RTS

PERSPECTIVES TO SUPPORT DECISION MAKING

Compliance and suitability for reuse of old construction products

concrete elements, glulam and bricks in building construction

Publications of The Building Information Foundation RTS sr 4/2025

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Compliance and suitability for reuse of old construction products

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Background

Promoting a circular economy in the construction sector is a key means of mitigating climate change and reducing environmental impacts – both nationally and internationally.

One of the most important circular economy measures is the reuse of construction products. However, putting these ideals into practice has been limited by the lack of clarity in the assessment of compliance and suitability for reuse as well as shortcomings in product approval, design guidelines and operating models.

This Policy Brief presents the key findings of the Assessing the Compliance and Suitability of Reusable Construction Products and Planning Their Reuse (UURAKET) project. It also presents the key contents of the guide prepared in the project for supporting the reuse of construction products.

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Introduction

Utilisation of building demolition materials is one of the key objectives of European Union (EU) and national construction guidance. The reuse and recycling of construction products extend the life cycle of construction products, reducing the need to manufacture new products and the use of virgin raw materials. However, the key challenges in reusing construction products include ensuring and verifying their compliance and suitability, lack of design guidelines and perceived risks in building projects1[1–9].

The construction sector is a large producer of greenhouse gas emissions and user of materials[10]. In Finland, the construction sector produced 10 million tonnes of construction and demolition waste in 2022[11]. 10 per cent of the total comes from building construction – mainly from repair and demolition activities. The volume of demolition has almost doubled since 2010[12].It is expected to accelerate even further due to the densification of towns, the demolition of old industrial and commercial buildings[13,] the need to remove underused buildings, as well as demographic and regional developments[14]. To reduce waste and conserve natural resources, it is essential that construction products be reused.

The aim of the UURAKET research and development project was to develop methods based on up-to-date information for assessing the compliance and suitability of construction products and for planning their reuse in building projects. The project examined how structural construction products originating from the interior environments of donor buildings can be repurposed for use in the interior structures of new or renovated buildings. It also aimed to verify that the products used are safe and healthy and meet the regulatory requirements applicable to construction. Interior products refer to structures that have not been exposed to direct weather and soil stress. The construction products examined in the project include concrete hollow core slabs, concrete pillar and beam elements, glulam beams and pillars, burnt clay bricks and autoclaved lime-sand bricks.

The project resulted in the publication of a guide that can be widely applied to building projects aiming to ensure that reusable construction products are healthy, safe to use, and compliant and suitable for their intended applications. The final report of the project provides information on the stages of the development work and the fundamentals of the guide's content. The information included in the guide provides guidance for the verification process and supports the authorities and other parties involved in a construction project in assessing the reuse potential of construction products. The guide and final report are available at: www.rts.fi/julkaisut.

Interface challenges between different laws

The EU regulation on waste and the circular economy strongly guides national legislation in the Member States. The EU Circular Economy Action Plan (CEAP)[15] was published in 2020 and the EU Commission announced in 2024 that it would start preparing the Circular Economy Act[16]. In the summer of 2024, the Finnish Ministry of the Environment launched a project aimed at transforming the Waste Act[17] into a Circular Economy Act[18]. In consequence, the aim is to keep on emphasising the sustainable use of natural resources and to promote the circular economy and the preservation of materials in the cycle.

The transition from a linear economy to a circular economy poses challenges in the interfaces of different laws. It means that the laws on waste, construction products, construction and chemicals will all be applied simultaneously to the reuse of construction products in particular.

The interface challenges between different EU laws have been identified as an important issue to be resolved at the EU level.

The interface challenges between different laws have been identified as an important issue to be resolved at the EU level. The aim is to ensure that the field of operations and regulatory environment would be clear and that reusable construction products could be on the market or gain access to the market without obstacles arising from legislation. For example, it is currently totally possible for a recycled product to still be classified as waste under waste legislation, while also being a CE marked construction product.

The reuse of construction products under national legislation during the transition phase of the Construction Products Regulation

Construction products must be safe and healthy to use, and their properties must be such that the building, when properly designed, constructed and maintained, meets the essential technical requirements laid down in the Building Act (751/2023)[19] during its service life. Essential technical requirements concern the strength and stability of structures, fire safety, health, user safety, accessibility, noise abatement and noise conditions, energy efficiency, low carbon requirement and life cycle characteristics.

The compliance of any construction product shall be ensured whenever a reusable product is subject to an essential technical requirement. Lack of a validation procedure suited for used construction products has become one of the obstacles to the reuse of materials. It has not yet been possible to use a CE marking or the declaration of performance to prove the compliance of construction products. Furthermore, the product approval procedures referred to in the Act on the Type Approval of Certain Construction Products (954/2012) (type approval, verification certificate and certification of quality control) are not directly suitable for establishing the compliance of a used construction product.

The new Construction Products Regulation contains provisions on reuse, enabling the preparation of harmonised product standards for reusable construction products in the future.

However, as a new issue, the new European Union Construction Products Regulation (2024/3110)[20] does contain provisions on reuse, which will also enable preparing harmonised product standards for reusable construction products in the future. However, when initiated, this work is estimated to take years. During that time, the reuse of construction products will take place in accordance with national legislation. As regards used products, the application will take place in stages. As long as no harmonised technical specifications have been published in the Official Journal of the European Union for used products, they will remain within the 'national competence'. Therefore, if necessary, they can ultimately be subjected to site-specific verification under certain conditions.

The properties of reusable products must be tested, or the products must otherwise be proven suitable for the intended use. It is ultimately possible for the building supervision authority to require site-specific verification of the construction product when the compliance of the construction product has not been proven otherwise and there is reason to suspect that the construction product does not meet the essential technical requirements laid down for it. The Ministry of the Environment has highlighted the transitional provisions of the Construction Products Decree. However, they cannot yet be used as a basis for requiring that a reusable construction product bear a CE marking if the product has not been substantially modified[21]. In site-specific verification, the party starting a construction project must assess the compliance and suitability of the reusable construction products for the intended use application[22–23].

Legislation sets the preconditions for the chemical safety of products

Manufacturers of construction products must comply with chemical and environmental legislation, such as Regulation ((EC) No 1907/2006) concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)[24] and Regulation (EU) 2019/1021 on persistent organic pollutants (POPs)[25], to ensure the compliance of their products and the safety of the products for humans and the environment. The obligations of the REACH and POPs Regulations apply to new and reusable products when they are placed on the market. For the purposes of these regulations, making available on the market means any supply or offering of a product to a third party, whether in return for payment or free of charge. For reusable construction products, it is the responsibility of the manufacturer/seller to ensure that the obligations of the REACH and POPs Regulations are met.

According to the Guide for the Treatment of POPs Waste[26], any product containing POPs can be reused, i.e. its use can continue, if it has been in use before the ban or restriction on POPs has entered into force. If the products are already in use and they are not substantially modified or placed on the market, it is not necessary from the perspective of legislation to fulfil the obligations laid down in the REACH and POPs Regulations for new products. In this case, it suffices that the reusable construction products studied in the UURAKET project are assessed for their compliance and suitability and for any contaminants according to need.

When receiving reusable products, the next holder should be provided with information on whether the product contains any POPs or hazardous substances, if known.

The Building Act (751/2023)[19] and the Health Protection Act (763/1994)[27] lay down requirements for the design and implementation of buildings and construction products from the perspective of safety, health and the environment. Construction products must not cause any such emissions to indoor air, for example, that cannot be considered acceptable. There is currently no obligation to measure indoor air emissions, and no binding limit values have been proposed for them. More detailed definition and demonstration of the acceptability of indoor air emissions would require additional instructions. Reusable products may lack information on the substances and processes used, especially if the products were manufactured before the entry into force of REACH and POPs Regulations. Prefabricated products may have been

post-treated at the construction site or in their use in a building, in which case the documentation of their material composition does not correspond to the current situation. Reusable products may contain substances the use of which is restricted or prohibited under current legislation.

Assessment of product properties is carried out according to need

The stages of the assessment of reuse potential developed in the UURAKET project and their documentation (Figure 1) are based on the models presented in national and international guidelines, standards and studies[5–6, 28–29]. The starting point for assessing the properties of building components is the appropriate phasing of the surveys in which the general and easy-to-identify properties and the conditions for reuse are assessed before any more detailed, challenging and expensive investigations are carried out [6, 30].

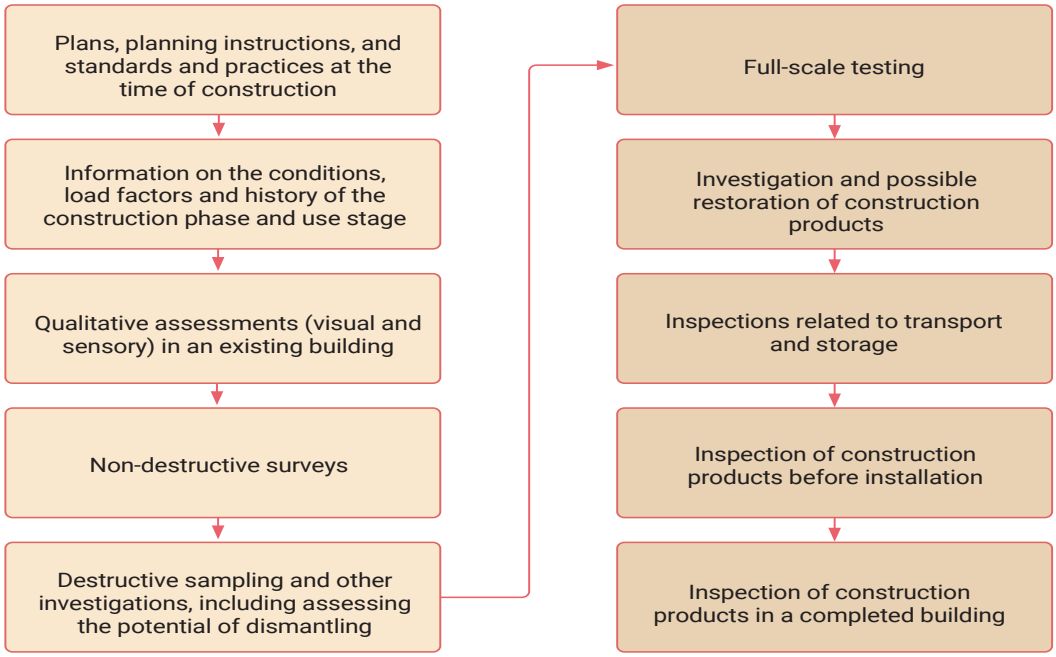

Figure 1. Product properties are assessed according to need and in stages.

The guide describes the properties to be assessed for each construction product that must be known about the product when it is to be used for the same use application for which it was originally designed.

If a construction product is used for an application that poses lower demands for the product than its original use application, the need to assess its properties may be lower. The initial data of a construction product, such as previous design, material and use history data and the requirement levels applicable to the future use application, affect the need to assess and test the properties of the product.

The guide describes the properties to be assessed and investigated for each reusable construction product.

The guide describes the investigation methods, guidelines, standards, test methods and quantities recommended to be used for assessing the properties of concrete elements, glulam products and brick products. Most of the existing guidelines, manuals, standards and test methods for new product are also suitable for assessing and investigating the technical characteristics of reusable construction products.

Concrete, brick and glulam products rarely contain contaminants that prevent their reuse

With regard to chemical exposure agents, it is important to know what kind of a building and operating environment the reusable construction products originate from. A pre-demolition audit and asbestos and hazardous substance investigations [31–32] provide a good starting point for assessing the compliance and suitability of reusable construction products.

Until now, no universal limits or reference values have been presented for the concentrations of harmful substances in reusable construction products. Instead, in such cases references are typically made to separate expert assessments[29, 33–35]. In the light of current information, concrete, glulam and brick products as such do not contain substances that are hazardous to health to the extent that would restrict their use[15]. However, the ancillary materials of these construction products or contaminations from in-service activities may impose restrictions on the re-use of the products. These should be assessed separately on a case-by-case basis as appropriate. The project estimated that there is no need to perform any pre-set harmful substance investigations routinely or based on sampling on the construction products covered by the study. As far as the REACH or POPs Regulations are concerned, the project did not identify likely concentration limitations that could create obstacles to reuse when placing products on the market.

Microbes and biological contaminants as part of the reuse assessment

Based on literature and research, a typical method for assessing moisture and microbial damage in reusable building components and materials is a qualitative assessment (visual and sensory observation)[36–38]. The Finnish legislation does not have any direct provisions on the microbiological or biological purity of new or reusable building components[9]. The requirement of adequate microbiological purity can be derived from the general health and safety requirements of buildings as defined in the Building Act[19,] the Health Protection Act (763/1994)[27], the Decree of the Ministry of Social Affairs and Health on Health-related Conditions of Housing and Other Residential Buildings and Qualification Requirements for Third-party Experts (Ministry of Social Affairs and Health 545/2015)[39] and its application guidelines[40].

The requirement for microbiological or biological purity of reusable construction products derived from the Acts[19, 27], Decree [39] and guideline [40] can be considered to be a known, unrepaired moisture, microbial or dry rot damage exceeding action limit[39–40]. If we want the conditions laid down in the Health Protection Act to be realised in a completed building, no products or construction methods that pose a significant risk of generating conditions hazardous to health can be used in construction.

In Finland, the primary method of studying microbial damage in buildings is the building moisture and indoor air quality investigation[41]. If construction materials are suspected of being moisture-damaged, a microbial analysis[40] shall be carried out in addition to observation-based inspections, if necessary. When reusing materials, one must take into account not only moisture and microbial damage but also microbes in natural materials, impurities spreading during demolition and the effect of storage on the purity of materials.

As the primary method for assessing biological damage, the guide proposes a careful assessment of the risks of moisture damage in structures and building components based on initial data and condition surveys conducted as necessary, as well as a visual and sensory inspection of building components. Material sampling is limited to unclear cases. The guide presents survey guidelines and risk categories for microbial damage based on which the reuse potential of construction products can be assessed.

The structural engineer must be aware of the product properties

The guide examines the development of the regulations on the load-bearing structures from the beginning of the 20th century to the 21st century. To ensure that the structures being planned are safe and healthy, when planning reuse it is essential to interpret the differences between the old planning guidelines and standards and the current design standards. The task of the structural engineer is to take a stand on whether the reusable construction products available are suitable for use at the planned site and to highlight any need for additional investigations concerning the products. This helps to identify potential reusable products as efficiently as possible and to identify any need for additional investigations from the structural engineer's perspective.

> **The task of the structural engineer is to take a stand on whether the reusable construction products available are suitable for use at the planned use.**

The aim of the guide is to provide guidance to structural engineers and other design professionals on how to integrate reuse into the construction and design process efficiently and safely. The design must take into account the possibility of dismantling building components intact, the compliance and suitability of construction products, and the associated schedule, documentation and risk management procedures.

Product data sheet to be completed as assessments and investigations, planning and implementation progress

The guide describes how to document information on reusable construction products on product data sheets. The product data sheet presents the information produced in the reuse assessment in an appropriate and concise format. The product data sheet is designed as a document to be supplemented as the reuse assessment and investigation, planning and implementation progress.

The product data sheet can be used for preparing a catalogue of construction products drawn up based on the Building Act (751/2023)[20] and in the building site-specific verification and demonstration of the compliance and suitability for the use application of reusable construction products. In addition, the information presented on the product data sheet is intended to serve as the design input. Once the information on reusable construction products has been compiled and presented in one place, the use application and purpose of use of the construction products can also be influenced by different design solutions. The product data sheet has been developed to serve the future information management of circular economy and construction. Therefore, it should be prepared in a machine-redable format.

Reuse assessment streamlines the permit process

In the case of concrete hollow slabs, concrete element beams and pillars, glulam beams and pillars, and burnt clay bricks and autoclaved lime-sand bricks, the guide presents the kind of assessments and contents that can be used to assess, study, test and verify the compliance and suitability of the products for reuse in a building project on a case-by-case basis. Once the compliance and suitability of the reusable construction products have been assessed on a needs- and site-specific basis in accordance with the guide, it is easier for authorities to assess whether the reusable construction product meets the essential technical requirements and suitability for the intended use and construction project.

The documentation of the compliance and suitability assessments should include: 1) Results of the assessment, investigations and testing of the essential properties of the product, e.g. a machine-readable product data sheet, product information and conclusions, including uncertainties, and an abstract from the perspective of reuse, 2) the plans and/or assessments of structural engineer and other designers, describing the suitability of the reusable construction products for the use application.

ABSTRACT OF FURTHER RECOMMENDATIONS

- Collect and analyse assessment and testing data of reusable products to further develop survey and testing needs.
- Collect experiences from reuse assessments and possibly develop and/or specify operating models.
- Develop the compatibility of building and product information and the management, enrichment and flow of digital information as well as the form of information nationally to serve different actors and the various stages of the building's life cycle.
- Disseminate information presented in the guide, the development of competence and the introduction of uniform methods for building site-specific verification.
- Streamline regulation and practices in the reuse of construction products.
- Develop a more detailed definition and demonstration of the acceptability of indoor air emissions.
- The Decree on Construction Products and harmonised product standards should be developed to also support the reuse and approval of existing old construction products.
- Clarify the terminology and interpretation of regulation, for example: placing on the market from the perspective of chemical and product legislation, and interpretations and procedures of building and waste legislation in reuse, preparation for reuse and waste in the interfaces of their classification.

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