



POLICY BRIEF 2022:20

Perspectives into topical issues in society and ways to support political decision making.

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Conditions for reuse of building components in Finland

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The reuse of building components in Finland is limited as of yet, although their use is seen to have potential. Large-scale reuse would also contribute to climate change mitigation. However, the reuse of building components is subject to legislative and validation-related framework conditions, which are addressed in this Policy Brief.

In addition to regulation, the reuse of building components can be promoted and accelerated by developing methods, procedures and guidelines for substantiating and verifying the characteristics of materials and for validating them.

This study provides background information on the preconditions for the reuse of building components

The utilisation of demolition materials of buildings is one of the key objectives of EU and national construction guidance, which promote the circular economy of construction. The aim is also to promote the reuse of building components, thereby extending the life cycle of building components and reducing the use of virgin raw materials. However, the reuse of dismantled building components in Finland is extremely limited. One of the key challenges for the reuse of building components is their validation at a new construction site.

Construction products must be safe and not hazardous to health. Construction products can be used in construction when their characteristics and performance meet the essential technical requirements laid down in or pursuant to the Land Use and Building Act (132/1999).¹

Regulation (EU) No 305/2011 on construction products² provides for the placing on the market of construction products. According to the Construction Products Regulation, 'placing on the market' means the first making available of a construction product on the Union market. The Regulation lays down the way the characteristics of a construction product should be declared and the conditions under which construction products are to be CE marked. With a CE marking, the manufacturer declares the characteristics of the product in a harmonised European manner and assures the conformity of the construction product's characteristics with the European harmonised product standard or European technical approval. The manufacturer of a construction product may also use a voluntary European Technical Assessment (EEA) for products that do not comply with the product standards³.

Objective of the study

The project *Suitability of demolition materials for different applications from the safety and health point of view* (PURATER)⁴ investigated the current state of reuse of build-

ing components and recycling of demolition materials as well as its potential in Finland. The project investigated the possible impact of the reuse of building components on the indoor environments of buildings and, through them, on the health and safety of the users of buildings. In addition, the project examined the risks related to the reuse of building components and the preconditions for safe use based on the possible damage to materials, the physical conditions of building materials and other technical characteristics of materials from the point of view of various use applications.

The study also reviews the legislation framework on construction products, focusing on issues related to the EU internal market for construction products and national product approval.

The PURATER project was designed to provide background information that can be used, for example, in the development of the utilisation of reusable building components and related operating procedures.

Materials and methods of the study

The PURATER project utilised information from literature and previous research projects on the current state of reuse and recycling of building materials and building components. Information on the handling of different building materials and components was collected from the websites of material manufacturers and processors and through interviews with operators in the field.

Data on the raw materials used in the manufacture of building materials and building components, as well as on the treatment chemicals that may have been added and accumulated during the life cycle of building components, on the formation of damage or the presence of hazardous substances and contaminants during the use of the building, and on their potential adverse health effects, were collected from literature, previous studies and publications of research projects.

The PURATER project examined the national product approval procedure⁵ and the EU Construction Products Regulation from the building component reuse point of view and interviewed Finnish authorities to obtain official legal interpretation of the subject.

In addition, representatives of authorities in Sweden, Denmark, Norway, Germany, and the Netherlands were interviewed to clarify their respective interpretation of the EU Construction Product Regulation in relation to the reuse of building components in the preparation of this policy brief.

Main findings and conclusions of the study

Reuse of concrete elements and steel structures as part of a building's frame is seen as having great potential for reducing greenhouse gas emissions. The PURATER project identified the building components with the highest reuse potential as bricks, steel, untreated sawn timber, and concrete elements which, based on existing information, do not contain particularly problematic raw materials for the safety or health of indoor environments. These building components are also reusable based on their detachability and quantity. The suitability of dismantled building components for reuse depends on the condition of the dismantled materials, their technical characteristics and performance levels after dismantling, as well as the requirements of the intended use application.

The project identified bricks, steel, untreated sawn timber, and concrete elements as the building components with the highest potential for reuse.

The project also identified building materials that may contain substances and compounds whose use is currently restricted or prohibited by the Regulation (EC) 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)⁶ or the Regulation on persistent organic pollutants (POPs)⁷. Account must also be taken of the fact that reusable building components may contain hazardous substances and contaminants accumulated during construction and use. There is currently a lack of defined test methods for the raw materials of reusable building components to determine the accumulation, addition or potential absorption of hazardous substances or for contaminants resulting from damage to reusable building components. In addition, there are no limit values defined for the acceptable level of hazardous substances and contaminants in case of the reuse of the building component in indoor environments or related structures.

The Construction Products Regulation was enacted from the point of view of the manufacture of new construction products, and the harmonised standards are not directly applicable to assessing the performance and durability of reusable building components, as they contain requirements for quality control during manufacture that are not possible for reusable building components. In addition, the testing of the characteristics of reusable building components must consider the impact of the previous use on the characteristics of the building components, which is not considered in the harmonised standards for new products.

Testing of the characteristics of reusable building components must consider the impacts of the previous use on their characteristics.

Once placed on the EU internal market, construction products that are reused are mainly covered by national regulations, which means that the validation is based on the national product approval procedure instead of the mandatory CE marking and declaration of performance. However, for reuse situations, there is no procedure for how the technical characteristics of reusable building components should be tested and verified, for example, by means of site-specific verification procedure. There are no specifications of the characteristics to be tested and the related standardised, generally accepted testing methods to identify and validate the characteristics of reusable building components, and such methods should be developed. Validation methods are important to be able to verify that the reusable building components meet the essential technical requirements laid down in and pursuant to the Land Use and Building Act and the requirements laid down for products in the building project. The suitability of reusable building components for the building to be constructed must always be assessed on a case-by-case basis based on the requirements of the intended use, local conditions and building regulations.

The suitability of the construction product for the building to be constructed must always be assessed on a case-by-case basis based on the requirements of the intended use, local , and the building regulations.

Based on the interviews with the Nordic authorities conducted for the policy brief, other Member States have also been confused as to whether all reusable building components are covered by the Construction Products Regulation with mandatory CE marking, or by national regulations, and if so, in what respects. However, according to the interviews, the control of the reuse of building components is seen as being under national legislative regime. This view is also supported by the clarification on the matter provided by the EU Commission to the Norwegian authorities upon inquiry, except in the case that a reusable building component is considered placed on the market under the Construction Products Regulation as a new product and should be CE marked. This is the case when a reusable building component is modified in such a way that its characteristics are substantially altered. When and how the Construction Products Regulation should be applied and how manufacturers should deal with these situations should be clarified further by the EU Commission.

When a building component is already on the market, the main criterion for its reuse is compliance with national building regulations.

On 30 March 2022, the EU Commission published a draft proposal⁸ on the revision of the Construction Products Regulation, which also sets out principles for the reuse of building components.

Recommendations

The PURATER project set out three further development themes to promote the use of reusable building components: 1) Clarification of the interpretation of mandatory CE marking and national voluntary product approval in accordance with the EU Construction Product Regulation in different situations of use and a description of the roles, responsibilities and obligations of the parties, 2) development of testing and verification methods and criteria for the validation of a building component, and 3) strengthening the knowledge base and development of competence (Figure 1).

Interpretative clarification of provisions

Methods and criteria

Knowledge base and competence

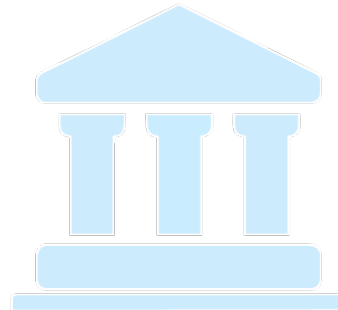


Figure 1. Promoting the use of reusable building components still requires further development in terms of interpretative clarification of regulations, methods, knowledge base, skills and various guidelines.

In addition to these recommendations, the PURATER project identified the need to harmonise key concepts related to the reuse of building components in related legislations (Waste Act 646/2011⁹, Construction Products Regulation, Land Use and Building Act).

Development of validation procedures

Since the Construction Products Regulation does not contain provisions on reuse, and since harmonised product standards are not, in principle and in practice, directly

applicable to the testing of the characteristics of reusable building components, the characteristics to be tested should be defined for reusable building components and testing and certification methods should be developed. To validate reusable building components, a procedure description and instructions are required for the various stages of the construction process and for the different operators. According to the interviews, this type of guidance is already being developed, for example, in the Netherlands. In this way, the site-specific approval of reusable building components could be streamlined. The testing of the characteristics of reusable building components must consider the impact of use on their characteristics, such as hazardous substances, which is not considered in the harmonised standards for new products.

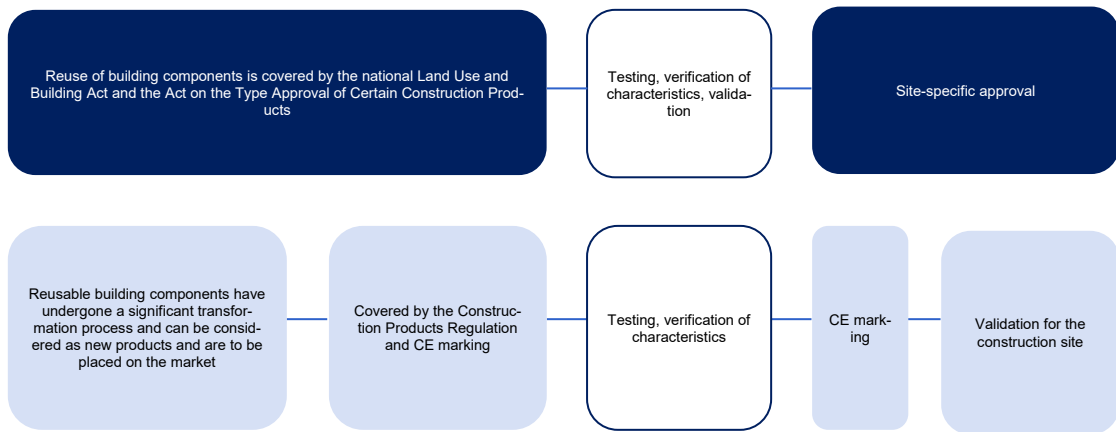


Figure 2. Uniform solutions and procedures are needed for the different situations of reuse of building components, especially for testing the characteristics materials, their validation and approval.

In addition, the EU Commission should clarify the obligation of CE marking in exceptional circumstances where a reused product is modified in such a way that it would be considered as a new product. In these situations, the new construction products must be CE marked according to a harmonised standard (Figure 2).

The phases of dismantling, reuse and construction are usually separate projects, so their seamless integration requires new practices and the identification of different work phases, contract interfaces and responsibilities, as well as their clarification and guidance in the future. In the initial phase, it is recommended to focus on the development of criteria on building components that are identified or predicted to have demand in the market and construction, as well as on the entire construction process and its operators.

Figure 3 illustrates a simplified process model, highlighting the steps of the verification of the characteristics of reusable building components, their suitability for the site and validation:

1. Initial data, preliminary study, and identification of the building components with the highest reuse potential
2. Structural condition survey and hazardous substance survey considering raw materials, impurities, and other contamination of materials
3. Demolition planning and demolition work
4. Transport, storage, and reprocessing
5. Planning of reuse according to the application
6. Validation and demonstration of suitability of the product for the construction site.

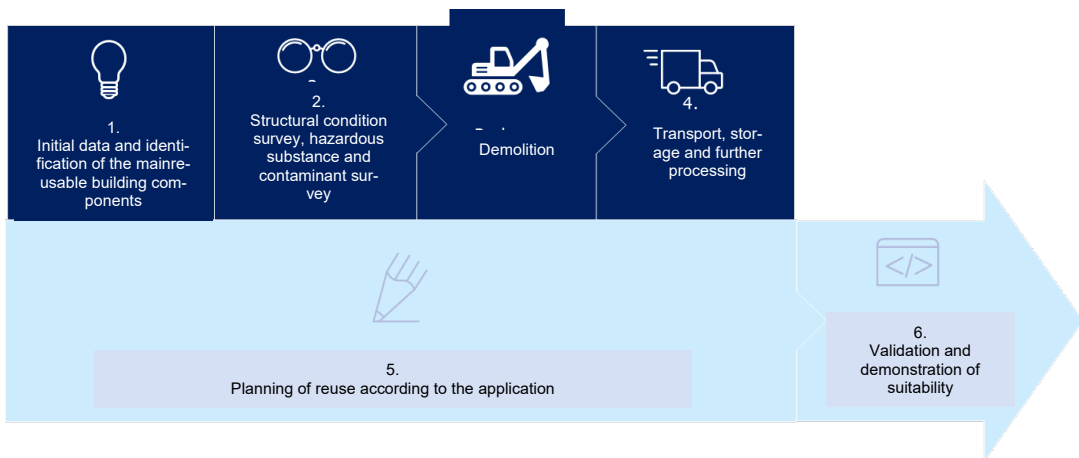


Figure 3. The activities of verifying and confirming the characteristics of reusable building components and the validation and demonstration of suitability for the reuse.

For example, in the case of a concrete element (Table 1), the verification of the characteristics of the building component, its validation and demonstration of suitability for the site could be conducted as follows:

Table 1. Verification of the characteristics of the reusable concrete element and the validation steps (in building construction):

PHASES	ACTIONS
INITIAL DATA AND PRELIMINARY STUDY	Review of building design documentation: year(s) of construction, element types, dimensions, openings, element joints, load classes, concrete compressive strength, reinforcement

	<p>Raw materials and (surface) treatments, other materials related to the structure (joint fillers, etc.)</p> <p>Usage history and operation in the premises with an impact on materials</p> <p>Mapping of hazardous substances and other contaminants</p> <p>Preparing a plan for a hazardous substance and contaminant survey as well as identification of reusable materials</p>
STRUCTURAL CONDITION SURVEY, HAZARDOUS SUBSTANCE AND CONTAMINANT SURVEY	<p>Structural function (load-bearing structures, stiffening), sampling (compressive strength of concrete), reinforcement cover thicknesses and quality, location, and quantity</p> <p>Visual inspection: all elements, visible damage, surface treatments or other materials connected to structures (e.g. joint fillers)</p> <p>Investigation of hazardous substances and other contaminants: sampling, analysis, and interpretation of results</p>
DEMOLITION PLANNING AND DEMOLITION WORK	<p>Safe lifting; lifting equipment, support during work</p> <p>Visual inspection after dismantling: visible damage, damage to connection elements, number of prestressed reinforcements, location, slipping</p> <p>Detection of hazardous substances (previously concealed building sections) and other contaminants and planning of necessary measures</p> <p>Required cleaning and other measures and quality assurance</p>
TRANSPORT, STORAGE AND REPROCESSING	<p>Storage plan, specified and planned further processing</p>
PLANNING AND REQUIREMENTS SET BY THE NEW INTENDED USE	<p>Planning: according to Eurocode and national construction legislation (structural function, fire safety, acoustics, structural physics, energy efficiency, health and safety in use) and assessment of suitability for the intended use and site</p> <p>Planned, targeted, and required service life and shelf life (determination)</p> <p>Full-scale testing: beams, hollow-core slabs</p> <p>New connectors: testing if necessary</p>
VALIDATION	<p>Validation, for example by means of site-specific verification</p>

Development work related to the testing methods of reusable building components, building component-specific and material-specific criteria and the various stages of

the process should be conducted in a coordinated manner and in cooperation with national and Nordic experts and authorities.

In exceptional cases, where the reusable building component must be CE marked because of modification (see Figure 2), the development for the functioning of the EU internal market must be conducted under the coordination of the Commission or in cooperation between EU Member States, which can be a long process.

Strengthening the knowledge base and development of competence

The development work requires a stronger knowledge base, as the amount of information available on the topic remains extremely limited. Research, development, and piloting related to the testing of the characteristics of reusable building components should be systematically targeted at different materials, building components and applications. In this way, knowledge of the preconditions for reuse would be systematically accumulated based on monitoring data.

The regulatory process of the European Chemicals Agency (ECHA)¹⁰ maintains a database with a large number of substances posing hazards to health and the environment and the database is constantly evolving. Information on materials used in the manufacture of reusable building components is necessary to assess their safety for human health and the environment during reuse. The identification and investigation of hazardous substances and contaminants, and the materials and raw materials containing them, as well as the interpretation of the results, also require research data to serve as a basis. In addition, a system is needed to provide information on the chemical compounds contained by raw materials and treatment chemicals, their concentrations, and possible contaminants. This would facilitate and accelerate the identification of the potential for reuse of building components and the identification of any necessary testing methods, as well as the identification and prevention of hazards to health and the environment.

The reuse of building components requires the development of the competence of operators throughout the value chain. This can be answered by further training for construction experts, such as developers, designers, construction health experts, hazardous substance surveyors, condition surveyors and demolition contractors.

References

Land Use and Building Act. 5.2.1999/132. www.finlex.fi

² Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (Text with EEA relevance).

³ European Technical Assessment EEA. <https://www.henhelpdesk.fi/>

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Government's analysis, assessment and research activities