

Circular demolition

This Replication Package describes the performance of the two CityLoops guides, *Pre-Demolition Audit Guide* and *Guide for Selective Demolition*, in total and partial demolition. The purpose of the pre-demolition audit is to prepare for selective demolition by providing a detailed assessment of building material fractions with respect to their amount, quality, purity, and suitability for circularity (reuse, recycling, recovering). The purpose of selective demolition is to sort the demolition materials in clean fractions for optimisation of circularity of the materials, according to the highest level of the waste hierarchy.

The pre-demolition audit guide explains how a pre-demolition inventory and material audit can be conducted to identify building components and materials with reuse or recycling potential. The guide can be used, when planning demolition projects, with sufficient time and coordination among actors, to make a pre-demolition screening (and subsequent selective demolition) required in the procurement of a demolition contractor. The screening procedure aims to recognise reusable and recyclable materials and building elements and to give recommendations for how to handle them. Identification of materials (as containing harmful substances, or as having residual value and potential for other uses) is the key first step to preventing their treatment as waste.

The selective demolition guide explains how a selective demolition can be conducted to select and preserve value of building components and materials with reuse or recycling potential, following a series of chronological steps to dismount components or materials without damaging them. The guide can be used, when planning demolition projects, with sufficient time and coordination among actors, to ensure that selective demolition is required in the procurement of a demolition contractor. The selective demolition procedure guide gives recommendations to manage material removal and treatment. By removing harmful substances and salvaging construction materials with recoverable value, a more circular demolition can take place, thus reducing the total CDW generated on site and creating secondary construction material supply.

Recommendations from lessons learnt

The two guides have been tested and evaluated in the CityLoops demonstration actions and recommended for replication in all renovation and demolition projects.

A general recommendation is that the screening and selective demolition both need to be planned for well in advance and are incorporated when tendering. Once contracted, contractors will not voluntarily carry out the screening – so any foreseen use should be clearly intended in the demolition planning phase.

Pre-demolition audit

1. Reuse of building materials cannot be promoted without a pre-demolition audit.

2. The audit guide presents a structure of how to perform screening of hazardous waste and circular resources before demolition and renovation of buildings. Details of performance and set-up of documentation, e.g., excel sheets are not included.
3. The audit is an important activity early in the value chain for planning, design and contracting demolition and renovation works.
4. Pro-active and early audit in advance of the demolition work is important to ensure all possible opportunities for reuse/recycling of materials.
5. Depending on the amount and quality of the demolition materials, the audit should be split up in different stages to optimise the timing and opportunities in accordance with the project planning and implementation.
6. The audit should be done in cooperation with various stakeholders, so that recycling and reuse of materials can be connected to the design processes.
7. Using a drone for visual inspection and mass calculation can be a useful tool during the pre-demolition audit before the demolition work begins.
8. It is necessary to consider how to digitalise data when you choose the method for the audit, in order to use the data for material passports and marketplaces.
9. Effective implementation requires education and experience.
10. The Pre-Demolition Audit Guide presents general principles which must be combined with other tools and aspects related to national legislation, e.g., legislation on hazardous materials.

Selective demolition

1. Selective demolition is an implementation method ensuring the best opportunities for on-site sorting of hazardous materials and circular resources, and for reducing the amount of mixed CDW waste.
2. Selective demolition should be mandatory in all kinds of demolition projects.
3. Selective demolition should be applied when planning demolition projects with sufficient time and coordination among actors, so that selective demolition can be required in the procurement of a demolition contractor.
4. Optimisation of building material circularity requires early removal of hazardous materials and sorting/separation of individual material fractions aiming at the highest level of the waste hierarchy (reuse, recycling, recovering).
5. The soft stripping phase must be executed promptly after the last user of the premises has moved out and organising the reuse of items should occur before moisture and vandalism ruins them.
6. Selective demolition can be significantly more time-consuming and expensive than traditional demolition – however, the cost savings are in waste management and material recovery. Financial and management models should account for the redistribution of costs and savings accordingly.

CityLoops instruments

These are the two guidelines for pre-demolition audit and selective demolition used in the CityLoops demonstration projects:

- **The Pre-Demolition Audit Guide** helps prepare selective demolition and covers both the environmental audit focusing on identification of hazardous materials, and the circular audit focusing on elements for reuse and materials for recycling. This instrument is [available here](#).
- **The Guide for Selective Demolition** explains how a selective demolition can be conducted to select and preserve the value of building components and materials with reuse or recycling potential. This instrument is [available here](#).

CityLoops demonstration experiences

- **Roskilde - Partial demolition of factory Hall 12:** The pre-demolition audit guide has been used to full extent for planning the demolition of the Hall 12 building of the Musicon development. This was documented by a hired consultant, Golder Associates A/S. The audit started with a documentation desk study followed by a field study. Focusing on hazardous materials, a detail inventory assessment of all materials in the building was performed. On this basis a report with recommended management of each waste stream was provided for the following selective demolition of Hall 12 and for the circularity of the materials, including preparation of a material bank. Read about Roskilde's [experience here](#).
- **Høje-Taastrup - Circularity requirements in sale of town hall for demolition:** The sale and development of the city hall estate required total demolition of all existing buildings. The two guides have been introduced as framework conditions in the purchase documents for handing over the old townhall buildings to a private company. Circularity requirements comprised a pre-demolition audit consisting of mapping of hazardous materials and screening of resources suitable for circularity. Based on the identification of resources and the preparation of a resource mapping report, selective demolition will be carried out, ensuring that min. 80 percent by weight of the uncontaminated materials from the demolition of the city hall must be reused, recycled, or recovered. Read about Høje-Taastrup's [experience here](#).
- **Mikkeli - Demolition of Pankalaampi HealthCare Center and Tuukkala Hospital.** The demolition was prepared and performed in accordance with the two CityLoops guides, and the guides were tested. Different waste fractions were sorted and at both demonstration sites, the amount of mixed CDW was minimal, as the legislation and waste prices guided sorting. However, it was found that there is some variation in the implementation of selective demolition between different contractors and demolition sites. The waste fractions that must be sorted at source should be stated in the demolition contract and compliance should be monitored during the implementation. Selective demolition was implemented well in the demonstration projects and the sorting rate in the demonstration sites was over 99%. The soft stripping procedure must be formalized with clear roles and duties for each participant.

Read about Mikkeli's [experience here](#).

The business case of applying selective demolition had a positive outcome. The Mikkeli business case is [described here](#).

- **Apeldoorn - Demolition of brick-road:** The contract for the road project was prepared and implemented, following the principles of selective demolition. Considering that this renovation project mainly involves waste material groups such as concrete, bricks, tiles, ceramics, stones and (dredging) soil, the demolition is not as complicated as for some buildings. Selective demolition received the necessary attention in this project.

Read about Apeldoorn's [experience here](#).