



Data and material passports

Extract from the Demonstration Report

Roskilde, Denmark



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This text describes Roskilde's experience gathering and digitalizing data and the material passport procedure. The sections come from Roskilde's CityLoops demonstration report available [here](#).

Roskilde's procedure for CDW to obtain a Material Passport

One of the most important aspects of absorbing reused and recycled CDW into new constructions is the need for data associated with the specific material. Early in the transition towards circular economy, Roskilde Municipality identified the need of a simple data vehicle that could ensure that data is kept and accessible throughout the procedure. This data vehicle can best be described as a material passport.

One of the often-overlooked functions of such a material passport is the need for delivering information to the different authorities, so the necessary permits can be given. Therefore, information in the material passport is targeted towards three different authorities, namely the:

- Environmental Authority.
- Waste Disposal Authority.
- Building Authority.

By law certain procedures are mandatory. Before demolition of a donor building, an environmental screening delivers data for the demolition permit. This environmental screening can be expanded to an combined environmental and resource screening to identify materials or elements for reuse/recycling. If this is the case, the elements or materials will be added to the tendering of the selective demolition.

When the demolition is completed, the elements and materials are checked to see if they are fit for further tests of their suitability for reuse/recycling. The following colour codes are used for the materials: Green means they are fit for direct reuse/recycling, yellow means they need further testing, red means they should not be reused/recycled.

The information is written in an Excel sheet, which forms the Material Passport. Information includes whether special care should be taken when handling or using the materials, as well as an assessment of the structural usability and recommendations on purposes for reuse/recycling. Together with pictures, tags and analysis results this constitutes the Material Passport. If the materials are destined for reuse/recycling in a new project, information about location of storage and expected future use (time, place and building) is also included.

The local building authority can then authorize use of the materials in a new construction if they fulfil the requirements of the intended use.

Resource mapping

When a building is to be demolished or renovated, the developer is responsible for identifying and reporting any waste that may be classified as hazardous to the municipality. This is done through an environmental screening, which involves taking samples of the building components and materials involved in the construction project. It is through this screening that environmentally harmful substances are identified.

Before demolition or renovation, the building owner can conduct a more detailed examination of the building to map the available resources. This mapping provides a detailed overview of the materials suitable for reuse, recycling, and material recovery.

It is essential for the usability of resource mapping that it is carried out in the initial phase of the project in conjunction with or as an extension of an environmental survey of the building. The information about hazardous substances from the environmental survey is an important parameter for assessing whether the available materials can be considered resources or if they need to be managed and disposed of as contaminated or hazardous waste. Together, these mappings form the basis for subsequent planning and description of the demolition process.

Based on the resource mapping, the building owner can demand the extraction of demolition materials for reuse, recycling, or other forms of material recovery. For all materials removed from a building, sufficient information must be provided to assess their circular potential.

'End of Waste' criteria for materials intended for recycling or other forms of recovery

Depending on whether the demolition material is intended for reuse, recycling, or recovery, there are different requirements for documenting its location, condition, environmental impact, etc. To achieve maximum transparency and flexibility, it is advisable to collect the same information for all materials intended for circular processes. This ensures that demolition materials can move from one category to another without requiring additional documentation in the regulatory process.

In Section 6 of the Waste Framework Directive (DIRECTIVE 2008/98/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL), a series of conditions are listed that must be met for waste that has undergone a recycling operation or another recovery operation to be considered as ceasing to be waste. These are referred to as the 'End of Waste' criteria:

- (a) the substance or object is commonly used for specific purposes;
- (b) a market or demand exists for such a substance or object;
- (c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and

- (d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.

In other words, the above criteria need to be addressed for demolition materials to cease being waste and be incorporated into new construction.

Requirements for reuse materials: "Reuse" refers to the reuse of products or components for the same purpose for which they were designed. An example of reusing construction materials from demolition projects is using bricks from masonry or entire floorboards that originate from the demolition of existing buildings and are reused in new construction as part of the masonry or flooring.

Construction materials from demolition projects that can be used for reuse are not considered waste and therefore do not need to be managed according to waste regulations. This means that construction materials from demolition projects can be handled and freely sold by anyone, and it is not the responsibility of a municipal authority to grant permission for the handling of these materials.

Step-by-step procedure

In Roskilde Municipality, we aim to follow this procedure for all circular demolition of municipal buildings:

1. During the mandatory environmental screening, the circular potential of the demolition materials is assessed through a resource mapping, and the building owner decides to what extent materials should be extracted for reuse or other forms of recovery during demolition.
2. The 'End of Waste' criteria are assessed for all materials with circular potential.
3. A material passport is created and pre-filled for all materials with circular potential. The material passport accompanies the material throughout the entire process. The material passport should contain at least the following information: a) Location of the building from which the material is extracted. b) Information about where the material will be stored until the time of reuse or recycling. c) Description of the material, including its dimensions and quantity. d) Test results from mandatory environmental screening and possibly resource mapping, including an assessment of the material's condition/durability. e) Assessment of the fulfilment of the 'End of Waste' criteria, including the expected future use and anticipated time of use. f) Photographic documentation of the demolition material.
4. Prior to demolition, a dialogue is conducted with the waste authority to provide an overview of which materials are expected to be reused, recycled, or disposed of.
5. Before demolition, the contractor applies for permission to dispose of materials deemed as construction waste.

6. Environmental inspections are conducted during the demolition process to ensure proper treatment of the demolition materials.
7. At the conclusion of the demolition, the information in all material passports is updated.
8. Prior to the reuse of materials, either the producing contractor/building owner or the receiving contractor/building owner applies for 'End of Waste' approval.
9. If materials intended for reuse are no longer desired, the material owner must apply to the waste authority, by the expected time of reuse stated in the material passport, for either permission to dispose of the material or permission for 'End of Waste' if the material is intended for recycling.
10. In case the reuse of materials is delayed or changes compared to the expectations stated in the material passport, the material owner must inform the waste authority about the revised use or schedule for the material, prior to reuse or by the anticipated time of use stated in the material passport.
11. Upon completion of incorporating reused, recycled, or otherwise recovered materials, the information in the relevant material passports is updated.

PROCEDURE

Forudsætning for anvendelsen af materialepas er at det indgår i "Roskildemodellen", der er en procedure, hvor byggeaffald tages ud af affaldshierarkiet og indgår som bygherreleverance under nogle bestemte omstændigheder.

"Roskildemodellen" består af fem faser:

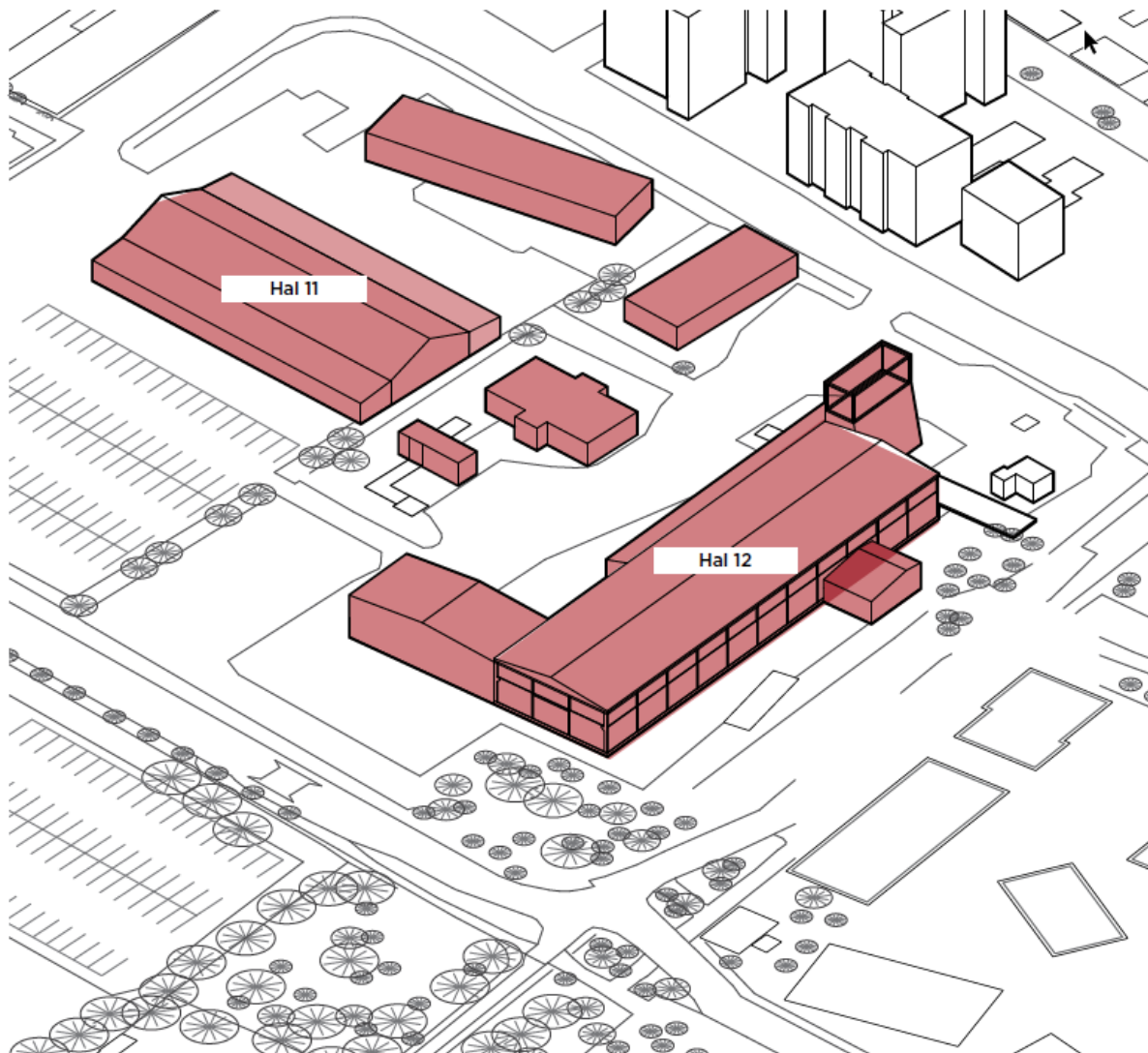
1	2	3	4	5
Bygherre eller dennes repræsentant vurderer på baggrund af miljørapport(er), hvorvidt der er byggematerialer fra den kommende nedrivning, der har potentiale til genanvendelse/genindbygning i fremtidigt byggeri. Hvis det er tilfældet, bliver det tilføjet som et udbudskrav til selektiv nedrivning, hvor nedriver får udfaldskrav til renhed af de pågældende materialer.	Når nedrivningen er overstået, bliver de nedtagne materialer kontrolleret i forhold til udbudskrav. Hvis de overholder de beskrevne krav, kan de testes yderligere for egnethed til genanvendelse. Det er typisk en specialrådgiver, der tester på foranledning af bygherre.	Når testresultaterne er kendte, kan bygherre vurdere, hvorvidt de nedtagne materialer er af en type, der: A) kan genanvendes direkte uden yderligere undersøgelser B) skal undersøges yderligere , før man kan vurdere egnetheden til genanvendelse C) færdigvaskes, som byggeaffald og forlader materialestrengen, fordi de er uegnede til genanvendelse.	Resultatet bliver derefter skrevet ned i et lokalt materialepas, der følger materialet videre i processen. I materialepasset kan man aflæse, om materialet er godkendt til genanvendelse eller yderligere undersøgelse, og man kan indskrive særlige begrænsninger for anvendelse af de materialer, der skal undersøges. Udover miljøforhold er der også anført byggeteknisk egnethed og begrænsning i materialepasset, der sammen med billede, mærkning og analyseresultater udgør en samlet dokumentation for materialet.	Den lokale byggemyndighed godkender genindbygning af materialer med medfølgende materialepas, hvis dokumentationen er fyldestgørende i forhold til det, materialet ønskes brugt til.

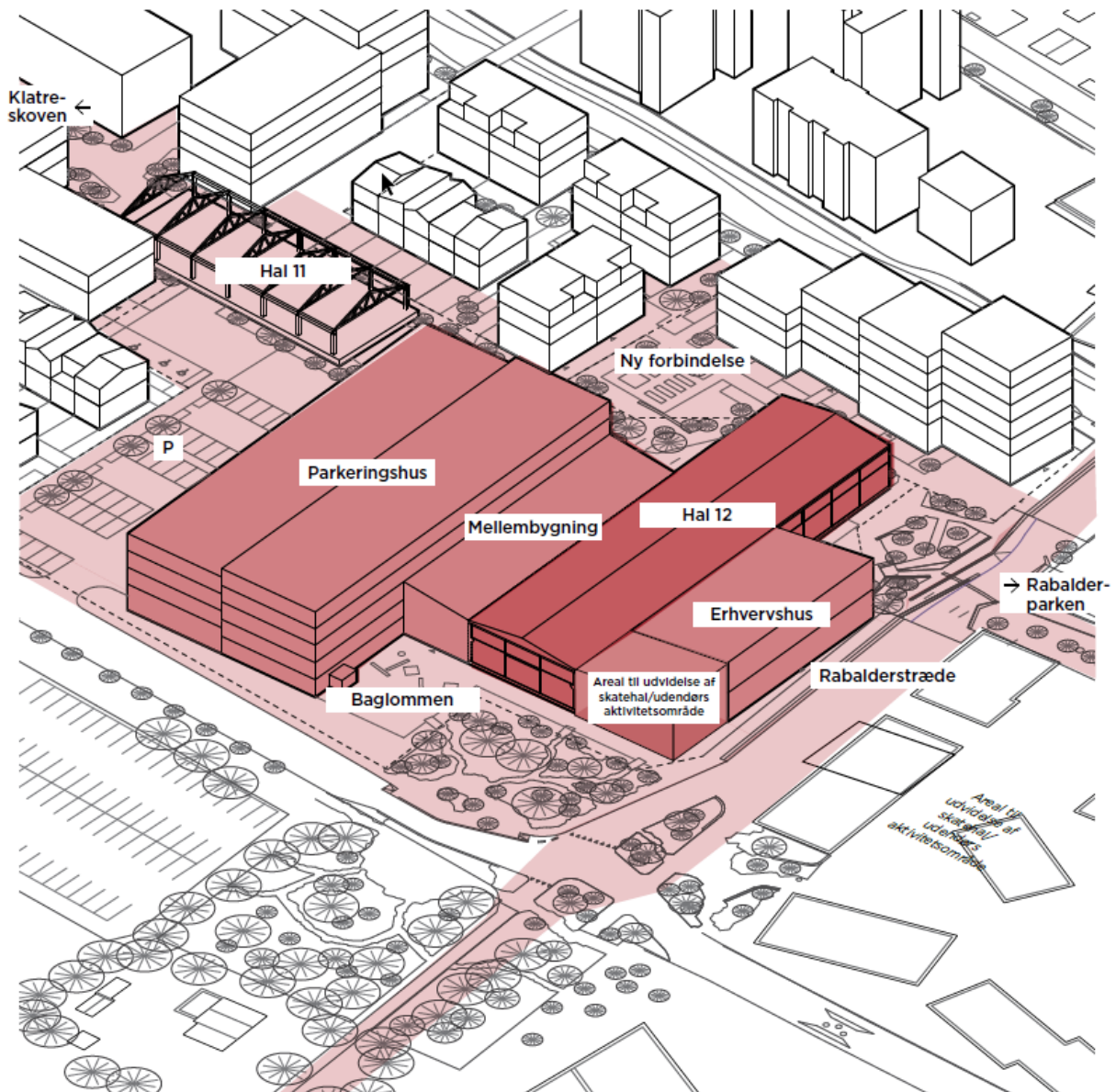
Demolition of hall 11/12: screening, data and material passport

Hall 12 is a secondary building situated in the demonstration area. It will be partly demolished and materials from the demolition will be incorporated into other construction projects. The function of hall 12 was and will remain a skate hall. Beams and pillars, concrete walls and the main steel structure of hall 12 will be preserved - therein lies the greatest savings in materials and CO2.

The buildings had a pre-demolition screening and selective demolition will take place, keeping reusable elements in storage for reuse in new buildings and creating material passports

documenting their quality and possible use. A virtual material bank will be created through design for disassembly using Building Information Modelling (BIM) for information on regulations, quantities, material types, etc. LCA on selected materials will aid in decision making by revealing the carbon emissions impacts of different handling options. Roskilde will also try to implement circular soil strategies in the project by minimising soil movement and facilitating reuse on site.





The buildings have been screened by Golder (a contracted consultant) using the CityLoops pre-demolition guidelines. LCA on selected materials have been performed as well. Selective demolition will take place between March – August 2023, keeping the main structure intact. Concrete recovered from the demolition will be crushed for recycling into new concrete in the construction of a multi-storey car park.






Screening procedure and selective demolition

Hall 11/12 has been screened for material inventory by Golder using the CityLoops guidelines. The selective demolition procedure was applied to three buildings in the hall 11/12 area at Musicon, to identify and keep materials with potential for reuse.

This gave rise to a new procedure in Roskilde, that ensures early involvement from relevant members from the value chain. In Hal 12 a group of architects, demolishers, special advisors and building owners participated in a joint workshop, where quality materials were pointed out for further testing. The experience was that only by combining the knowledge from several professionals, it was possible to make a positive list of relevant materials for future reuse.

In connection to the use of the internal material passport, a construction material passport was created. Construction material passport holds all operational information during the planning and building phases. When the rebuilding of Hal 12 will be completed, it is the intention to condense the information into the internal material passport and place it in the virtual material bank online.

Materiale-kategori	Materiale	Lokalitet (Hal nr)	Reg. nr.	Nærmere placering	Antal	Dimension	Foto	Miljøforhold: (A) Særlige arb.miljøkrav ved håndtering (skæring i materialet - afrensning af maling) (B) Særlige miljøkrav ved bortskaffelse som affald (C) Særlige krav ved genanvendelse og indbygning mht. indeklima (se Miljøforhold ark for nærmere beskrivelser)	Holdbarhed/stand	Mulighed for/ metode til adskillelse	Potentiale (skriv bogstav) Genbrug lokalt (A) Genanvendelse lokalt (B) Genbrug / genanvendelse andetsteds (C) Bortskaffes (D)
Døre - træ/metal	Dobbelt træder Venstre ud Venstre-glænde	H12	H12.H.5	Hal 12 - nordlig ende - streekskate område. Udgang i vestlig facade	1	210 x 88 cm		Prøvetaget. Miljøforhold i maling: A1 B1 C1	God stand	Karmkræver skrues ud og døreri inkl. karm tages forsigtigt ud. Der opbevares fastmonteret i karm. Støve og propper gemmes. Håndtag og greb afmonteres og opbevares sammen med døren. Døren stilles lodret på palle, med skråtvejs monteret (som ved ny dør). Opbevares tørt og indendørs.	A Kan genbruges i ny hal 12.
Døre - træ/metal	Dobbelt træder Venstre ud Venstre-glænde	H12	H12.H.6	Hal 12 - nordlig ende - streekskate område. Udgang mod silo i nordlig gavl	1	210 x 195 cm		Prøvetaget. Miljøforhold i maling: A2 B2 C2 (PCB)	God stand	Karmkræver skrues ud og døreri inkl. karm tages forsigtigt ud. Der opbevares fastmonteret i karm. Støve og propper gemmes. Håndtag og greb afmonteres og opbevares sammen med døren. Døren stilles lodret på palle, med skråtvejs monteret (som ved ny dør). Opbevares tørt og indendørs.	A - B Kan bruges til konstruktion i skure. Kan alternativt bruges indendørs hvis maling afrenses.
Døre - træ/metal	Dobbelt stider Venstre ud Venstre-glænde	H12	H12.H.7	Hal 12 - nordlig ende - streekskate område. Udgang i vestlig facade	1	210 x 150 cm		Prøvetaget. Miljøforhold i maling: A2 B2 C2 (metal) (gennemsnitkoncentration)	God stand	Karmkræver skrues ud og døreri inkl. karm tages forsigtigt ud. Der opbevares fastmonteret i karm. Støve og propper gemmes. Håndtag og greb afmonteres og opbevares sammen med døren. Døren stilles lodret på palle, med skråtvejs monteret (som ved ny dør). Opbevares tørt og indendørs.	A - B Kan bruges til konstruktion i skure. Kan alternativt bruges indendørs hvis maling afrenses.

Construction material passport, databank and digital marketplace for recovered materials

A material passport will be created for selected materials from the demolished buildings. A virtual material bank is sketched and will be used for hall 11/12 - both for materials going out (in the selective demolition) and in the new renovated hall. The first version consists of an Excel sheet for each material, describing its lifespan, what kind of testing it has to go through, and where it could end up in future uses.


The virtual material passport and databank are merged in one database. The circular procurement strategy includes use of the virtual material bank to source and supply secondary construction materials. The data is extracted from BIM models and kept in a database.

In Roskilde a commercial platform called Upcycling Forum is used as a database for the time being. Upcycling Forum acts also as a digital marketplace, where the registered materials can be placed in a public domain for sale if wanted. But mainly Upcycling Forum acts as a database for all municipality circular materials.









All materials identified during the screening of Hal 12 have been placed on Upcycling Forum, where they are viewable for all users in Roskilde Municipality.

Upcycling Forum Upcycling Bank Dashboard K

DASHBOARD <<

 Roskilde Kommune

- Overview
- Projects
- Materials**
- Products
- Demolitions
- Users
- Settings

 <p>SF-betonfliser</p> <p>Price: 0.00 DKK Amount: 2 m³ CO₂e: -</p>	 <p>Kranspor (inklusive tværliggere)</p> <p>Price: 0.00 DKK Amount: 1 piece CO₂e: -</p>	 <p>H-bjælker</p> <p>Price: - Amount: 6 CO₂e: -</p>	 <p>Stålprofiler</p> <p>Price: 0.00 DKK Amount: 10 pieces CO₂e: -</p>
 <p>Limtræsspær, kip</p>	 <p>Trapez-plader</p>	 <p>Vinduer</p>	 <p>Vinduesrammer i træ</p>

During the procurement period of the demolition of Hal 12, all relevant people will have access to the database and the construction material passport has been part of the tender for the demolition.

Roskilde asks for the BIM in the tendering process for each building to be built at Musicon, to ensure such documentation is available for the future. Contractors need to provide a Revit/BIM model level of detail of each building with amounts/ types of materials.



CityLoops is an EU-funded project focusing on construction and demolition waste (CDW), including soil, and bio-waste, where seven European cities are piloting solutions to be more circular.

Høje-Taastrup and Roskilde (Denmark), Mikkeli (Finland), Apeldoorn (the Netherlands), Bodø (Norway), Porto (Portugal) and Seville (Spain) are the seven cities implementing a series of demonstration actions on CDW and soil, and bio-waste, and developing and testing over 30 new tools and processes.

Alongside these, a sector-wide circularity assessment and an urban circularity assessment are to be carried out in each of the cities. The former, to optimise the demonstration activities, whereas the latter to enable cities to effectively integrate circularity into planning and decision making. Another two key aspects of CityLoops are stakeholder engagement and circular procurement.

CityLoops started in October 2019 and will run until September 2023.



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