections which should be carried out and what they refer to,<br>2. who should carry out the inspections,<br>3. what notifications should be made to the Planning and Building Committee,<br>4. what site visits the Planning and Building Committee should carry out and when,<br>5. the hazardous waste that demolition actions can give rise to, and<br>6. how hazardous waste and other waste should be dealt with.<br><br>An inspection plan is only required if the actions are subject to permission or notification. (Chapter 10, sections 6-8, PBL, and the Swedish National Board of Housing, Building and Planning's general advice (2013:15) on demolition waste) |
| **Waste sorting** | Means that waste is separated into different fractions on the site where the waste occurs. |
| **Material inventory** | Inventory of materials and products affected by the demolition works. (Expanded significance in relationship to BFS 2013:15 Riv 1) |
| **Material and waste management plan** | Plan for the management of materials and products which become waste during construction and demolition works. The plan is drawn up before the demolition or replacement of building materials, and also before construction. It is also drawn up in those cases where an inspection plan for demolition is not required according to PBL[9]. If the plan contains the required information, it can be used as part of the inspection plan for demolition according to PBL. The plan is a tool for fulfilling the waste hierarchy. |
| **Material recovery** | Each form of recycling procedure through which waste material is reprocessed into products, materials or substances, either for the original purpose or for other purposes; this includes reprocessing of organic material but not energy recovery and reprocessing into material to be used as fuel or fill material (Waste Framework Directive (2008/98/EC)). |

8 SFS 2001:512

9 The Swedish Planning and Building Act (2010:900)

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| **Environmental assessment system for building materials** | System that assesses building materials on the basis of criteria and gives them a score. Also called material choice system or material assessment system. |
| **Environmental plan** | Document stating the actions causing specific environmental impact within the area, such as work methodology, choice of building materials, material handling, waste sorting at source and disposal of waste in order to ensure increased protection for the environment. (AMA AF 12). |
| **Organic waste** | Waste that contains organic carbon, for example biological waste and plastic waste (Section 3, Swedish Waste Ordinance). |
| **Producer** | Anyone who<br>1. professionally manufactures, imports to Sweden or sells goods or packaging, or<br>2. in their professional activities produces waste which requires specific actions for cleanliness or environmental reasons (Chapter 15, Section 9 of the Swedish Environmental Code). |
| **Producer responsibility** | Within industries where producer responsibility applies, producers must ensure that waste is collected, transported away, recycled, reused or disposed of so that waste handling is acceptable from a health and environmental viewpoint. In Sweden, there is statutory producer responsibility for items including packaging, tyres, waste paper, cars and electrical and electronic products. There are also industries which have adopted voluntary producer responsibility. |
| **Demolition** | All demolition works (both entire buildings or parts of a building), demolition during modifications (rebuilding and extension) and maintenance are designated as demolition. The legislation lacks a definition for the term "demolition”[10]. |
| **Wastage** | Wastage refers to waste that occurs in the form of excess material during the adaptation of dimensions. |
| **Maintenance** | Actions intended to restore function in a property object, a fitting or piece of equipment. During maintenance, function is normally restored to its original level. Maintenance includes labour, assistance and replacement of materials, goods or components. However, replacement of consumables which means that function is restored to the original level is counted as operation. (AFF definitions 10) |

[10] According to the preparatory works for the 1987 planning and construction law, prop. 1985/86:1 page 705, demolition should involve complete removal of the whole or parts of the building.

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| **Operator** | Anyone carrying out an activity (something which is repeated) or taking an (individual) action which is covered by the Swedish Environmental Code's regulations. This can be a physical person or legal entity. According to Chapter 2, Section 2 of the Swedish Environmental Code, anyone carrying out or intending to carry out an activity or take an action should acquire the knowledge required with reference to the nature of the activity or measure in order to protect people's health and the environment against damage or inconvenience. |
| **Reuse** | An action that involves a product or component which is not waste being used again to fulfil the same function for which it was originally intended (Chapter 15, Section 4, Swedish Environmental Code). |
| **Recycling of waste** | Means that the waste is seen as a resource and treated accordingly. The possibility is thereby created to replace newly produced material with recycled material. The procedure stated in Appendix 2 to the Swedish Waste Ordinance. Includes energy recovery, reclamation of metals, organic substances and non-organic materials together with |

# 3 Content and reading instructions

Below is a description of the content of each chapter and the appendices, together with instructions for how they should be read and used.

**Chapter 4** Introduction and justification for working with resource and waste management during construction and demolition.

**Chapter 5** Normative industry texts for:

- Material inventory prior to demolition, together with procurement of inventory
- Reuse, waste sorting at source and waste management, together with procurement of contractors for demolition
- Design, waste sorting at source and waste management, together with procurement of contractors for construction

The normative industry texts are the construction industry's agreement about how resource and waste management should take place during construction and demolition. When reference is made to the guidelines during procurements, these are the texts which must be fulfilled.

**Chapter 6** Recommendations for:

- Support during the execution of industry standards
- Handling of certain types of waste during construction
- Handling of certain types of waste during demolition

The chapter is intended as an additional aid prior to activities such as inventory of a building and contains information about substance and material characteristics, where they can be found and how they should be handled. The chapter is not primarily intended for the inventory consultant as they are assumed to have significantly more knowledge of the subject.

**Chapter 7** A list of literature and websites where further information can be found.

**Appendix 1** **List of hazardous waste – HW list**

List of hazardous waste together with other waste that requires particular attention or which is difficult to classify. The list contains examples of substances with hazardous properties which waste can contain and which do or can mean that the waste is hazardous waste and requires special handling. Examples are also provided of materials and products in which hazardous substances can be found, together with suggestions for waste codes and descriptions of waste handling according to legislation and industry standards.

The list is an outline list which is intended to be adapted to the relevant project in digital form. The list does not claim to be complete and the waste codes stated are only suggested codes. The code which should be stated depends on the origin and characteristics of the waste. Responsibility for classification lies with the producer of the waste. See Appendix 18 for more information about classification.

**Appendix 2** **Waste fractions during demolition – basic level**

List of waste fractions for sorting at source (basic level) during demolition. The list has industry-wide designations for fractions and colours for signs for containers and other waste receptacles.

The basic level is the smallest division for reuse and waste sorting. Division into fewer fractions than is required for the basic level must be specifically justified. What the fractions may contain and how they should be handled is stated in Appendix 4, Waste fractions and signs – overall list. What the fractions should contain in detail is determined in the individual project.

**Appendix 3** **Waste fractions during construction – basic level**

List of waste fractions for sorting at source (basic level) during construction. The list has industry-wide designations for fractions and colours for signs for containers and other waste receptacles.

The basic level is the smallest division for reuse and waste sorting. Division into fewer fractions than is required for the basic level must be specifically justified. What the fractions may contain and how they should be handled is stated in Appendix 4, Waste fractions and signs – overall list. What the fractions should contain in detail is determined in the individual project.

**Appendix 4** **Waste fractions and signs – overall list**

List of waste fractions for sorting at source (overall list) during demolition or construction, including description of what the fractions may contain and how they should be handled. At the end of Appendix 4 is a list of standardised signs and colours for the different fractions.

In the case of large quantities of waste of a particular sort, this waste should be handled separately and according to the description in the overall list. The list does not contain any more detailed description of hazardous waste, but refers to Appendix 1.

**Appendix 5** **Search list – Materials and products from demolition and exchange**

A search list of the materials and products that may need to be handled during demolition or exchange of building materials. The list contains information about what each material/product can contain, how it should be sorted and in certain cases additional information, for example about the occurrence of such materials or products.

Regarding how the waste should be handled, see Appendix 1 and Appendix 4.

**Appendix 6** **Recommended AF texts for procurement of material inventory according to industry standards**

The texts are designed according to AMA AF Konsult 10. The recommended texts regarding particular conditions should be adapted to the current project. If a simpler material inventory is to be ordered, the normative industry texts in Chapter 5 can be used as a checklist.

**Appendix 7** **Recommended AF texts regarding waste management during demolition according to industry standards**

The recommended texts regarding particular conditions should be adapted to the current project. The texts are written for contracts in which the General Provisions for construction, civil engineering and installation works (AB 04) apply.

Texts provide a supplement to AMA AF 12 and are primarily usable for reconstruction and demolition contracts. Codes and headings are stated for execution contracts. For turnkey contracts, see corresponding codes and headings in AMA AF 12.

**Appendix 8** **Recommended AF texts regarding design for a circular economy according to industry standard**

The texts are designed according to AMA AF Konsult 10. The recommended texts regarding particular conditions should be adapted to the current project.

**Appendix 9** **Recommended AF texts regarding waste management during construction**

The recommended texts regarding particular conditions should be adapted to the current project. The texts are written for contracts in which the General Provisions for construction, civil engineering and installation works (AB 04) apply.

Texts provide a supplement to AMA AF 12 and are primarily usable for reconstruction and demolition contracts. Codes and headings are stated for execution contracts. For turnkey contracts, see corresponding codes and headings in AMA AF 12.

**Appendix 10** **Template for material and waste management plan during demolition**

The plan is used as an aid in planning how products for reuse and waste should be handled. Fractions according to the basic level (Appendix 2) are included. The plan has a different status in different stages of the project:

- Version one - reporting of material inventory
- Version two - appendix to inspection plan for demolition according to PBL (drawn up when inspection plan for demolition is required)
- Version three - final waste management report

A more detailed description of the plan and its use can be found in Chapter 5.

**Appendix 11** **Template for material and waste management plan during construction**

The plan is used as an aid in planning how products for reuse and waste from construction should be handled. Fractions according to the basic level (Appendix 3) are included. The plan has a different status in different stages of the project:

- Version one – reporting planning of material and waste management
- Version two – follow up and documentation of material and waste management.

A more detailed description of the plan and its use can be found in Chapter 5.

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| **Appendix 12** | **Suggestion for hazardous waste management procedure**<br>The procedure has been developed on the basis of information from BF9K, which has been revised and supplemented. |
| **Appendix 13** | **Inspection points during environmental rounds to minimise waste**<br>Recommendations for expanded inspection points for material storage, spill protection, cleaning and waste management during environmental rounds to minimise the quantity of waste. |
| **Appendix 14** | **Start-up meeting minutes, waste management**<br>The form can be used as an aid during start-up meetings with demolition and waste contractors. |
| **Appendix 15** | **No longer included.** |
| **Appendix 16** | **Prevention of waste during construction**<br>Methods for how to work to prevent waste during construction. |
| **Appendix 17** | **Template - action plan for waste prevention during construction**<br>A template with suggestions for headings in an action plan for the prevention of waste. |
| **Appendix 18** | **Waste rules**<br>Summary of important waste concepts and the legislation which can be relevant during the handling of construction and demolition waste (legislation applicable as of March 2019). |
| **Appendix 19** | **Waste and environmental certification systems**<br>Description of how the Miljöbyggnad, BREEAM, LEED and CEEQUAL environmental certification systems address waste issues. |
| **Appendix** | **No longer included** |

# 4 Less and better waste

## 4.1 What is waste?

Waste is residues occurring during production and consumption. The waste definition says that: “Waste refers to...every object, material or substance that the owner disposes of, intends to dispose of or is responsible for disposing of.” In other words, it is the purpose of the action that determines whether or not something is waste.

Waste can be prepared for reuse, sent for material recovery or energy recovery or disposed of (in Sweden, generally by means of landfilling). In other words, the fact that something is waste in the legal meaning does not prevent it from being regarded as a resource that can be beneficial. If something is reused it is not waste.

The expression “by-product” is also defined in the Swedish Environmental Code. In general, we can say that a substance or object is a by-product rather than waste, if it occurs during a manufacturing process and can be used without significant processing and without risk to health or the environment.

Comprehensive guidance is available relating to both waste and by-product definitions, because the assessment affects the legislation that applies, for example if there are obligations to obtain permits or to make notifications.

Residual product is a general expression which is not legally defined.

## 4.2 Construction and demolition activities in the circular economy

Construction and demolition in Sweden generate approximately 10 million tonnes of waste every year. This is more than twice as much as household waste, and the most produced by any industry, if you discount the mining industry.

### 4.2.1 Society’s expectations and requirements

When the first edition of these guidelines was adopted in 2007, a number of policy instruments had been introduced to increase recycling and reduce landfilling. Since then, society's requirements and expectations have developed, which is reflected in the guidelines.

The waste hierarchy, which is the basic policy for preventing waste and waste management in Swedish and the EU, is integrated in the Swedish legislation through Chapter 2, Section 5 and Chapter 15, Section 10 of the Swedish Environmental Code. This means that waste should, firstly, be prevented; secondly prepared for reuse; thirdly sent for material recovery; fourthly sent for energy recovery and finally disposed of (e.g. landfilled). The priority order applies as long as it is environmentally justified and financially reasonable.

Several of the UN’s global goals for sustainable development relate to resources and waste. The clearest of these is goal 12, Sustainable consumption and production, where one of the sub-goals is “By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse”.

Sweden's environmental goals, primarily the goals A good urban environment and A toxin-free environment, contain references to economising on energy and natural resources, sustainable waste management, exposure to chemical substances, the use of specific hazardous substances and knowledge and information about hazardous substances in materials and products.

In 2014, the European Commission presented a message about the opportunities for resource efficiency within the construction sector.[11] The emphasis here lies on the significant potential represented by the sector in terms of waste minimisation and good waste management, as important building blocks in achieving environmental objectives and reducing Europe's dependency on the import of raw materials.

In both the EU's framework directive for waste[12] and in Sweden's waste plan[13], it is emphasised that it is important not merely to dispose of the waste in an environmentally friendly manner but also to reduce the quantity of waste and its hazardousness. The directive establishes targets which Sweden and the rest of the EU's member states must fulfil. These include 70% of non-hazardous construction and demolition waste being prepared for reuse, sent for material recovery or recycled in another way (excluding energy recovery) no later than 2020.

Sweden's national waste plan and preventative programme for 2018-2023 still points out construction waste as a prioritised area and states that there are still major opportunities for improvement.

The waste hierarchy, which says that waste should, firstly, be prevented; secondly prepared for reuse (e.g. repaired); thirdly sent for material recovery; fourthly sent for energy recovery and finally disposed of (normally by landfilling), has been integrated into the legislation in the entire EU[14].

The Swedish Planning and Building Act (2010:900) (PBL) also sets requirements for demolition activities. Chapter 9 states when demolition permission and notification of demolition are required. Chapter 10 describes requirements for inspection plans for demolition, which must include, for example, the hazardous waste that demolition actions can produce and how hazardous waste and other waste should be dealt with. The general advice BFS (2013:15) on demolition waste provides information about inspection plans and inspection managers' tasks. Chapter 6:911 in BBR 26 (BFS 2011:6) contains rules and general advice on inventory and the use of materials with regard to the indoor environment.

Work to use plastic sustainably was intensified during the years 2018-2020. In 2018, the government investigation "Det går om vi vill, Förslag till hållbar plastanvändning"[15] (We can do it if we want. Suggestions for sustainable plastic use) was published, which includes construction and demolition waste. In January 2018, an EU strategy for plastic in a circular economy was published.[16] According to this, all plastic packaging in EU markets should be recycled no later than 2030, the consumption of single-use plastics should be reduced and the use of microplastics limited.

Resource and waste management issues are also discussed in several of the most common environmental certification systems for buildings and the use of these is increasing. There are several criteria within the certification system that are linked to material choice, waste management, the use of recycled materials etc. Appendix 19 describes the relationship in more detail.

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[11] 1.7.2014 COM(2014) 445 final

https://eur-lex.europa.eu/legal-content/SV/TXT/PDF/?uri=CELEX:52014DC0445&from=EN

[12] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives

[13] Att göra mer med mindre – Sveriges avfallsplan 2018-2023 Rapport 6857

[14] Swedish legislation contains texts about preventing waste in Chapter 2, Section 5 and Chapter 15, Section 10 of the Swedish Environmental Code.

[15] SOU 2018:84

[16] European strategy for plastics - the European Commission 2018http://ec.europa.eu/environment/waste/plastic_waste.htm

The UN, EU, the Swedish state and properly owners are therefore sending clear signals that resource efficiency and the circular economy need to be created in practice. The construction industry needs to be part of this solution.

### 4.2.2 Strategies and actions to link to the circular economy

"A circular economy can be described as an economy where waste essentially does not occur, but where resources can be retained in society's ecocycle or in a sustainable manner returned to nature's own ecocycle"[17] There are a number of strategies to achieve this. For example:

- Resource efficiency – choosing resource efficient alternatives during design and production, or reducing surface requirements, for example by designing housing for compact living.
- Extend the lifetime – for the building itself and for materials and resources included in the building. In practice this can involve everything from creating a flexible building that can cope with changes over time to using recycled material or second-hand products, choosing high quality products or materials that can be recycled. Reconditioning and maintenance or dismantling and reinstallation in a new location are other examples.
- Increase use of the building – for example if an office building is designed so that it can also be used as the venue for courses in the evening, the total use is increased.
- Design the building for material recovery and reuse by choosing materials and products that can be dismantled and materials that can be separated from each other.
- Act to ensure efficient use of material resources at all stages (design, purchasing, transport, storage and construction).
- Document selected materials and ensure that the information at least fulfils requirements according to the industry-wide format for eBVD. Also collect safety data sheets, according to REACH, for chemical products.
- Avoid errors, shortcomings and wastage during

production. In practice, this means that we need to:

- Take the above strategies into account when we plan, design and construct buildings.
- Avoid materials that are difficult to recycle or which contain hazardous substances and instead ideally choose recycled material.
- Request and save documentation about all built-in materials.
- Minimise errors, shortcomings and wastage.
- Reuse products when possible, and sort products that can be reused.
- Sort the waste that occurs so we create conditions that are as good as possible for it to be able to be sent for material recovery or ultimately for energy recovery.

Together with correct and safe handling of hazardous waste, this is what these guidelines are intended to achieve.

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[17] From value chain to value cycle – how Sweden can achieve a more circular economy. (Från värdekedja till värdecykel -så får Sverige en mer cirkulär ekonomi.) SOU 2017:22, page 57, Section 3.4

## 4.3 Focus on hazardous waste

Hazardous waste refers to waste which is marked with an asterisk (*) in the list in Appendix 4 to the Swedish Waste Ordinance. For waste that has both a code with an asterisk and one without (so-called double inputs), assessment shall be carried out according to sections 11b and 13b of the Swedish Waste Ordinance and the EU ordinance 1357/2014.[18] More information about how the classification of waste is carried out can be found on the Swedish Environmental Protection Agency's website.

To simplify, we can say that hazardous waste is waste that is hazardous because it is explosive, flammable, corrosive, infectious or toxic for humans and the environment. Hazardous waste must always be sorted at source and disposed of in an environmentally correct manner. This is a legal requirement. It is also necessary to have fractions free of hazardous substances to be able to recycle waste and reduce the costs of waste management.

Hazardous waste contains *hazardous* or *particularly hazardous substances*. Particularly hazardous substances (Substances of Very High Concern, SVHCs) have properties that can lead to serious lasting effects on human health and the environment. These are substances which are carcinogenic, damage the genome, disrupt reproduction, are persistently bioaccumulative and toxic or have other particularly hazardous properties, such as being endocrine disruptors. On the candidate list for the EU's chemical ordinance REACH, 200 substances are listed which have been identified as *particularly hazardous*. The candidate list is updated twice a year. Read more, for example in Particularly hazardous substances, waste and material handling.[19]

Due to the serious properties of *particularly hazardous substances*, the aim is for them to be phased out, both in newly manufactured and recycled materials. Waste that contains particularly hazardous substances should therefore not be sent for material recovery, but sorted and destroyed or permanently stored in a safe manner.

## 4.4 Three reasons to focus on waste

Swedish legislation sets extensive requirements for waste management during construction and demolition. But there are other reasons to focus on waste.

### 4.4.1 Health and the work environment

Good waste management leads to a cleaner and more pleasant workplace. Possessing knowledge about the hazardous materials and products which will become waste is also necessary to ensure a good work environment, particularly during demolition or decontamination. By means of correct handling of hazardous waste, health risks are reduced for staff during handling, which can contribute to reducing injuries and sickness absence.

The occupational health and safety aspects are not in focus in these guidelines, but in certain special cases occupational health and safety issues are still highlighted, and references are made to the report Occupational health and safety during demolition, decontamination and drilling – guidance, the Swedish Work Environment Authority's statutes

[18] Section 11b of the Swedish Waste Ordinance (2011:927) contains a reference to Appendix III to

Directive 2008/98/EC. However, this has been replaced by EU ordinance 1357/2014.

19 Particularly hazardous substances, waste and material handling (Särskilt farliga ämnen, avfall och materialhantering), WSP, 2016-02-04, https://www.naturvardsverket.se/upload/miljoarbete-i-samhallet/miljoarbete-i-sverige/regeringsuppdrag/2016/giftfria-resurser/farliga-amnen-avfall-studie-20160204.pdf

(AFS)

### 4.4.2 Reduced environmental impact

By preventing waste in the first instance and then sorting out hazardous waste and sending the waste that still occurs for material or energy recovery as far as possible, the environmental impact is reduced. Correct handling of hazardous waste reduces the risk of injury or damage to people, animals and the environment. Reuse of construction material and increased material recovery reduces the need for the extraction of new resources. In general, less energy is also required to recycle material compared with extracting it from raw materials. Energy recovery creates vehicle fuel, heating and electricity, and replaces fossil fuels.

The environment is protected because hazardous waste is disposed of in an environmentally friendly way and other waste is sorted so that it can be handled as high up the waste hierarchy as possible. In this way, the environment is less encumbered by landfill waste while the need for the extraction of new resources is simultaneously reduced.

### 4.4.3 Money saving

Waste costs money and takes time and space. It must be sorted, stored, transported and disposed of. Waste is also material we have already paid for once. If the quantity of waste can be reduced, money can be saved. Experience from a project in the UK shows that actions to prevent waste reduced production costs by the equivalent of 0.2-0.8 per cent during new production.[20] These figures include the costs for carrying out the actions.

The costs for collection and processing of waste are reduced with better sorting. You can be paid for some fractions. Clean fractions increase the opportunities for material recovery and reduce the costs. Mixed waste for post-sorting generally costs significantly more than clean fractions for material and energy recovery. Landfill fractions are also more expensive, as is reclassification of containers, for example from combustible waste to hazardous waste, where the sorting has not been carried out correctly.

[20] Assessing the cost and benefits of reducing waste in construction, Cross-sector comparison, WRAP, www.wrap.org.uk

# 5 Normative industry texts

The normative industry texts are the construction industry's agreement about how resource and waste management should take place during construction and demolition and are described in sections 5.2-5.4. Appendices 6-9 contain recommendations for AF texts for procurement of material inventory, design and waste management during construction and demolition in accordance with the industry standards described here. A central aspect of the normative industry texts is the smallest number of fractions required for waste sorting. These are called basic levels and can be found in sections 5.3.1 and 5.4.1 and in appendices 2 and 3.

## 5.1 Allocation of responsibility

With several actors involved, it is important that the division of responsibility is clear. The chapter therefore begins with a section on this issue.

### 5.1.1 All participating parties have responsibility

Every party in the chain from client to final recipient has responsibility for waste management within the framework of their own activities.

The project owner (client) plays an important role and has particular responsibility when it comes to handling resources and waste during construction and demolition.[21] The project owner shall plan and inspect the activities to counteract or prevent any impact on human health and the environment. This means having knowledge about handling hazardous waste and recycling of non-hazardous waste, setting requirements for the contractors engaged and following up requirements through inspection of the entire waste management process up to the final recipient of the waste.

### 5.1.2 Responsibility for ensuring that waste regulations are fulfilled

It is the waste owner who is responsible for handling the waste, in accordance with the Swedish Environmental Code, in an acceptable manner from a health and environmental perspective[22]. It can be difficult to determine the waste owner according to the legislation. It is therefore appropriate during procurement to clarify who should fulfil the waste owner's responsibilities. Appendices 7 and 9 contain suggestions for texts for this purpose for contract procurement.

In the same way, it is also appropriate to clarify who should fulfil the other relevant provisions in Chapter 15 of the Swedish Environmental Code and the Swedish Waste Ordinance (for example regarding the obligation to list waste). Appendix 18 contains a statement of the rules that the various actors should in general be responsible for fulfilling. Depending on how the procurement is carried out and how the contract is written, the division of responsibility can in certain cases be different.

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21 The Swedish Planning and Building Act (2010:900) (PBL), chapters 9 and 10, BFS (2013:15) on demolition waste, BFS (2011:6) – BBR
26, Chapter 6:911.

22 Chapter 15, Section 5 a, Swedish Environmental Code

## 5.2 Division of fractions into basic levels

There is a standard division of waste fractions which is more extensive than the basic levels. The division is administered by the Swedish Recycling Industries' Association, and could be used as a standard for purchasing and statistics of waste management during construction and demolition. This is available as a whole at http://www.recycling.se/beast. Signs and sign colours have been developed for a large number of fractions. These can be found here: www.recycling.se/branschfragor/skyltfarger.

The main groups in this division are:

- Hazardous waste
- Electrical waste
- Wood
- Plastic for recycling
- Scrap and metal
- Paper
- Glass
- Combustible materials
- Plaster
- Mineral soils
- Excavation soils
- Asphalt
- Mixed waste for post-sorting
- Park and garden waste
- Mineral wool
- Landfill

Under these main groups are a large number of sub-fractions. The basic levels for waste sorting of construction and demolition waste (sections 5.3 and 5.4 and appendices 2 and 3) are adapted to these main groups. However, not all main groups are mandatory in the basic levels.

Landfill is a treatment form that is applied to waste which cannot or should not be handled higher up in the waste hierarchy. Waste to be landfilled should be characterised, for example with regard to the origin of waste, the identity of the waste producer, the processes that have given rise to the waste, the treatment the waste has undergone, the composition and leachability of the waste, together with its odour, colour, physical form and waste code according to the Swedish Waste Ordinance.[23] Waste of different types to be landfilled should therefore not be mixed with each other. Some easing of these conditions is possible for non-hazardous waste and inert waste. The Landfill fraction is therefore not included in the basic levels. Sorting is carried out on the basis of type of material.

Here is an example to clarify this: Plaster is sometimes recycled into new plaster, sometimes into soil improver and sometimes landfilled. In the case of landfilling, plaster must not be landfilled together with organic material as hydrogen sulphide can be formed.[24] Regardless of whether the plaster is to be sent for material recovery or landfill, it should always be sorted out as a separate fraction.

[23] The Ordinance (2001:512) on landfilling of waste and the Swedish Environmental Protection Agency's

regulations (NFS 2004:10) on landfill, criteria and procedures for reception of waste at facilities for landfilling of waste.

[24] The Swedish Environmental Protection Agency's regulations (NFS 2004:10) on landfill, criteria and procedures for reception of waste at facilities for landfilling of waste

According to the basic level for both construction and demolition, plaster shall be sorted out into a separate fraction. Whether the plaster will then be recycled into new plaster or soil improver or sent for landfill is decided in consultation with the waste contractor and depends on the distance to the recycling facility or landfill and the quality of the plaster.

## 5.3 Industry standards for resource and waste management during construction

Recommendations for AF texts for setting requirements for industry standards for construction during procurement can be found in appendices 8 and 9.

### 5.3.1 Requirements for material and waste management

- Draw up a material and waste management plan
- Design for a circular economy (see separate box)
- Manage material and waste for a circular economy (see separate box)
- Check that transporters and waste recipients have the requisite permits.
- Carry out a start meeting and regular follow-up meetings between the client and the construction contractor

**Design for a circular economy**

- Ensure that there is information on which to base the choice of materials and products regarding content either by using an environmental assessment system or by asking and assessing information at least according to the accepted industry format for eBVD.
- In the first hand choose products and materials that can be sent for material recovery and suppliers who reuse waste from installation for material recovery.
- Begin to compile information about materials and products.
- Design so that errors, shortcomings and wastage are minimised during production.

**Manage material and waste for a circular economy**

- Carry out waste sorting at least according to basic level. See below.
- Minimise the production of waste on the construction site.
- Continue to compile information about materials and products.
- Check the following during rounds:
    - Is there a designated site and weather protection for storage of material?
    - Do waste containers have clear signs?
    - Is the waste sorted correctly? ○Is the construction site free of rubbish?

**Basic level for construction**

Division into fewer fractions than is required for the basic level or use of the fraction Mixed Waste for post-sorting shall be specifically justified and approved in writing by the client. The basic level for construction production includes the following fractions:

- Packaging material included in the reuse system (for example standard pallets)
- Hazardous waste (different waste types are separated)
- Electrical waste (different waste types are separated)
- Wood
- Combustible materials
- Plastic for recycling
- Plaster
- Scrap and metal
- Mineral soils
- Excavation soils
- Mineral wool
- Corrugated cardboard
- Paper packaging
- Glass packaging
- Plastic packaging
- Metal packaging

**Notes:**

- Combustible waste must be sorted out at the source unless circumstances on site make this impossible. (NFS 2004:4. Sections 9 and 10)
- The quantity of waste sent to landfill shall be minimised.
- Adapt the sorting possibilities to the stage of the construction process. Packaging waste occurs, for example, primarily in the fitting out phase.
- All pallets of standard format shall be reused. These can, for example, be returned according to the Retursystem Byggpall system (www.byggpall.se) or to the supplier.
- Cable drums should be returned to the supplier.
- Wooden packaging that is not included in the system for reuse is sorted together with other wooden waste.
- Plaster and mineral wool are sorted out into separate fractions regardless of whether they will be sent to material recovery or landfill. See Section 5.2 in the main report.

The basic level for construction can also be found in Appendix 3. See Appendix 4 for division into more fractions and sign colours.

### 5.3.2 Requirements for the client

- Set requirements in the contract according to industry standards.
- Draw up or approve a material and waste management plan before beginning work.
- Carry out a start meeting and regular follow-up meetings between the client and the construction contractor.
- Follow up implementation and documentation in design and production on ongoing basis and at the end of the project.
- Inspect waste management on the construction site, for example by means of environmental rounds with inspection of the contractor's documentation of self-inspection.

### 5.3.3 Requirements for the designer

- Design for a circular economy (see separate box).
- Document and report choices that affect waste management to the client.

### 5.3.4 Requirements for the construction contractor

- Design for a circular economy (see separate box).
- Manage material and waste for a circular economy (see separate box).
- Check that transporters and waste recipients have the requisite permits.
- Carry out a start meeting and regular follow-up meetings between the client and the construction contractor.
- Minimise errors, shortcomings and wastage

#### *5.3.4.1 Competence*

- Have knowledge of resource and waste management and documented experience of the type of work covered by the contract.

#### *5.3.4.2 Requirements for documentation before work begins*

- State the name of the person responsible for waste management in the workplace, no later than the start meeting.
- Draw up a new or supplement an existing material and waste management plan, as far as possible taking account of the different stages. The plan shall:
    - Report how waste shall be sorted and handled, including procedures, logistics and types of containers.
    - Justify deviations from basic level.
- Draw up a description of waste management in the form of containers on drawings, e.g. on the construction site arrangement plan.

#### *5.3.4.3 Requirements for documentation during and after construction*

- Report to the client:
    - That permits held by transporters and waste recipients have been inspected.
    - Transport document and proof of reception.

- Compile statistics on the monthly basis and after conclusion of the project containing information about the weight and final treatment of:
  - Hazardous waste
  - Other waste divided into fractions
  - After completion of the project, the total quantity of waste per square metre of gross area[25].
- Compilation of information about the selected materials and products.

[25] Or the external dimensions selected.

## 5.4 Industry standards for resource and waste management – Material inventory

Recommendations for AF texts for setting requirements for industry standards for material inventory during procurement can be found in Appendix 6.

A material inventory traditionally involves an investigation of the types of hazardous waste and other waste which will occur during a demolition process.[26] Here, the concept is broadened to also include inventory of products and materials for reuse.

The term "material inventory" is used instead of "environmental inventory", as in other contexts the latter can include much more; for example, the building's energy performance.

These guidelines only discuss inventory of buildings. For land affected by planned construction works, a visual assessment should be carried out and previous activities investigated to provide an indication of whether there is a need to carry out a more detailed investigation of the land in terms of contamination or buried installations such as systems or heat pump equipment.

### 5.4.1 Requirements for material inventory

The purpose of material inventory is to obtain knowledge about hazardous substances and materials, where these can be found and in what quantities, in order to plan the demolition to ensure occupational health and safety and correct handling of the waste and to avoid project stoppages. The purpose is also to identify products for reuse to reduce the quantity of waste.

- Material inventory shall be carried out before demolition actions. Exceptions may only be made if those responsible are entirely sure that no hazardous materials or products will be affected by these actions.
- The results of the inventory should form the basis of the material and waste management plan.

#### *5.4.1.1 Material inventory scope*

The material inventory shall include:

- Complete inventory of all parts of the building which may be affected during demolition works as part of the project
- Materials and products which can be hazardous waste
- An assessment of which materials and products can be reused and material recycled
- Visual assessment, supplemented with sampling to a reasonable extent
- Knowledge should be sought regarding previous activities which may be of significance in determining how materials and products in the building should be disposed of during demolition

Inventory must also be carried out of land affected by construction actions, but this is not included in these guidelines and is not carried out by the material inventory consultant.

[26] See the Swedish National Board of Housing, Building and Planning's general advice (2013:15) on demolition waste (RIV1).

### 5.4.2 Skills requirements for material inventory consultant

- The material inventory consultant should fulfil one of the following requirements:
    - Have relevant training in environmental inventory and environmental legislation, have experience of material inventory and at least 5 years' relevant work experience, e.g. in the construction sector.
    - Have experience of material inventory of at least 10 objects, together with at least 5 years' consultancy experience.
- Experience of inventory for reuse (i.e. evaluation of products for reuse) is useful.

### 5.4.3 Requirements for documentation

- The material inventory consultant should draw up an occupational health and safety plan for their work before the assignment begins. The occupational health and safety plan should also include risks that affect tenants or activities. This plan should be approved by the client.
- The material inventory report shall include the following:
    - A list of all types of materials and products which will become hazardous waste in the case of demolition, with waste codes according to Appendix 4 of the Swedish Waste Ordinance.
    - The estimated amount of all materials and products which will become hazardous waste during demolition.
    - An overall description of how the stated hazardous waste should be handled.
    - Products for reuse, together with waste for material recovery divided into fractions, overall estimated amounts, waste codes (where applicable) and the handling of the waste.
    - The names of the fractions suggested for other waste should agree with the names in Appendices 1-4.
    - Hazardous substances and materials which have been sought but not found.
    - Spaces which were not accessible and which could therefore not be inventoried.
    - Occupational health and safety aspects which may be of importance for future demolition/dismantling/decontamination or property maintenance and which affect substances and materials discovered.
- The results should be provided in the form of an inventory report with supplementary reporting of the drawings provided with relevant marking of the hazardous waste discovered which cannot be described generally and marking of other waste. "Relevant" here includes appropriate detail level.

## 5.5 Industry standards for resource and waste management – Demolition

Recommendations for AF texts for setting requirements for industry standards for material inventory during procurement can be found in Appendix 7.

### 5.5.1 Requirements for waste management

- Carry out a start meeting and follow-up meetings between the client and the demolition contractor
- Work on the basis of the material inventory or material and waste management plan to ensure that all identified hazardous waste is correctly handled.
- Decontaminate and/or dismantle anything which is hazardous waste or electrical waste, together with products and materials for reuse before demolition as far as it is practically possible.
- Sort waste at least according to basic level.
- Check that transporters and waste recipients have the requisite permits.

**Basic level for demolition**

Division into fewer fractions than is required for the basic level or use of the fraction Mixed Waste for post-sorting shall be specifically justified and approved in writing by the client. The basic level for demolition includes the following fractions:

- Sorted products and materials for reuse
- Hazardous waste (different waste types are separated)
- Electrical waste (different waste types are separated)
- Wood
- Combustible materials
- Scrap and metal (different waste types are separated)
- Plaster
- Mineral soils
- Excavation soils
- Asphalt
- Mineral wool
- Glass

**Notes:**

- Combustible waste must be sorted out at the source unless circumstances on site make this impossible (NFS 2004:4. Sections 9 and 10)
- The quantity of waste sent to landfill shall be minimised
- Older plastic from demolition often contains substances that are problematic and which should not be sent for material recovery. If the content is known and approved for material recovery by the ECHA, material recovery is a possible alternative. Plastic from demolition which is not hazardous waste or which is not sorted out for material recovery is sorted as combustible.
- Plaster and mineral wool are sorted out into separate fractions regardless of whether they will be sent to material recovery or landfill. See Section 5.2 in the main report.

The basic level for demolition can also be found in Appendix 2. See Appendix 4 for division into more fractions and sign colours.

### 5.5.2 Requirements for the client

- Set requirements in the contract according to industry standards.
- Draw up or approve a material and waste management plan before beginning work
- Carry out a start meeting between the client and demolition contractor.
- Inspect waste management on the construction site, for example by means of environmental rounds with follow up of the contractor's documentation of self-inspection.
- Follow up to ensure that identified material and waste in the material inventory has been disposed of.
- Check that waste has been disposed of according to the material and waste management plan, and that proof of reception has been reported as proof that the waste has ended up in the "right" place.
- Follow up implementation and documentation on ongoing basis and at the end of the project.

### 5.5.3 Requirements for the demolition contractor

- Sort waste at least according to basic level
- Check that transporters and waste recipients have the requisite permits
- Carry out a start meeting between the client and demolition contractor
- Check waste management on the construction site
- Check that transporters and waste recipients have the requisite permits and that waste is managed according to agreement with the client
- Follow and follow up the material and waste management plan and follow up to ensure that identified material in the material inventory has been disposed of (self-inspection).
- On an ongoing basis, collect proof of reception from approved recipients.
- On an ongoing basis, document deviations and additions compared to the material inventory.

#### *5.5.3.1 Competence*

- Have expertise and documented experience in the type of work covered by the contract.
- Have access to a named person who will participate or be available during demolition and who has the training and/or experience to carry out assessments when suspicious material is discovered.

#### *5.5.3.2 Requirements for documentation before work begins*

- State the name of the person responsible for waste management in the workplace, no later than the start meeting.
- Draw up new or supplement the existing material and waste management plan. The plan shall
  - Be based on the report from material inventory
  - Report how products for reuse will be handled
  - Report how waste shall be sorted and handled, including procedures, logistics and types of containers.

- if necessary function as an appendix to the inspection plan for demolition according to PBL[27]
- Justify deviations from basic level.

[27] See the Swedish Planning and Building Act (2010:900), Chapter 10, sections 5-13 for more information about inspection plans and who is responsible for them.

- Report how any decontamination will be carried out. This can be done in the material and waste management plan or in a separate decontamination plan.
- Description of waste management in the form of containers on drawings, e.g. on the construction site arrangement plan.

#### *5.5.3.3 Requirements for documentation during and after demolition*

- Inform the client:
    - When decontamination is complete.
    - Immediately if hazardous waste in excess of what has been identified in the material inventory is encountered.
- Report to the client:
    - That permits held by transporters and waste recipients have been inspected
    - Statistics as agreed, e.g. monthly
    - Transport documents and proof of receipt/waste receipt shall be submitted as verification for all waste.
    - Any deviations from the agreed sorting and treatment (e.g. if it has not been possible to send the waste for material recovery despite it being sorted for this purpose)
    - After completion of the project, report:
        - compiled waste statistics with information about the weight and final treatment of:
            - Hazardous waste
            - Other waste divided into fractions
        - compiled statistics for the quantity of reuse material

# 6 Recommendations

Chapters 6.1 and 6.2 briefly describe recommendations and tips for implementing the requirements in Chapter 5. The purpose is to provide support for implementing the recommendations in practice. To obtain an overall picture, these sections must be read in parallel with Chapter 5.

Chapters 6.3 and 6.4 contain knowledge and recommendations about identification and management of different types of waste during construction and demolition respectively.

## 6.1 Support during the execution of industry standards: Construction

### 6.1.1 Actors and their roles

The client has three key functions in achieving effective, environmentally friendly and cost-effective material and waste management:

- Plan material and waste management
- Set requirements during the procurement of designers, construction contractors and waste contractors
- Follow up of requirements

Other affected actors shall implement the requirements in practice. These are:

- Designer
- Construction contractor
    - Construction contractor’s purchasing function
    - Construction contractor’s production planner
    - Construction contractor’s site manager
- Supplier
- Waste contractor
- Recycler/waste facility

### 6.1.2 Plan material and waste management

Actor: Client Tips

for the client:

- Set objectives and plan for material and waste management. Sorting of hazardous waste including electrical waste and sorting other waste for handling according to the waste hierarchy are legal requirements.
- Decide how the product choice should be carried out, for example by choosing an environmental assessment system for building materials or state the criteria for assessment (at least based on information according to the format for eBVD). Today there are essentially three systems on the market: Byggvarubedömningen, Sundahus and Basta. Read more about the systems on their respective websites.
- Choose a system for documentation of built-in products. These can be found,

for example, in the environmental management systems for building materials as described above.
- If as a client, you want to take further steps when it comes to preventing waste, Appendix 16 includes suggestions for ways to work.

- Appendices 8 and 9 include requirements for material and waste management to fulfil industry standards. Ensure that these requirements are included in the AF section in the tender specification and agreement with the designer/construction contractor/waste contractor.
- Design the material and waste management plan so that it functions as a follow up document for the entire project. A template for the plan can be found in Appendix 11.
- Identify material that risks being sent to landfill and assess whether actions to avoid landfilling should be taken.

### 6.1.3 Design for a circular economy

Actor: Designer and client

What is meant by designing for a circular economy is described by the industry standards. See Section
5.3.1. Appendix 8 contains recommendations for contract texts.

The purpose is to reduce the quantity of waste that occurs during construction by reducing wastage and facilitating material recovery by using less hazardous substances in the building and by choosing suppliers who reuse their own waste materials. In a longer perspective, documentation is required on materials and products to evaluate the possibility for reuse and recycling when the time comes to replace them.

Tips for the client:

- For the requirements to be taken into account in practice, knowledge and follow-up are required.
    - Ensure that there is a person within the designer's organisation responsible for supporting and following up the requirements.
    - Ensure that the requirements are communicated to the designers via the client's project manager/design manager and not merely through the environmental function.
    - Ensure that the client and design organisation have achieved consensus regarding the follow up documents required.
- Add the project to the environmental assessment system for building materials in a carefully considered way, so that it works throughout the entire project.
- The requirements can be supplemented with goals, for example for how large a percentage of products and materials designed into the project can be sent for material recovery.

Tips for the designer:

- Appoint a manager
- Ensure that you have a procedure to collect documentation (should fulfil the format for eBVD) or use an environmental assessment system for building materials so that checks take place during the choice of material/product and not retrospectively.

- Insulation and plastic flooring are two product categories where it can be worth taking into account return of waste material.
- At an early stage, decide upon a format for reporting the actions taken to take into account the requirements for material recovery and return of waste material. It must be possible to report the actions to the client. It can be useful to have a heading for this in the design meeting report, and for the relevant manager to compile these in a separate document which is presented to the client.

If you want to expand the requirements:

- Investigate the possibilities of using reused products and materials. If the project is preceded by demolition, you can investigate which products can be reused from the demolition. It is even possible to have a procedure for investigating which materials/products could consist of reused materials, e.g. internal doors.
- To extend the lifetime of buildings and fittings:
    - Facilitate repair and maintenance.
    - Think in a modular way to replace parts of the building.

### 6.1.4 Plan production Actor:

Construction contractor and client

Tips for the client

- For the requirements to be taken into account in practice, knowledge and follow-up are required.
- Ensure that there is a person within the contractor's organisation responsible for the requirements being fulfilled.
- Ensure that the requirements in Section 5.3.4.2 are fulfilled before beginning the work on the construction site.
- Ensure that you and the production organisation have achieved consensus regarding the follow up documents required.
- Ensure that the contractor's purchasing function has knowledge of the requirements set.

Tips for the construction contractor

- Ensure that the requirements are included in the contract with subcontractors.
- Ensure that the purchasing function is aware of the requirements set for material. See Design for a circular economy, Section 5.3.1.
- Have a systematic process to choose building materials, based on the requirements in Section 5.3.1.
- Plan to reduce waste:
    - Many temporary constructions are available in the form of rental solutions, for example fall protection.
    - See Appendix 16 for more information.
- Consider the following when choosing a waste contractor:
    - The waste contractor must have authorisation to transport and handle the fractions that occur.
    - Ensure that the waste contractor can supply the statistics required.
    - Member companies of the Swedish Recycling Industries' Association have undertaken to follow these Resource and Waste Guidelines for construction and demolition.

- Plan the waste management process, ideally in collaboration with the waste contractor, and draw it in, for example on the construction site arrangement plan. Ensure that the location for collection of pallets for reuse is planned and marked on the construction site arrangement plan.
- If possible, place the waste containers in a location that means they will naturally be passed by people discarding waste.
- If space is particularly short, positioning containers/big bags to disrupt the surrounding area as little as possible and reduce littering is particularly important.
- If space is particularly short, it can be better to use the fraction Mixed waste for post-sorting instead of only reducing the number of fractions.
- Erect clear signs.
- Plan waste management on the basis of different stages in the project. Different types of waste occur in different phases.
    - Carry out a dialogue with the waste contractor for solutions for sorting waste, possible waste for material recovery and quality requirements for these fractions.
    - Have a plan for handling surplus concrete in concrete trucks
    - Corrugated cardboard or plastic packaging material arises and require sorting primarily during the fitting phase.
    - Ensure that there is a designated place for standard pallets, and plan who will collect them.
- Have good procedures for emptying containers – agree with the waste contractor how this will work. Overfull containers lead to incorrect sorting.

### 6.1.5 Store, produce and manage waste

Actor: Construction contractor and

client Tips for the client:

- Ensure that waste management is discussed at the start meeting with the contractor, and ensure that there is a start meeting with the waste contractor which you participate in.
- Take part in rounds with a focus on waste management and storage. Appendix 13 contains examples of additional parts that can be inspected during rounds.

Tips for the construction contractor

- Hold a start meeting with the waste contractor, and ensure that they are conscious of the requirements. Consult with the waste contractor about the design of the waste management process.
- Hold a start meeting with the project personnel and provide clear information about the waste management process
- Erect clear signs
- Follow up waste management and storage during rounds. Appendix 13 contains examples of additional parts that can be inspected during rounds.
- Ensure that statistics are provided continuously and that they cover everything you need to know.
- Use the material and waste management plan to draw up documentation.
- If there is a lack of space at the workplace, for example during rebuilding,

solutions involving small containers and more regular collection of waste can be sought. A variety of different services can be ordered from the waste contractor, who can, for example, be involved at the workplace, monitor sorting and ensure that containers are emptied when required. Examples of how waste handling can be resolved are described in Appendix 20, Waste management in a selection of typical cases.

- During work on a construction site, site hut waste also arises which should be regarded as household waste. The municipality is responsible for handling household waste and subscriptions for collection of household waste can be ordered from the municipality. Packaging and return paper in site hut waste must also be sorted and sent to a deposit return system or to another approved collection system. This waste is not otherwise discussed in these guidelines.

## 6.2 Support during the execution of industry standards: Material inventory and demolition

### 6.2.1 Actors

The client has three key functions in achieving effective, environmentally friendly and cost-effective material and waste management:

- Plan material and waste management
- Set requirements during the procurement of material inventory consultants, demolition contractors and waste contractors.
- Follow up of requirements

Other affected actors shall implement the requirements in practice. These are:

- Material inventory consultant
- Demolition contractor
- Reuse actor
- Decontamination contractor
- Waste contractor
- Recycler/waste facility
- Recipient of waste for construction purposes

Collaboration between different actors is important to achieve a good waste management process.

### 6.2.2 Plan material and waste management

Actor: Client Tips

for the client

- Set objectives and plan for material and waste management. Sorting of hazardous waste including electrical waste and sorting other waste for handling according to the waste hierarchy are legal requirements.
- A material inventory is always required, so order this in good time. A material

inventory carried out at an early stage increases the opportunities to reuse products. If the inventory is carried out at a late date and too close to the demolition stage, this reduces the opportunities for reusing high quality products.

- Appendices 6 and 7 include requirements for material inventory and waste management to fulfil industry standards. Ensure that these requirements are included in the AF section in the tender specification and agreement with the material inventory consultant, demolition contractor and waste contractor.
- The material inventory should form the basis of a material and waste management plan. Design the plan so that it functions as a follow up document for the entire project. A template for the material and waste management plan during demolition can be found in Appendix 10. If an inspection plan for demolition is required according to PBL, the material and waste management plan can be attached as an appendix to the inspection plan (if the relevant Planning and Building Committee does not require a specific form to be used).
- It is cost-effective to acquire knowledge so that problems during the contract period can be prevented. By achieving an early overview of the hazardous substances found in the building and planning any decontamination and waste management, you avoid significantly more expensive stoppages later in the demolition process.
- Identify material that risks being sent to landfill and assess whether actions to avoid landfilling should be taken.

- If space is particularly short, it can be better to use the fraction Mixed waste for post-sorting instead of reducing the number of fractions. However, this should be specifically justified in accordance with the basic level for waste sorting.
- Consider the following when choosing a demolition contractor:
    - The demolition contractor must have authorisation to transport and handle the fractions that occur.
    - Member companies of the Swedish Recycling Industries' Association have undertaken to follow these Resource and Waste Guidelines for construction and demolition.

### 6.2.3 Material inventory

The purpose of a material inventory is to:

- primarily to obtain knowledge about hazardous substances and materials, where these can be found and in what quantities
- to obtain knowledge about the other materials and products present in the building
- to obtain information in order to plan any decontamination, demolition/exchange and to estimate the costs of these actions
- to obtain information for setting requirements in terms of demolition and waste management
- to give designers and contractors useful information on which to base their work
- obtain information for creating a project-specific basis for an occupational health and safety plan for the contract
- reduce the risk of stoppages in the demolition process, unpleasant surprises, occupational health problems and additional works
- to obtain information about reuse, sorting, waste amounts and disposal

Environmental inventory consultants for property are certified following testing according to the requirements in the Swedish Property Federation's CMF Requirement specification[28]. This covers other areas in addition to material inventory. SWEDAC provides accreditation for bodies certifying environmental inventory consultants for property.
However, the industry standards do not set requirements for certification as experience of material inventory is more important and crucial in being a skilful material inventory consultant.

Actor: Client and material inventory

consultant Tips for the client:

- Ensure that the material inventory consultant also carries out an inventory for reuse
- To provide the material inventory consultant with information useful in their assessment, the following information should be provided to the consultant:
    - Existing activities in the relevant building.
    - Information regarding the building, e.g. drawings, year of construction, year of rebuilding where applicable, installations etc. and information about previous activities in the building. Previous activities may have left contamination in the building which can be difficult to see, and all such information is therefore important prior to rebuilding or demolition.
    - A description of what the current project involves; demolition/rebuilding/extension, adaptation for tenants, modernisation etc.
    - Information about the accessibility of the space for visits during the tender period.
    - Information about the accessibility of the space for inventory
- The material inventory should be procured on a cost plus basis. Sampling and analyses should also take place on a cost plus basis, against verified cost prices. The scope should be decided in consultation with the client. Request that a price list for the most common analyses is attached.
- Prior to the inventory, it may be appropriate for the client to organise a meeting in which the project manager, property administrator and inventory consultant review the project.
- Note that there may be occupational health and safety problems during the inventory process. It is often appropriate to allow two people to carry out the inventory, particularly if there are occupational health and safety risks or if the inventory is very extensive. You should therefore request the material inventory consultant to draw up an occupational health and safety plan for their own work before this begins.

Tips for the material inventory consultant

- Destructive sampling should take place in consultation with the client if activities are underway in the buildings.
- The material inventory consultant should therefore provide information on any risks associated with materials discovered, and should recommend actions to manage these, so that this can be integrated into an occupational health and safety plan for the contract works.
- If product inventory skills for reuse are lacking, support can be sought, for example, from local reuse actors or demolition contractors.

7 [28] CMF – Certification of environmental inventory consultants for property (Certifiering av miljöinventerare-fastigheter), Requirement specification for basic certification, March 2000. Solveig Larsen, Swedish Property Federation

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### 7.2.2 Draw up a material and waste management plan

Actor: Client, material inventory consultant or demotion contractor Tips:

- The purpose of the material and waste management plan is that it should be able to act as an appendix to the Inspection plan for demolishing according to PBL, and that it should function for following up the demolition. Hazardous waste should therefore be added in a way that is reasonable to follow up. Appendix 10 is designed for this to be possible.
- Quantities of waste which are not hazardous waste are assessed in an overall manner. The purpose is to facilitate planning, and to be able to ensure that waste does not "disappear" and get handled incorrectly.

### 7.2.3 Dismantle products for reuse

Actor: Client

- For a product to be reused, there needs to be a market. This market can be found via a reuse actor, via the client's internal network or with other project owners. Carry out a reasonable assessment of whether there is a demand for these products and ensure that they are dismantled first. Enlist the help of a reuse actor if there is one within a reasonable distance.

### 7.2.4 Decontaminate

Actor: Client and decontamination contractor

Tips for the client

- Set requirements for the decontamination plan before project start.
- Decontamination actions which involve, for example, decontamination of PCBs or mercury in drainage pipes should be reported to the local environmental authority.[29] For PCBs, notification must be provided at least three weeks before the decontamination works begin. For other decontamination, at least six weeks apply – or the shorter period accepted by the environmental authority. Set aside sufficient time for decontamination works.
- Check that decontamination is carried out in the right way. It is appropriate for the client to request a preliminary inspection of the decontamination works. You should ideally engage the inventory consultant for the preliminary inspection.
- In certain cases, decontamination of materials, e.g. asbestos, which is concealed, may have to be carried out in stages as the building sections concealing the material are dismantled. This sets specific requirements in terms of the clients' checks – it is perhaps not possible to carry out inspection after every decontamination stage.

It is appropriate for the client to appoint an environmental control officer for each project who can be summoned for sampling, assessment and inspections. It is not appropriate to

leave this to the demolition contractor.

### 7.2.5 Demolish and waste sort

Actor: Client and

demolition contractor Tips

for the client

- Follow up the demolition contractor's planning of waste management.
- Ensure that a start meeting is held before demolition. Appendix 14 contains an example of a start meeting report.
    - Ensure that the demolition contractor has knowledge of the hazardous waste which has been identified. Discuss the issue of procedures for any additional sampling during the demolition phase for concealed material. The material inventory consultant can participate in the start meeting to increase knowledge transfer.
    - The start meeting should also include a review of how the documentation and self-inspection should be reported during the project period and a review of how the waste management process is intended to work.
- Ensure that you agree how follow up should be carried out. The material and waste management plan is an instrument for this process.
- Follow up the client requirements in a systematic way. If the treatment facility receiving the hazardous waste invoices the client direct, the client obtains good control of where waste is sent. An alternative is for the treatment facility to invoice the contractor, who then carries out reporting of receipts, proof of reception and transport documentation etc. to the client.

Tips for the contractor

- The material and waste management plan shall be supplemented by the contractor with information about the planned management of hazardous waste and other waste. Information about follow up and documentation of the ongoing handling of the waste should be filled in during the contract works, so that the plan can be used for the contractor's final report on the management of the waste.
- Examples of how waste management can be resolved where space is limited are described in brief in Appendix 20, Waste management in a selection of typical cases.
- Electrical waste must be handled so that, for example, components containing mercury do not break. Electrical waste can be of very different type and nature and therefore requires different containers or space for storage at the workplace. See also Appendix 1, List of hazardous waste and Section 6.4, Identification and handling of certain types of waste from demolition.
- During work on a construction site, site hut waste also arises which should be regarded as household waste. The municipality is responsible for handling household waste and subscriptions for collection of household waste can be ordered from the municipality. Packaging and return paper in site hut waste must also be sorted and sent to a deposit return system or to another approved collection system. This waste is not otherwise discussed in these guidelines.

## 6.3 Handling of certain types of waste during construction

Construction means that primarily new building materials are used. This means that you know or have good opportunities of knowing what type of waste will arise and what the different building materials that will become waste contain.

The most important types of waste that arise during new construction and other construction are:

- material waste
- packaging material including load carriers (such as pallets and cable drums) which are not returned for reuse
- small quantities of hazardous waste
- electrical waste
- waste from temporary constructions

This section describes knowledge about and handling possibilities for different types of waste. The possibilities vary in different parts of the country. How you can reduce waste is partly described below and partly under the relevant stage and actor in sections 6.1 and 6.2 and in Appendix 16.
Basic strategies can also be found in Section 4.2.2.

### 6.3.1 Hazardous waste during construction

Examples of hazardous waste are paint and varnish waste together with adhesives and joint compounds which contain organic solvents or other hazardous substances, oil waste and packaging that contains residues of or is contaminated with hazardous substances. Electrical waste is also hazardous waste.

The Farligt avfall (Hazardous waste) app can help you to determine quickly and easily how different types of waste should be handled. The Farligt avfall app is a development of the 2004 "Hazardous waste for construction and civil engineering works" handbook (Farligt avfall för bygg- och anläggningsarbeten), and the app can be downloaded via AppStore or Google Play.

### 6.3.2 Plasterboard waste

Plaster waste can be used for material recovery to produce new plasterboard sheets. The plaster shall be clean and dry without contamination by lime residues etc. Plaster can also be sent for material recovery as a soil improver.

### 6.3.3 Plastic

Installation waste is clean waste which can be easily recycled into new products. Some manufacturers take back installation waste.

The Nordic Plastic Pipe Association (NPG) has a recycling system that includes pipes and parts of pipes in PVC, PE and PP plastics. Both pipe waste during new construction and old pipes from demolition are accepted. The collected material is sorted, washed and recycled into new products. Collection containers are currently located in seven places in Sweden. Only pipe waste from a number of manufacturers can be deposited, following agreement with the contact person for the container. For more information, see www.npgnordic.com.

During installation of plastic flooring, up to 10% can be installation waste as a result of trimmed edges and residual fragments. GBR Floor Recycling accepts floor and wall material from all major suppliers on the Swedish floor market and recovers the material.
The installation waste is collected in sacks and marked with the name of the supplier. Wastage from different suppliers should not be mixed in the sacks as each supplier is responsible for wastage from its own material. The flooring company laying the floor is responsible for collecting the wastage and returning it via the system.

The Swedish Flooring Trade Association, Golvbranschen (GBR) also has a system for ecocycle marking of floors. The system makes possible simple identification of the chemical substances included in the floor construction. You can find more information on both of these systems at www.golvbranschen.se.

Unintentional spreading of construction materials to the surrounding area can be a source of microplastics in the environment. Unintentional spreading can be minimised by keeping the construction site free of rubbish.

### 6.3.4 Packaging and newspapers

Producer responsibility applies to all packaging material. Producer responsibility is administered by Förpacknings- och Tidningsinsamlingen (FTI AB), which is owned by the four material companies Returkartong, Plastkretsen, Metallkretsen and Pressretur. Swedish Glass Recycling has a specific collaboration agreement.

Clean packaging and newspapers resulting from professional activities should be sorted from other waste. Packaging should be sourced as glass, paper, metal or plastic packaging.
It is often sensible to sort corrugated cardboard and shrink or stretch film separately.

By compressing corrugated cardboard, you can reduce the volume and simplify handling as cardboard is often bulky. Note that corrugated cardboard must be relatively clean in order to be able to be recycled. Dirty corrugated cardboard should be placed in the combustible container.

There is a separate recycling system for glass packaging. See www.glasatervinning.se.

For wooden packaging waste, there is no approved collection system, so wooden packaging material is sorted together with other wooden waste.

You can engage a waste contractor to collect sorted packaging. Sorted packaging can also be deposited at a reception point free of charge. Read more at www.ftiab.se. Consult with the waste contractor about how packaging material should best be sorted.

### 6.3.5 Pallets

For standard format pallets, the construction industry has its own system for reuse; Retursystem Byggpall.

The pallets covered by the system are full (800 x 1200 mm) and half (600 x 800 mm) construction pallets. The full construction pallets are used EUR pallets with established quality standards.
The pallets are clearly marked to facilitate identification.

The pallets in Retursystem Byggpall have a fixed repurchase price, which means that full remuneration is paid for both whole and damaged pallets. A construction pallet should never be discarded, even if it is damaged. It should always be returned for possible repair and then reused. More information is available at www.byggpall.se.

In some cases, pallets can be returned to the supplier. This is regulated by the purchase agreement. Set requirements in the contract with the supplier for the products to be supplied on a return pallet (and not a single-use pallet).

### 6.3.6 Cable drums

Some Swedish cable manufacturers have a system for disposal and repurchase of cable drums. All of the producers involved use cable drums with the same design/standard. Returns are accepted regardless of who has sold the drum on condition that it fulfils the standard. The remuneration is the same for everyone and there are common rules for valuing damaged drums, for example. The cable drums are used on average eight times before they are scrapped.

There are also companies that specialise in collecting cable drums and submitting them to the return system.

### 6.3.7 Insulation

Some insulation manufacturers recycle their own insulation waste, but there is no common system for the industry. Often this is sorted glass wool insulation which becomes loose wool. Loose wool can then be used as insulation, for example in attic spaces.

Dry, clean insulation is collected in sacks which are then sent back to the factory for recycling. Sorted insulation is often collected in return for a shipping cost, or alternatively you can drive it to the designated factory. There is also a company which has a mobile facility that travels around to factories producing wooden houses, shredding their glass wool waste into loose wool. In this way you can avoid the installation having to be transported back to the factory as the mobile facility can instead deliver it directly to the customer.

Trials are also underway with external material from construction and demolition. Consult with your supplier or waste contractor about the opportunities available.

## 6.4 Identification and handling of certain types of waste from demolition

Information in this section supplements the information in Appendix 1, List of hazardous waste and Appendix 5, Search list – Materials and products from demolition/exchange.

Further information is available in the Swedish Environmental Protection Agency's

report 5491, "Contaminated buildings, investigations and actions" (Förorenade byggnader, undersökningar och åtgärder).

### 6.4.1 Products for reuse

To reduce the amount of waste during demolition, you should try to reuse as much of the material as possible. Depending on where you are in Sweden, there are different opportunities for reuse. It is generally easier in metropolitan areas, where there are often active reuse or second-hand actors on the market that you can engage.

During material inventory, you should check whether any of the following products are present and if it is considered that they could be reused:

- Doors
- Internal walls and ceilings (glazed sections and acoustic panels)
- HVAC and sanitation, e.g. hand basins and toilets
- Fittings and door automation equipment, e.g. door handles, door fittings and door closers
- Lighting
- Gratings and ironwork, e.g. spiral staircases, accessibility ramps, storage area gratings.

Other product types can also be relevant for use, on condition that they do not contain unwanted hazardous substances.

### 6.4.2 Asbestos

Asbestos is a collective name for a number of fibrous silicate materials found in bedrock. They all tolerate high temperatures. They also provide insulation, noise damping, are mechanically durable, easy to use and were cheap – which meant that they were used to a wide extent.

Inhalation of asbestos fibres may over time lead to diseases such as asbestosis and lung cancer.

Asbestos is present in installations from the early 1900s and onwards. The largest use was from the 1950s to the mid-1970s, when usage largely ceased. An initial prohibition of certain types of asbestos was issued in 1976, but the total ban only came in 1982.

The combination of asbestos and sheet metal/metal can be found in a number of construction materials and products. In the report Occupational health and safety during demolition, decontamination and drilling – guidance, and in the Swedish Work Environment Authority’s statute book (AFS), you can read more about what you should think about when demolishing material containing asbestos.

#### *6.4.2.1 Ventilation systems*

In ventilation systems with sheet metal ducting manufactured before 1976, it is extremely common for asbestos to occur in different parts of the systems, such as noise and fire insulation. It is most common for the asbestos-containing material to have been used on the inside or outside of ducting and in ventilation air handling units.

#### *6.4.2.2 Cooling and heating facilities, pipes*

Asbestos occurs in cooling and heating facilities, for example around pipes, in gaskets and air handling units, as fire protection and thermal insulation.

Asbestos is also found in heating plants as boiler installation and as sealing around hatches and between boilers and flues. Asbestos also occurs as asbestos board in older immersion

heaters inside the insulation of cow-hair felt and in the ends as asbestos-containing diatomaceous earth or magnesia block insulation.

Asbestos often occurs in older pipe insulation. In steam systems, the whole of the pipe insulation consists of asbestos-containing diatomaceous earth or magnesia block insulation. In other systems (cold water, hot water and heating pipes), asbestos has only been used for bends, transitions, before and after valves etc. On straight pipe sections, glass wool or cow-hair felt has been used. The outer surface is often oil-soaked canvas above one or more layers of corrugated paper.

#### *6.4.2.3 Fire doors*

Fire doors manufactured before 1976 often contain asbestos insulation. Sometimes the asbestos is only located around the lock case, and in some cases over the entire door inside the sheet metal. Checking whether fire doors contain asbestos can be done by checking the manufacturer and year of manufacture, which should be stated on the hinge side of the door leaf. If marking is absent or illegible, older fire doors should be regarded as asbestos-containing. .

#### *6.4.2.4 Paint*

In some cases, sheet metal façades and roofs were previously painted with a type of paint that contained asbestos.

#### *6.4.2.5 Floor tiles, vinyl flooring and floor adhesive*

Older floor tiles and vinyl flooring can contain asbestos. Asbestos can also be found in floor adhesive under floor tiles and vinyl flooring, in which case it is called black adhesive or tar adhesive. It is normally black but can be brown or yellowish brown. Asbestos can occur in products produced before 1976.

#### *6.4.2.6 Joint compound, sealing compound*

Certain soft compounds contain asbestos. These joint compounds can be recognised by short fibres in the structure, but laboratory analysis is required to be completely certain of the content.

Commonly occurring types are a type of red/pink sealing compound with asbestos around drainage pipe joints and WC connections. This is primarily encountered in bathrooms and cleaning storage spaces. In other parts of the drainage system, it is most uncommon, as lead was used instead.

It is also common that sealing compound in joints around ventilation ducts, air handling units and diffusers contain asbestos.

#### *6.4.2.7 Tile adhesive and grout*

Until 1976, it was common for asbestos to be used as an additive in tile adhesive and grout. Asbestos-containing material can occur both in the adhesive behind the tiles and also in the grout between tiles. These are often different types of compound, so samples of each are required.

#### *6.4.2.8 Sheet material and coatings with asbestos*

Sheets and tiles with asbestos have been used for fire and thermal insulation and for sound absorption. Façade panels and corrugated roofing sheets can be made of Eternit. Eternit sheets can also be concealed behind a façade of sheet metal.

Acoustic tiles and fire protection tiles for walls or ceilings can be asbestos sheets, often

painted or with a surface coating of fibre material or veneer. Asbestos can also be found in PVC floor tiles (vinyl tiles which were common in chemical laboratories, corridors etc.) and PVC matting (floor and wall matting produced before 1976).

#### *6.4.2.9 Putty*

Old putty can contain asbestos. It is not currently clear how common this is, nor which years or manufacturers are involved. Because asbestos was completely banned in 1982, asbestos can occur in putty on houses built or renovated between 1940-1982. The process during which the risk of exposure to putty dust is greatest is during routing out of the putty from the window frames or heating of the putty with a heat gun. Samples should be taken before the work begins.

#### *6.4.2.10 Recommended handling*

For the material combination asbestos and sheet metal/metal, it is generally recommended that where the asbestos-containing material is attached to the sheet metal with screws or nails, it should be separated on site. If the asbestos is glued to the sheet metal with adhesive, hardened compound or similar, it is recommended that both the sheet metal and asbestos are classified as asbestos waste. For the commonly occurring sealing compound at duct joints etc., taping over the sealing compound and then cutting out the section of sheet metal which is contaminated with asbestos is recommended.

Where only the asbestos is to be removed, for example the fire insulation around a steel construction, the asbestos must be mechanically removed and the construction sanded clean.

Where decontamination of asbestos entails risks of the detachment and spread of asbestos fibres, in addition to personal protective equipment, the work area must also be covered. The spread of fibres is prevented by underpressure ventilation using a fan with a particle filter. The demarcated area can be large or small, depending on which is most practical. Only authorised personnel must enter the work area and access is through an airlock.

If possible, the decontaminated asbestos should first be sucked out from the decontamination area into an airtight container outside the work area. The asbestos material is then packed into tightly sealed packaging. Asbestos waste may not be mixed with other waste. Packaging that contains asbestos should be clearly marked. Contact the waste contractor regarding how the material should be packaged.

For occupational health and safety rules including requirements for authorisation and notification regarding asbestos, see the Swedish Work Environment Authority's regulations (AFS 2006:01) on asbestos.

### 6.4.3 Lead

Lead is a toxic heavy metal which can accumulate in the body and cause chronic lead poisoning, which can cause anaemia and damage to the liver, kidneys and nervous system. Lead can also cause birth defects.

Metallic lead can be found, for example in joints on older drainage pipes. In some cases it is encountered as pipe material. Older gas lines and pipes to gas meters can also be made from lead. Lead is also contained in objects such as car batteries and cable sheathings.

Lead salts have occurred as stabilisers in some PVC building products. The European PVC

industry has voluntarily chosen to phase out use. A prohibition that also covers imported products is under way within the EU. The use of recycled PVC will be exempt. Plastic pipe manufacturers in the Nordic countries have not used lead salts since 2002. In 2000, the European PVC industry decided to phase out lead stabilisers on a voluntary basis by the end of 2015. The target is considered to be achieved.[30] The lead (normally 0.75% by weight) is not recyclable in the same way as metallic lead. Lead salts are on the candidate list.

Lead is also found as an additive to paint etc. A number of different lead compounds have been used as colour pigments and stabilisers. The different compounds have different hazardous properties, which are defined in the Swedish Waste Ordinance.

#### *6.4.3.1 Handling*

***Metallic lead***

Metallic lead is not hazardous waste according to Appendix 4 to the Swedish Waste Ordinance. Metallic lead is ideally sorted separately in order to be recycled. Lead caulking in drainage pipes can be deposited together with the pipe for metal recycling.

***Lead compounds – general***

In order to obtain knowledge about a material which is suspected to contain lead compounds, a chemical analysis must be carried out to determine the type of compound. Commonly occurring lead compounds in paints are lead phosphite and lead phosphate, both of which have a limit value of 0.3% by weight for classification as hazardous waste. Sampling and analysis are required if the paint layer containing lead is to be disturbed. See below.

***Lead glazing on ceramics***

Lead can be found as a glaze on white glazed tiles but also in other colour glazes. Tiles with glazes which contain lead should be used as aggregates at a controlled landfill site. The waste must be characterised before it can be sent to landfill.

***PVC with lead***

See Section 6.4.15 on plastic.

***Paint layers containing lead***

Note that if the paint layer containing lead is disturbed (e.g. sanding during rebuilding or renovation), the lead content is an occupational health and safety risk. If the paint contains more than 1% lead, the Swedish Work Environment Authority's regulations for working with lead should be followed during the works.
Prior to disturbing the paint layer on wood, the paint should be analysed so that any requirements for occupational health and safety measures can be clarified. Residues from sanding and blasting of paint containing lead are hazardous waste.

In the case of demolition (i.e. if the paint is not to be processed), sampling is not required.

Wood which has a paint layer containing lead should be sorted separately and incinerated in an incineration facility which has the authorisation to incinerate such waste.

30 https://www.stabilisers.eu/lead-replacement/

### 6.4.4 CFC (freon)

CFC (chlorofluorocarbons), HCFC (hydrochlorofluorocarbons) and halons break down the ozone layer which protects us against the sun's ultraviolet radiation. CFCs, HCFCs and halons are long lasting in the atmosphere. As a result of the ozone layer becoming thinner, the production of phytoplanktons has reduced. Skin cancer, eye cataracts and damage to the immune system in people have increased as a result of the ozone layer becoming thinner.

CFCs, HCFCs and halons are also extremely powerful greenhouse gases. Depending on the type of CFC, emissions of 1 tonne of CFCs can have a greenhouse effect corresponding to emissions of several thousand tonnes of carbon dioxide[31]. It is therefore important that material which is currently often landfilled and thus leaks CFCs should be handled in a more environmentally friendly manner. Ignorance regarding the handling of such materials is currently large and must be addressed.

CFCs are present as cooling media in refrigeration appliances and fixed cooling facilities and in PUR and XPS in buildings and land. The largest amounts are found in insulation.

New installation of CFCs as cooling media was prohibited in 1995. HCFCs were prohibited for new installation as cooling media in 1998.

CFCs were used as a blowing agent in PUR insulation from the early 1970s to the mid-1990s. CFCs in foam plastics (PUR and XPS) were prohibited (with certain exceptions) in 1991. PUR and XPS from 1991 and before should be assumed to contain CFCs until sampling has shown otherwise. HCFCs were only used during a short period and were prohibited in foam plastics in 1997.

Cellular plastic insulation with CFCs is found, for example, in refrigerators, cold room walls, insulation on district heating pipes, insulation in walls and floating floors, as flooring sheets etc.

Identifying insulation containing CFCs can be difficult. The structure of the cut surface can provide guidance. Small round balls in the cut surface mean that the material probably does not contain CFCs. If the structure in the cut surface is denser, the product may contain CFCs as a dense surface encloses CFCs to a greater extent.

EPS has often been blown with CFCs but as it has a more open structure than XPS/PUR the vast majority of the freons will have escaped during or immediately after manufacture. EPS therefore does not contain CFCs to a sufficiently large extent to be classified as hazardous waste.

In order to be certain of identifying CFCs, laboratory analysis is required. The material can be sent to some reception facilities for free checks. Always contact the recipient before the material is sent.

#### *6.4.4.1 Handling*

Waste with CFCs is hazardous waste (waste code 170603*) and should be separated from other waste, handled separately and transported by approved contractors.

***CFCs in cooling facilities***

CFCs in cooling facilities are emptied on site by cooling service companies with certified personnel. Rules can be found in the EU's F gas ordinance 517/2014 and the Ordinance (2016:1128) on fluorinated greenhouse gases. Smaller air handling units which can be handled whole can be deposited at an approved pretreatment facility.

***CFCs in insulation materials***

CFCs in insulation materials should be handled separately and carefully so that the material is not damaged. In this case, the CFCs will leak out.

Sheets that contain insulation material with CFCs should if possible not be split. The waste should be kept separate during transport but need not be packaged.

Composite materials such as sandwich elements should not be separated on site but the metal housing should be left in place. This should then be handled and divided in a controlled environment by the recipient.

Composite insulation with, for example, concrete poses particular problems and can require manual separation on site.

For larger sections of insulation material, it is appropriate to allow the recipient to carry out an assessment on site about how they should best be handled.

Materials that contain CFCs may not be placed in a normal fraction for combustion because normal waste combustion facilities have too low a temperature to destroy freons. Landfilling of CFCs should be avoided. CFCs leak out in landfill.

31 The Swedish Environmental Protection Agency's website, 20 January 2017

***Reception, handling and destruction***

There are several facilities in Sweden which can receive insulation with CFCs. Always contact the recipient before demolition and delivery. The recipient separates the CFCs from the insulation. Destruction then takes place through incineration in a facility which is authorised for this.

The Swedish Environmental Protection Agency has drawn up guidance and fact sheets as aids during identification, demolition, transport and destruction, and also on the issue of responsibility for handling CFC-containing materials during demolition.[32]

## 6.4.5Electrical waste

Electrical products can contain mercury, lead, cadmium, PCBs, oils, batteries, asbestos, brominated flame retardants etc.

Electrical waste is electrical and electronic products that have become waste. Depending on whether or not the product is covered by producer responsibility, it is handled in different ways. Producer responsibility domestic electrical waste and other electrical waste.

According to Section 8 of the Swedish Waste Ordinance, electrical and electronic products are:

1. products which in their design and for correct function are dependent upon electrical current or electromagnetic fields
2. equipment for the generation, transmission and measurement of electrical currents or electromagnetic fields, or
3. material included in or which has been included in such products or equipment as are referred to in 1 and 2.

Composite products that primarily use energy other than electricity are not included in the category of electrical and electronic products. However, electric components in a composite product are included in the category. Material in composite products used for cooling, heating or protection of components can be counted as electrical and electronic products.

Accessories for, or consumables used in, electrical and electronic products are not included in the product category if they have not had an electronic or electrical function.

32 http://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Avfall/Bygg--och-rivningsavfall/CFC- haltigt-byggisolermaterial/#rivning

***Electrical waste that completely lacks producer responsibility:***

- Electrical and electronic products which are intended to be used with an electrical voltage of more than 1000 V AC or 1500 V DC
- Products that:
    - Are included or manufactured and sold only to be included as part of an electrical product which is not covered, or
    - Have a link with the protection of security interests in an EU country. For example weapons, ammunition or munitions, if they are manufactured for a military purpose,
- Medical devices which are implanted or expected to become infected
- Large-scale, stationary industrial tools
- Large-scale, fixed installations

***Electrical waste with producer responsibility***

- Electrical and electronic products which are intended to be used with an electrical voltage of less than 1000 V AC or 1500 V DC and which fall into one of the following categories:
    1. Temperature control equipment
    2. Display monitors
    3. Lamps
    4. Large electrical equipment
        a) the external dimensions of the equipment are such that they exceed 50 cm in length, width or depth, and
        b) The equipment is not covered by categories 1 or 3,
    5. Small electrical equipment
        a) the external dimensions of the equipment are such that they do not exceed 50 cm in either length, width or depth, and
        b) the equipment is not covered by categories 1, 2, 3 or 6
    6. Small IT and telecommunications equipment

For electrical waste where producer responsibility applies, only domestic electrical waste is covered by a collection system. Domestic electrical waste means electrical equipment that is normally used in a private household and which has become waste.

Incandescent light bulbs and luminaires in households are covered by the Ordinance (2000:208) on producer responsibility for light bulbs and certain luminaires.

#### *6.4.5.1 Non-electrical waste*

Examples of products which are not classified as electrical waste according to the definition in 6.4.5 are compressed air tanks and heat exchangers.

#### *6.4.5.2 Sorting guide for domestic electrical waste with producer responsibility*

- Fluorescent tubes (whole and without packaging)

  - Straight fluorescent tubes 60 cm and longer
- Light sources (all light sources, regardless of chemical composition can be placed in the same box)
  - incandescent light bulbs (whole and without packaging)
    small bulbs (low-voltage halogen, vehicle bulbs, bulbs for Christmas decorations, signal bulbs including glow lamps, cycle and torch bulbs)
  - low-energy bulbs (whole and without packaging)
    curved fluorescent tubes
    compact
    fluorescent tubes
    under 60 cm
    low-energy bulbs
    discharge lamps
    high pressure sodium lamps (discharge type)
    mercury vapour lamps (discharge type)
- White goods such as
  - dishwashers (floor or tabletop)
  - mangles
  - mini kitchens ("Trinett" or equivalent, exc. cooler unit)
  - cookers (floor, tabletop, separate ovens and hobs)
  - oven fans
  - drying cabinets
  - tumble dryers
  - washing machines
- Refrigerators and freezers
  - ice boxes
  - refrigerators
- Small and medium appliances (electrical products only) such as
  - home electronics products
  - household appliances
  - toys
  - furniture
  - tools
- Screen products (includes both TVs and monitors)
- Portable batteries

#### *6.4.5.3 All electrical waste should be pretreated*

Electrical waste should be considered to be hazardous waste until otherwise demonstrated. See also Appendix 1, List of hazardous waste. It must be submitted to an approved recipient of hazardous waste, an approved collection system or to a facility that fulfils the Swedish Environmental Protection Agency's regulations (NFS 2005:10) regarding professional pretreatment of waste consisting of electrical or electronic products.

Normal installation and connection cables without hazardous substances are an exception and are not classified as hazardous waste but should be sent as electrical waste to an approved cable granulator or to a scrap metal company which is permitted to handle electrical waste.

#### *6.4.5.4 Handling in the workplace*

Electrical waste should be sorted out and handled separately from other waste. Normally the entire electrical product (as in the list above) should be sent for pretreatment. In certain cases individual parts can be removed (e.g. it should be possible to remove the motor and fan, which become electrical waste, from a fan drum).

Electrical waste should be handled carefully so that the products can be dismantled and no environmentally hazardous substances leak out. In certain cases there are risks that components containing mercury can break while being handled. In such cases, the entire mercury-containing component should be dismantled on site and disposed of separately.

Electrical waste should be placed at the appointed location at the collection point depending on the fraction concerned. Electrical waste is placed in a cage, container or box. White goods such as refrigerators and freezers are handled as separate items. Light sources should be handled separately.

### 6.4.6 Plaster

Plaster waste should be handled separately and sorted at the source as plasterboards can easily crumble and therefore become more difficult to sort from mixed waste.

To prevent the occurrence of hydrogen sulphide in a landfill, special provisions state that plaster must be landfilled separately from waste with organic content. Hydrogen sulphide is extremely flammable and toxic when inhaled. The odour can also lead to inconvenience near the landfill site, and disrupt technical equipment for leachate management and landfill gas.[33]

### 6.4.7 Concrete

#### *6.4.7.1 Handling*

If concrete with suspected contamination is encountered, investigation should be carried out to establish the type of contamination and its extent. Sampling of suspected concrete should take place during the material inventory to avoid high costs as late sampling can bring the entire demolition process to a halt.

The waste owner must investigate whether, for example, recycling for construction purposes is an alternative. Notifications or applications for permits are required if the contamination risk is low or more than low. The alternative to material recovery is landfill. Contact the reception facility in good time to find out which characterisation and sampling is required.

Fibre reinforced concrete may need to be separated/sorted from other concrete as it can create problems during crushing.

#### *6.4.7.2 Types of contaminants in concrete*

***Oil***

If the contaminant can be visually determined to consist of oil from oil tanks, oil boilers, leaking machinery/installations or similar, analysis should be carried out regarding PCB content if the building was erected before 1980. PAH analysis is always recommended.

***Tar products***

If the concrete surface consists of a black coating, for example a wear surface on a floor, a PAH analysis is recommended.

***Epoxy, paint and Acrydur flooring***

The surface of hardened epoxy or paint does not normally need decontamination. Note, however, that occupational health and safety problems can arise if the surface layer of epoxy is disturbed.

PCBs have been encountered in paint but are unusual and most often at low levels according to known figures (often less than 50 mg/kg, but in some cases a couple of percent). If painted concrete is present in large volumes and the building was erected between 1956 and 1973, analysis for PCBs is recommended.

Commercial kitchens, laundry rooms, certain workshops etc. sometimes contain flooring of Acrydur type which can contain PCBs. PCBs have then also been sprayed into the underlying concrete. Analysis of the flooring should be carried out of the floor can have been laid between 1956 and 1973.

***Concrete with joint compound***

If joint compound was installed between 1956 and 1973, the concrete adjacent to the joint compound should be analysed before demolition, even if the actual PCB compound has previously been removed. See Section 6.4.12.

33 http://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Avfall/Deponering-av-avfall-/Hantering-av- gips-pa-deponier/

***Miscellaneous***

Depending on previous and ongoing activities within the building, a large quantity of contaminants can be found on and have penetrated into the concrete. Examples of such contaminants are arsenic, chromium and mercury. See, for example, the Swedish Environmental Protection Agency's report 4918 for examples of contaminants for different types of activities. In addition to these types of contaminants, there may also be other substances which can affect occupational health and safety, such as mould, decomposition products from adhesives and levelling compounds containing casein.

#### *6.4.7.3 Investigation, delimitation and handling*

In order to identify the type and spread of a contaminant, laboratory analyses are required. If the contaminant is an oil, delimitation can be carried out by means of laboratory analysis of aromatics and aliphatics (however, note that oil can contain PAHs and/or PCBs which can be governing factors).

Core drilling is recommended with a core at least 5 cm deep being removed and sent for laboratory analysis. It is then appropriate to divide the core into layers, for example 0-1 cm, 1-3 cm and "deeper than 3 cm", in order to facilitate delimitation of contamination in terms of depth. If the coating of the flooring material is suspected to contain PCBs, samples are

taken for separate analysis of this surface coating and samples of the underlying material as drill cores.

If the contamination can with great probability be assumed to be limited to the concrete surface, a scrape sample can be taken which will then represent the upper 3 mm. After this a core sample is taken where the surface has been scraped away if it is not obvious that the contamination is limited to the surface. In order to obtain knowledge of the horizontal extent of the contamination, more than one sample should be taken for analysis.

If the concrete may be contaminated by joint compound containing PCBs, drill cores are taken at different distances from the joint edge, e.g. 1 cm, 2 cm and 5 cm. Concrete with a PCB content of 50 mg/kg or more is hazardous waste. In order to be able to reuse concrete as crushed material, approximately 3 cm of the concrete edge should be removed if the joint compound contains or has contained approximately 10% PCBs.

Concrete with high levels of contamination often requires special landfilling and can also be an occupational health and safety risk. Where necessary consult an expert regarding decontamination and the local environmental authority regarding decontamination and final disposal.

#### *6.4.7.4 Hexavalent chromium in concrete*

Hexavalent chromium can affect the skin and airways and cause problems such as eczema, ulceration and nasal irritation.[34] Chromium can be found as a natural contaminant in cement, as a result of the chromium content in the lime used during production. This chromium contamination is oxidised into hexavalent chromium in the cement oven. Since the 1980s, iron(II) sulphate is therefore added during manufacture of cement products to reduce the chromium to less toxic trivalent chromium.[35] The Swedish Demolition Association states that it does not see any health problems related to the occurrence of hexavalent chromium when handling concrete during demolition.

The Swedish Environmental Protection Agency's general guidelines for contaminated ground state the target values for hexavalent chromium as 2 mg/kg DS for sensitive land use and 10 mg/kg DS for very sensitive land use.[36]

Handling of concrete containing hexavalent chromium varies between different recipients and across the country. The state of knowledge on the environmental impact is unclear. Some regard concrete as inert, while others require sampling of hexavalent chromium. Contact the reception facility in good time for information about the requirements it sets.

#### *6.4.7.5 Blue concrete*

Blue autoclaved aerated concrete (blue concrete) gives off more radon than other building materials. Blue concrete is a building material containing alum shale which was manufactured between 1929 and 1975. There are different types of blue concrete which have been manufactured at different places in the country. Blue concrete has increased levels of radium, which vary between the different types of blue concrete. There is also a risk that blue concrete contains increased levels of heavy metals such as arsenic, cadmium, molybdenum and vanadium.

Blue concrete must not be reused for new buildings. The waste owner must investigate whether, for example, recycling for construction purposes is an alternative. Notifications or applications for permits are required if the contamination risk is low or more than low.

### 6.4.8 Cadmium

Cadmium is a toxic heavy metal used in applications such as nickel-cadmium batteries and in plastics and glazes for ceramic materials. Cadmium is toxic and bioaccumulative, which means that it is stored in the human body, primarily in the liver and kidneys. A number of different cadmium contaminants are used in building materials.

Cadmium was used a great deal in the 1960s and 1970s, primarily as a stabiliser or colour pigment in plastic materials. Cadmium was also used for surface treatment of building fittings and sheet metal, and as an alloying material. The use of cadmium as an additive to plastic and for surface treatment was prohibited in Sweden in 1982.

For example, plastics in light shades of yellow, orange or red are often based on cadmium pigments, particularly in products manufactured before 1982. Products imported after 1982 can also contain cadmium. Cadmium can occur both in metallic form and as salts. The different forms have different hazardous properties, which are defined in the Swedish Waste Ordinance.

In order to obtain knowledge about a material which is suspected to contain cadmium, a chemical analysis must be carried out. To determine whether or not a material is hazardous waste, each cadmium compound included must be quantified. The limit value for a material containing cadmium to be classified as hazardous waste varies from 0.01 to 25% by weight, depending on the form in which the cadmium is present in the waste.

34 Naturvårdsverket, https://utslappisiffror.naturvardsverket.se/Amnen/Tungmataller/Krom/

35 Arbets- och miljömedicin Uppsala, http://www.ammuppsala.se/krom

36 https://www.naturvardsverket.se/upload/stod-i-miljoarbetet/vagledning/fororenade-omraden/berakning- riktvarden/generella-riktvarden-20160707.pdf

#### *6.4.8.1 Batteries*

Intruder alarms, fire alarms and emergency lighting can all be equipped with battery backups powered by NiCd batteries. Check before demolition that any batteries in emergency lighting luminaires or which provide backups for alarm systems have been removed.

#### *6.4.8.2 Ceramic materials*

If tiles and similar materials are yellow, orange or red it should be suspected that they contain cadmium. Cadmium has also been encountered in glazed roof tiles. Suspected cadmium-containing tiles should be carefully dismantled so that they are not unnecessarily crushed.

If there is a reason to suspect that the waste exceeds the limit values set in sections 22 or 23 of the Swedish Environmental Protection Agency's regulations (NFS 2004:10) on landfilling of waste, samples should be taken. See also Appendix 18, Waste rules, regarding the characterisation of waste.

#### *6.4.8.3 Cadmium in plastics*

Cadmium can be present in plastic profiles, plastic pipes and plastic interior design fittings (for example laminates). Floor coverings of PVC in light shades of yellow, orange or red can contain cadmium, as can electric cables in yellow, orange or red shades. Cadmium was prohibited as an additive to plastic in Sweden in 1982.

The Nordic Plastic Pipe Association states that it rarely encounters pipes containing cadmium. However, plastic roofing used in areas such as patios, and which are brown in

colour, contain cadmium.

Plastic which is contaminated with hazardous substances is classified as hazardous waste. Samples should therefore be taken for laboratory analysis if you are uncertain about whether the waste contains cadmium. In other cases, it should be handled as hazardous waste.

According to REACH it is permitted to reuse PVC containing cadmium for certain building products. The requirement is that the concentration of cadmium must not exceed 1000 ppm. [37]

[37] EU Commission Ordinance (EU) no. 494/2011 dated 20 May 2011

### 6.4.9 Mercury

Mercury is a heavy metal that accumulates in the human body and can cause damage including to the central nervous system and kidneys. It can also result in birth defects and allergies. Metallic (liquid) mercury evaporates at room temperature.

In technical goods and products, mercury has above all been used in control equipment, measurement instruments and contacts for continuous current transmission. Sales of electrical components and measurement instruments with mercury have been prohibited since 1 January 1993.

Two types of mercury are encountered in older technical products; electrical and mechanical.

In older electrical products, mercury occurs visibly in glass ampoules. When the glass ampoule changes position, the mercury in the ampoule moves and can make or break an electrical contact. Typical use areas are level switches and position sensors.

Mercury's mechanical characteristics, for example its volume changes at different temperatures, have been exploited in mechanical products. Typical products are thermometers and long-distance thermometers with capillary tubes.

The table below shows examples of older products with electrical and mechanical functions which can contain mercury. New installation of such products occurred into the 1990s.

| **Product** | **Electrical function** | **Mechanical** |
|---|---|---|
| Thermometer, glass | | 4-11 g |
| Thermometer, dial | | 2-10 g |
| Thermostat | 5-20 g | |
| Pressure switches | 5-20 g | |
| Differential pressure meters | | 30-60 g |
| Oil quantity meters | | 30-60 g |
| Level switches | 5-11 g | |
| Level sensors (for example in | 5-20 g | |

| | | |
|---|---|---|
| Flow meters (in water/sanitation plants, | | up to 5300 g |
| Manometers | | 30-300 g |
| Relays | 2-80 g | |

**Table 1. Examples of older products which can contain mercury.**

Mercury can also be present in drainage pipes and water traps in schools, laboratories, hospitals and industrial premises. Through normal handling, accidents and carelessness this mercury has entered the drainage system over time (laboratory work with mercury was once common in schools).

Amalgam contains 50% mercury. Amalgam can remain in drainage pipes where there is or has been a dentist's practice. Check water traps, drains and low points. Amalgam can be found as a coating on the inner walls of pipes, particularly on the lower part of the pipe (the water path).

See also the Swedish Environmental Protection Agency's report 5279, “Find mercury in technical items and products” (Hitta kvicksilver i tekniska varor och produkter).

#### *6.4.9.1 Handling*

Products with mercury should be handled carefully so that they do not break.

Decontamination of mercury in drainage pipes etc. should be carried out by authorised companies. The extent, type of pipe and condition determine the choice of decontamination method. It is important, for example during dismantling of pipes, to dismantle them carefully, wrap both ends in plastic and place them in resealable, airtight containers for removal. Decontamination of mercury should be reported to the regulatory authority.

For mercury in electrical and electronic products, see Section 6.4.5, Electrical waste.

### 6.4.10 PAHs

Contamination by polycyclic aromatic hydrocarbons, PAHs, occurs during incomplete combustion and is found above all in the bases of chimneys, flue ducts and in older products with asphalt and tar (coal tar).

Tar products (tar, coke and bitumen) containing PAHs can be found as a waterproofing layer on foundations and bathroom walls (waterproofing), in tar paper (impregnation and surface treatment), in older cold rooms insulated with bitumen impregnated cork etc. Cast iron pipes for wastewater can be treated both internally and externally with asphalt. Coal tar also occurs in older earth cables. PAHs also occur in creosote-impregnated wood. Products containing recycled car tyres, such as some fall protection beneath playground equipment, can also contain PAHs.

There are a number of different PAH contaminants which have different hazardous properties and which are defined in the Swedish Waste Ordinance. Several of the PAH contaminants are strongly carcinogenic.

#### *6.4.10.1 Handling*

If it is suspected that a material contains PAHs, it must be analysed with regard to the

occurrence of PAHs in order to be classified. It can be difficult to take samples for analysis of painted tar products. However, sometimes the layer is thick which also facilitates disposal.

### 6.4.11 Asphalt

Until 1973, tar was used for road surfacing. Road tar produced from coal tar contains PAHs. Identification in the field can be carried out by spraying it with white solvent-based paint and illuminating it with a UV lamp. If tar is present in the sample it will appear yellow green in the UV light. Asphalt samples with bitumen display a blue colour. If you require a more detailed analysis, the sample should be analysed in a laboratory. There is also a spray that functions in a similar manner but without requiring a UV lamp.

#### *6.4.11.1 Handling*

The cities of Stockholm and Gothenburg have joint guidelines for handling asphalt containing PAHs. See the table below. The guidelines refer only to the use of waste in road constructions.
The Swedish Transport Administration also has guidelines for how such soils should be handled. The table shows these guidelines together with the Swedish Environmental Protection Agency's guidance on how such waste should be classified.

| | **Swedish Environmental Protection** | **Swedish Transport Administration guidelines** | **Stockholm and Gothenburg guidelines** |
|---|---|---|---|
| > 1000 mg PAH16/ kg asphalt | Should be classified as hazardous waste | Specific assessment should be carried out of how the soils should be handled. | Hazardous waste, waste code 17 03 01* |
| 300-1000 mg PAH16/ kg asphalt | Should be classified as hazardous waste | As soils with 70-300 mg/kg supplemented with the points below:<br>• Intermediate storage is only carried out if the soils cannot be used directly. The storage should be time-limited.<br>• Stored soils should be covered to avoid the formation of leachate.<br>• Storage of uncovered soils should take place on a watertight surface and be combined with arrangements to dispose of any leachate.<br>• Storage may not be carried out on sensitive land, e.g. water protection areas.<br>• Reuse is not carried out within sensitive land areas. | Can be reused in road constructions as bound or unbound road base/reinforcement layers below new watertight surface courses, although not within water protection areas and always following consultation with the environmental authority, waste code 17 03 02. |
| 70-300 mg PAH16/kg asphalt | In normal cases may be classified as non-hazardous waste | • The soils should primarily be reused within the object.<br>• The soils are used as bound or unbound road base.<br>• Cold or semi-hot recycling methods are used.<br>• The road base is covered with a watertight surface course.<br>• The soils can be utilised, for example in noise barriers, provided that they are covered by plastic membrane or another water-resistant protective layer.<br>• The soils should be laid above groundwater level.<br>• Personnel who handle the soils should be informed. | Can be reused in road constructions as bound or unbound road base/reinforcement layers below new watertight surface courses, waste code 17 03 02. |

| | | | |
|---|---|---|---|
| < 70 mg PAH16/kg asphalt | In normal cases may be classified as non-hazardous waste | In the case of levels of < 70 mg/kg PAH16, the soils are regarded as free of coal tar and can be freely reused, i.e. both as surface course and road base. | Can be reused, waste code 17 03 02. |

**Table 2. Guidance on classification of asphalt together with guidelines for recycling of asphalt in road constructions**

### 6.4.12 PCBs

PCBs are a group of persistent organic compounds that were found in the environment in the mid-1960s (Sören Jensen, 1966). The fact that the substances are persistent – stable – means that they accumulate in the food chain when they enter the environment. PCB compounds have a number of different harmful effects on animals and people.

PCBs were used in Sweden in applications such as the large-scale housing developments of the 1960s (the Million Programme), in which PCBs were added as softeners to the joint compounds used to seal and absorb movements in façades, for example involving concrete elements.

Other than in joint compounds, PCBs in buildings have been used in flooring materials (Acrydur), insulated window panes and condensers.

PCBs can remain in joint and flooring materials from 1956-1973. Regarding condensers with PCBs, equipment installed until 1980 should be checked. The manufacture of insulated window panes stopped in Sweden in 1973, but insulated window panes were imported until 1980. PCB use in open systems (joint compounds, flooring materials) was prohibited from 1 January 1973. It is possible that materials containing PCBs remaining in storage can also have been used later. For this reason, checks should also include joint compounds and flooring materials that were installed during 1973.

### 6.4.13 Inventory and decontamination

It is important to carry out an inventory to see if PCB decontamination of a building is required. The inventory consultant should have good knowledge of PCBs and the environmental and health impacts, together with how to carry out sampling. The PCB level in a sample is determined with chemical analysis and should be carried out by an accredited laboratory.

PCBs in joint compounds and flooring materials are inventoried through sampling and laboratory analysis. Insulated window panes and condensers can in certain cases be identified through marking. Otherwise it should be assumed that they contain PCBs if they are from the relevant period.

Three weeks before decontamination of PCBs will be carried out, notification should be sent to the relevant regulatory authority. The majority of municipalities have created notification forms for this purpose. It is important to engage a serious company for PCB decontamination. Decontamination of joint compounds and flooring materials requires decontamination companies with special training and knowledge. Special requirements are set in terms of environmental protection and occupational health and safety. The municipality can give references for decontamination companies.

PCB-containing materials from a building shall be collected carefully and both ground cover and tight sealing against the building are required. Mandatory rules can be read in Section 18 of the PCB Ordinance.

Floor and joint compounds with PCBs in excess of 500 mg/kg (0.05% by weight) must have been removed both internally and externally by 30 June 2016. It is considered that the majority has been removed, but that a great deal still remains. This a result of significant hidden statistics, properties not being identified when the register of affected properties were drawn up and of floor and joint compounds containing PCBs being missed during the inventory process.

Sampling and decontamination of joint compounds containing PCBs is described in more detail at www.sanerapcb.nu. Industry recommendations for decontamination are available in "Industry recommendations for actions to take during the decontamination of PCB-containing joint compounds" (Branschrekommendation för åtgärder vid sanering av PCB-haltiga fogmassor). See Section 7.

### 6.4.14 Chlorinated paraffins

Chlorinated paraffins are toxic substances that can be found in a number of building products, including joint compounds, PVC flooring, pipe insulation (e.g. in Armaflex products) and in sealing compounds in insulated window panes. It is above all the short-chain chlorinated paraffins (SCCPs) which are toxic and against which protection is required. Short-chain chlorinated paraffins have properties that can lead to serious and lasting effect on human health and the environment. These produce contamination which is persistent and can accumulate in the environment, is very toxic to aquatic organisms and can produce harmful long-term effects in the aquatic environment. They can also be carcinogenic.

If joint compounds with chlorinated paraffins contain more than 2500 mg/kg (0.25%) SCCP/MCCP), they must be treated as hazardous waste. If the levels of short-chain chlorinated paraffins (SCCPs) are in excess of 10,000 mg/kg (1%), the waste must also be handled according to the POP ordinance's requirements for destruction or irreversible transformation. In practice this can mean combustion of the waste in facilities with permits for this.

Products that contain a concentration lower than 1% by weight of SCCPs may be produced, released on the market and used. There are also exceptions and it is still permitted to use and release goods onto the market if they were manufactured or were in use no later than 10 July 2012.

SCCPs were included in the candidate list and prohibited in goods according to the EU's 2013 POP ordinance. Within the EU, they are primarily used in rubber conveyor belts in the mining industry and in sealing agents for ponds.

### 6.4.15 Plastic

Plastic is a material family that consists of polymers combined with additives. Plastics are divided into thermoplastics and thermosetting plastics. Thermoplastics include volume plastic such as PE, PP, PVC and PS, together with construction plastics. It is primarily volume plastics that occur within the construction sector.

Additives are used to give the plastic the desired characteristics, for example particular rigidity, resistance or fire tolerance. Examples of additives are stabilisers, plasticisers and flame retardants. Some older additives are today considered to be hazardous or particularly hazardous and their use has been limited. This relates in particular to brominated flame retardants, chlorinated paraffins, some phthalate plasticisers and stabilisers based on lead and cadmium. See for example sections 6.4.3 and 6.4.8.

Plastic can be both hazardous and non-hazardous waste. A large proportion of older plastic from demolition can today be considered as hazardous waste.

Certain new plastic is produced today with such high levels of hazardous substances that it becomes hazardous waste. (The substances that may be used during new production within the EU are controlled by authorisation procedures according to the REACH legislation and affected by the application of the product to be manufactured. For example, particularly high

requirements apply to food packaging and toys.) We should not reasonably advise against sending newly manufactured plastic containing hazardous substances for material recovery. In other words, it can still be appropriate to send plastic which is hazardous waste for material recovery.

Some information on hazardous additives in plastic can be found below.[38]

[38] Sources are KEMI, the Swedish Flooring Trade Association's fact sheet GBR Fakta 2015, IKEM, IVL report B2031, the City of Stockholm's waste fact sheet 9 (May 2007) and oral references from experienced inventory consultants.

- No time limit can be set for lead content in PVC. Plastic pipes and cables with lead stabilisers still occur, but not in Swedish products. The industry has phased out lead stabilisers on a voluntary basis. On the Swedish market these have been uncommon since the early 2000s. On the European market, the objective for phasing out was considered to have been achieved in 2015.[39]
- Lead additives in PVC matting can be found until the mid-1970s.
- Plasticisers can be harmful/toxic to reproduction and are suspected to be endocrine disruptors. Special attention should be paid to softened plastics produced before 2000 and plastics produced outside the EU. Some plasticisers which were previously common (DEHP, DBP, BBP) are today classified as toxic to reproduction and are included on the candidate list as endocrine disruptors. Since 2015, authorisation has been required to use these within the EU.
- Chlorinated paraffins have previously been used as plasticisers and flame retardants.
- Brominated flame retardants bioaccumulate and are persistent.
- Stiff PVC need not be flame-proofed.
- Soft PVC contains large quantities of plasticisers. Soft PVC has not been flame-proofed with brominated flame retardants. Substances such as titanium dioxide have been used.
- Plastic in electrical waste can contain brominated flame retardants such as TBBPA and PBDE.
- Flooring (textile and polyolefin) and panels can contain brominated flame retardants such as PBDE and HBCD.
- Brominated flame retardants can be found in insulation panels of:
    - Extruded polystyrene (XPS). Common types are Styrofoam (light blue), Ecoprim (pink) and Jackofoam (purple). Finnfoam sheets are white and those from German BASF are green. Light blue, pink and purple sheets manufactured after 1999 do not contain brominated flame retardants. XPS sheets are used under railways, roads and in ground as a moisture barrier and frost protection and are manufactured by companies including Dow Chemicals and Nordic Foam.
    - Expanded polystyrene (EPS). This is white and the flame retardant sheets have been used for purposes such as façade insulation in rendered façades.
    - Polyurethane plastic (PUR), which is generally yellow.
- Plastic ventilation products such as fans, pipes, chillers, heat pumps etc. can contain the flame retardant PBDE.
- Armaflex probably contains brominated flame retardants, at least until the 1990s. Can also contain chlorinated paraffins.
- Safety flooring can contain chlorinated paraffins, at least until the 1990s. Between 1994 and 2010, use reduced by about 80%.

#### *6.4.15.1 Polyolefins*

Polyethylene (PE) and polypropylene (PP) belong to the *polyolefin* group.

Polyolefins contain different additives, including those to increase strength and resistance. There are around 50 different additives. Carbon black is often used in PE as an additive to protect the material against UV radiation. PE pipes are normally black. Polyethylene is also available in a fourth form, cross-linked polyethylene (PEX).

Polyolefins are more flammable than, for example, PVC. It should therefore be noted that certain products, although not in pipes manufactured in Sweden, can contain flame retardant additives. This also applies to plastic fans and ventilation ducts in plastic.

Objects made from PE and PP (although not pipes) where flame retardant additives are suspected shall be handled as hazardous waste.

39 https://www.stabilisers.eu/lead-replacement/

#### *6.4.15.2 Elastomers*

Like plastics, elastomers consist of polymers and additives. Styrene-butadiene rubber (SBR), ethylene propylene diene monomer (EPDM), nitrile rubber (NBR) and fluoro rubber (FPM) occur in HVAC and sanitation products.

The most common materials for rubber seals in pipes are SPR or EPDM.

Rubber seals on concrete pipes and MA pipes are separately removed and deposited as waste. Other rubber seals are handled in the same way as the pipes.

#### *6.4.15.3 PVC*

PVC is different from the other volume plastics in that it contains chlorine (57% of the polymer's molecular weight). PVC is the most widely used plastic within the construction sector. It is also a plastic which is extremely suitable for recycling. The material is stable and can be melted down several times while retaining its essential properties.

In Europe, the recycling of PVC has increased by more than 500% in 10 years as a result of the PVC industry's voluntary commitments. The most widely recycled PVC products are window profiles, cabling, flooring, roofing membranes, coated fabrics, pipes and pipe connectors. For more information, see www.vinylplus.eu. In Sweden, floor waste is taken back by the Swedish Flooring Trade Association, and there is some collection of plastic pipes. See below.

PVC contains additives that can have hazardous properties. See the introduction to the chapter applying to plastic in general. PVC waste is not by definition classified as hazardous waste, but PVC waste that contains lead, cadmium, brominated flame retardants, chlorinated paraffins or phthalates toxic to reproduction over certain levels should be considered as hazardous waste unless otherwise proven. Even newer PVC plastic can contain plasticisers which mean that it can be classified as hazardous waste.

Here is an example to describe the problem. DEHP (CAS No. 117-81-7) is a plasticiser used in many different plastic products, including in flooring. This was used until the 2000s in Swedish products and is still used in international products. DEHP is classified as Repr. 1B (toxic to reproduction) according to Appendix 1 of Directive 67/548/EEC. According to Ordinance 1357/2014 (which describes how to assess whether waste is hazardous waste), this means, for example, that PVC flooring containing more than 0.3% of DEHP is hazardous waste according to HP10. All floors where this plasticiser have been used contain more than this level. In other words, flooring containing DEHP is hazardous waste. This

conclusion has also been made in other reports.[40]

The use of DEHP is limited in toys and childcare articles but is still used in some products. Since 2015, authorisation is required to manufacture or introduce the plasticiser DEHP on the EU market. The requirement for authorisation also applies to material recovery. In September 2014, the ECHA supported three recycling companies being approved to formulate recycled soft PVC containing DEHP. This proposed approval is time-limited (four years for use of DEHP in PVC applications and seven years for recycling of PVC articles containing DEHP) and company specific. Because new production occurs, it is also reasonable that material recovery may occur.

[40] Particularly hazardous substances, waste and material recovery, An overall view of the current situation in Sweden, WSP 2016

### *Handling*

*PVC pipes*

The Nordic Plastic Pipe Association (NPG) has a recycling system that includes pipes and parts of pipes in PVC, PE and PP plastics if they were manufactured by the NPG's members. This system takes back both pipe waste arising during new construction and old pipes removed during rebuilding.

*PVC flooring*

The floor manufacturer Tarkett takes back its end-of-life floors if they are loose laid and installed in 1993 or later. The recycling system includes both homogeneous and heterogeneous PVC and polyolefin flooring.

*PVC cabling*

In Sweden there is one facility[41] that separates plastics and metals during cable recycling. This makes it possible both to recover more copper and to recycle large amounts of plastic material. The technology is called Plastsep and involves the use of a water bath and vibrating separation table to obtain better separation of metals, PVC and polyethylene plastic. The PVC plastic can then be used in products such as road cones and garden hoses. For more information, see www.stenametall.com.

*Incineration*

Other than the above industry initiative, there is no general material recovery facility for PVC in Sweden today. Transport of PVC from demolition for material recovery on the continent is essentially not carried out. Until better material recovery alternatives are established, plastic not covered by the initiative above should be sent for incineration with energy recovery.

Nor do we want plastic containing substances which are now prohibited or where there is no authorisation for material recovery (regulated according to EU legislation) to re-enter the ecocycle. This plastic should be incinerated (with energy recovery) in such a manner that the hazardous substances are completely destroyed.

Whether or not waste incineration facilities may incinerate different types of hazardous waste depends on how the authorisation is drawn up.

However, Section 32 of the ordinance (2013:253) on the incineration of waste contains a requirement that the flue gases must have a temperature of at least 1100°C for at least two

seconds if the waste contains more than 1% organic halogen contaminants expressed as chlorine. In practice, the requirement for sorting the PVC which is hazardous waste into a separate fraction means that at least hazardous PVC waste should be sent to an incinerator where the temperature in the flue gases exceeds 1100°C for at least two seconds[42].

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41 Stena Metall in Timrå

42 There is no data for determining whether certain persistent substances are completely destroyed in a waste incinerator where the temperature in the flue gases exceeds 850°C for at least two seconds. There is data that shows they are completely destroyed in a waste incinerator where the temperature in the flue gases exceeds 1100°C for at least two seconds. (General technical guidelines on the environmentally sound management of wastes of wastes consisting of, containing or contaminated with persistent organic pollutants, Table 4: Overview of technologies for the destruction and irreversible transformation of POPs in wastes, http://www.basel.int/Implementation/POPsWastes/TechnicalGuidelines/tabid/5052/Default.aspx)

Always consult with the waste contractor about how PVC should be sorted.

*Landfilling*

Landfilling of organic material is not permitted. An exemption from the County Administrative Board can be granted under certain conditions. Landfilling of PVC should therefore be the final alternative if material recovery or energy recovery is not possible. There is a risk of spreading dioxins from fires in landfill sites. Leaching problems[43] also contribute to it being necessary to avoid landfilling PVC.

If PVC is to be sent to landfill, the material should be characterised by the waste producer and an analysis must be carried out if the landfill owner requires this. Exemption is also required from the landfill prohibition.

## 6.4.16 Preservative-treated timber

Chemical wood preservatives protect the timber by means of their toxic effects but often also have negative effects on the environment. CCA consists of copper, chromium and arsenic. Each of these substances can have effects on the surrounding environment. CCA contains substances that can cause cancer, reproductive disorders, chemical burns and allergies. Timber treated with CCA is often green when it is damp. Substances that leak out from the timber during use and from discarded material cannot be broken down in the environment.

It is entirely prohibited to sell timber treated with impregnated agents containing arsenic compounds (CCA agents) within the EU.

For timber impregnated with newer copper-based impregnating agents, IVL has carried out an extensive investigation and determined that this is not generally hazardous waste. In order to classify the waste as non-hazardous, you must be able to demonstrate which impregnating agent was used.[44]

### *6.4.16.1 Handling*

Handle all preservative-treated timber according to the precautionary principle as hazardous waste unless otherwise proven, and send it to an incineration facility which has the authorisation to incinerate such material. Breathing and eye protection should be used when working with preservative-treated timber.

## 6.4.17 Creosote-impregnated timber

Creosote, an oily, brown, thick liquid, is produced by distillation of wood and coal tar and contains a large number of polycyclic aromatic hydrocarbons, PAHs, some of which are classified as carcinogenic.

Creosote is a skin irritant and can lead to troublesome skin reactions when combined with sunlight. The substance bioaccumulates and is very toxic to animals and plants. Creosote-impregnated timber is often dark brown or beige and has a characteristic odour.

Creosote may only be used on telephone poles and railway sleepers, and only by professionals with specialist training. However, it can occur in older building components.

Creosote-impregnated timber may not be used in buildings, toys, playgrounds, parks and gardens or in facilities for leisure activities where there is a risk of repeated skin contact, containers for plant cultivation etc.

43 http://ec.europa.eu/environment/waste/pvc/

44 Impregnated timber in the ecocycle – recommendations for residual product handling (Impregnerat trä i kretsloppet – rekommendationer för restprodukthantering), IVL report B1827 (2009)

#### *6.4.17.1 Handling*

Creosote-impregnated timber is hazardous waste. The incineration of creosote-treated timber can lead to emissions of environmentally hazardous substances. Creosote-treated timber should therefore be incinerated in an incineration facility which has the authorisation to incinerate such material.

### 6.4.18 Dry rot and pests in timber

Buildings with constructions made from wood can be attacked/have been attacked by pests such as house borers, Ptinidae (e.g. deathwatch beetle) and carpenter ants or by dry rot. Different types of pest are common in different regions. Pests and dry rot all thrive in warm, moist environments. An inventory before demolition may need to include pests and dry rot. Specialist knowledge is required, and this type of inventory should be ordered separately from an expert within the specific area.

#### *6.4.18.1 Handling*

When dry rot is suspected during demolition, the demolition residues must be handled so that dry rot spores are not spread to the surrounding area via the material or by the material being recycled. The receiving waste contractor must be informed that the waste contains dry rot. Anyone working with the material must be informed about the risks of spreading dry rot from affected material. It can be difficult to distinguish between brown rot and dry rot, and both specialist knowledge and sampling with analysis are required to be certain.

Timber attacked by dry rot or pests shall be incinerated, and the planning and construction ordinance sets requirements for the extermination of wood-destroying insects in a building to be demolished.

# 7 Literature and websites

**Legislation (websites)**

- www.notisum.se
- www.lagrummet.se

**Authorities**

- The Swedish Work Environment Authority, www.av.se (regulations, guidance and reports on occupational health and safety))
- The Swedish National Board of Housing, Building and Planning, www.boverket.se (regulations, guidance and reports on aspects such as PBL. See specific theme section on demolition waste in the knowledge base)
- The Swedish Chemicals Agency, www.kemi.se (regulations, guidance and reports on aspects such as the health and environmental risks of hazardous chemicals)
- The Swedish Environmental Protection Agency, www.naturvardsverket.se (regulations, guidance and reports on waste and other environmental aspects)
- The Swedish Radiation Safety Authority, www.stralsakerhetsmyndigheten.se (regulations, guidance and reports on aspects such as radiation sources in smoke detectors)
- ECHA European Chemical Agency: www.echa.europa.eu/, (database of chemical substances)

**Industry organisations and other initiatives**

- Swedish Waste Management, www.avfallsverige.se
- Byggmaterialindustrierna, www.byggmaterialindustrierna.se
- Centrum för cirkulärt byggande, www.ccbuild.se
- El-kretsen, www.elkretsen.se
- e-BVD, digital building product declaration, https://byggmaterialindustrierna.se/byggvarudeklaration-ebvd1-0/
- The Packaging and Newspaper Collection Service – FTI, www.ftiab.se
- The Swedish Federation of Glazing Contractors, www.glasbranschen.se
- Innovation and Chemicals Industries in Sweden IKEM: www.ikem.se
- PVC Forum (sector group within Plast & Kemiföretagen), www.pvc.se
- The PVC industry's voluntary sustainable development programme, VinylPlus, www.vinylplus.eu
- Retursystem Byggpall, www.byggpall.se
- Swedish glass recycling: www.glasatervinning.se
- Recycling system for thermoplastic membranes: www.roofcollect.com
- The Swedish Recycling Industries' Association, www.recycling.se
    - Waste fraction division: http://www.recycling.se/beast

- Signs and sign colours: www.recycling.se/branschfragor/skyltfarger

**PCBs**

- www.sanerapcb.nu

**Environmental assessment system for building materials**

- Basta: www.bastaonline.se/
- Byggvarubedömningen: www.byggvarubedomningen.se
- SundaHus: www.sundahus.se

**Reports etc.**


- Anvisning för miljöbesiktning. National Property Board of Sweden, 2006
- Arbetsmiljö vid rivning, sanering och håltagning -En vägledning, Riv- och Saneringsentreprenörerna och Håltagningsentreprenörerna inom Sveriges Byggindustrier, 2016
- Avfall i Sverige 2012, Naturvårdsverket
- Avfallshantering inom bygg- och fastighetssektorn. Boverket, juni 2004
- Branschrekommendation för åtgärder vid sanering av PCB-haltiga fogmassor, Grundad på rapporten ”Åtgärder vid sanering av PCB-haltiga fogmassor – Studie och rekommendationer om skyddsåtgärder, utrustning och rutiner”. Riv & Saneringsentreprenörerna, 2006
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- Från avfallshantering till resurshushållning – Sveriges avfallsplan 2012-2017, Naturvårdsverket, rapport 6502
- Förorenade byggnader, Undersökningar och åtgärder, Naturvårdsverket, rapport 5491, 2005.
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- Isolermaterial kan vara farligt avfall. Faktablad. ISBN 978-91-620-8740-1. Naturvårdsverket, 2015
- Lundblad Dag, Hult Marie, Farliga och miljöstörande material i hus. Guidebok om förekomst och hantering, Formas 2006
- Materialsortering vid rivning och renovering, Stockholm Environment Department, 2006 (available on the Environment Department's website or can be ordered)
- Nazdaneh Yarahmadi et al., Återvinning av polymera material från gamla byggnader, FoU i Väst, Report 0303
- 2004:06 Utredning - Klassificering av farligt avfall (Swedish Waste Management)
- 2004:07 Vägledning - Klassificering av farligt avfall (Swedish Waste Management)
- Studsvik RadWaste AB and Sydkraft SAKAB AB, Omhändertagande av kasserade brandvarnare. Can be downloaded from www.ssi.se

- Tillsammans vinner vi på ett giftfritt och resurseffektivt samhälle - Sveriges program för att förebygga avfall 2014-2017
- Tjära: SBUF projekt om asfalt och tjära: 11 359, www.sbuf.se
- Utvärdering av återvinning av CFC i byggisolermaterial, Swedish Environmental Protection Agency, 2013
- Vägledning för ökad och säker materialåtervinning. Naturvårdsverket, 2017
- Vägledning om CFC-haltigt byggisolermaterial, Naturvårdsverket, uppdaterad senast 2017
- Byggbranschens hantering av standardlastpallar – en jämförande studie av klimatmässiga och ekonomiska avtryck. Returlogistik, 2017

# 8 Appendices

***Appendices to normative industry texts (waste lists)***

Appendix 1 List of hazardous waste - HW list

Appendix 2 Waste fractions during demolition – basic level

Appendix 3 Waste fractions during construction – basic level

Appendix 4 Waste fractions – overall list

***Aids for inventory***

Appendix 5 Search list – Materials and products from demolition and exchange

***Texts regarding particular conditions (AF-texter), forms etc.***

Appendix 6 Recommendations for AF texts for procurement of material inventory according to industry standards

Appendix 7 Recommendations for AF texts regarding waste management during demolition according to industry standards

Appendix 8 Recommendations for AF texts regarding design for a circular economy according to industry standards

Appendix 9 Recommendations for AF texts regarding waste management during construction according to industry standards

Appendix 10 Template for material and waste management plan during demolition

Appendix 11 Template for material and waste management plan during construction

Appendix 12 Recommendations for procedures for handling hazardous waste

Appendix 13 Inspection points during environmental rounds to minimise waste

Appendix 14 Start meeting minutes, waste management

Appendix 15 No longer included

***Other appendices***

Appendix 16 Prevention of waste during construction

Appendix 17 Template, action plan for waste prevention during construction

Appendix 18 Waste rules

Appendix 19 Waste and environmental certification systems

Appendix 20 No longer included