

DIGITAL DECONSTRUCTION (DDC)
Advanced Digital Solutions Supporting Reuse
and High-Quality Recycling of Building Materials

DT 3.1.6
**PREPARATION OF PILOT
SITES FOR DECONSTRUCTION**

HOF TER LAKEN (BELGIUM)
STICHTING KEMPENS LANDSCHAP

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1. Introduction

Construction and demolition waste (CDW) accounts for about 1/3 of all waste produced in the EU. Approximately 50% of this amount is currently recycled in most EU countries, however the majority of CDW is destined for backfilling and other low value applications (down cycling). In Northwest Europe countries, reuse and high-quality recycling (upcycling) of CDW remains below 3%. The most disregarded is the end of life of the building who must be seen as a resource and not as a waste.

Digital DeConstruction (DDC) aims to develop an innovative digital decision support system, integrating various digital tools (3D scanning, Building Information Modelling, a digital materials & buildings database, blockchain technology) that helps to define the most sustainable and economical deconstruction and reuse strategy for buildings. The integrated DDC system will enable reuse and highquality recycling of 25% of materials sourced from deconstructed buildings.

In order to improve and develop this technology, different pilot sites are in progress. In Belgium, Stichting Kempens Landschap will deconstruct some annex buildings and the interior of one wing of the outbuilding of Hof Ter Laken in Booischot (Heist-op-den-Berg).



Picture 1: the castle of Hof ter Laken



Picture 2: The outbuildings next to the castle

De building complex, which is situated next to the castle and which is also protected as a monument, consists of a former coach house with horse stables, housing for staff, an old bakery and two barns. The spatial implementation plan for Hof Ter Laken provides that these two barns could be constructed and new volumes could be built in place, in order to increase the economic feasibility of the whole project. (After all, the restoration will cost a lot of money).

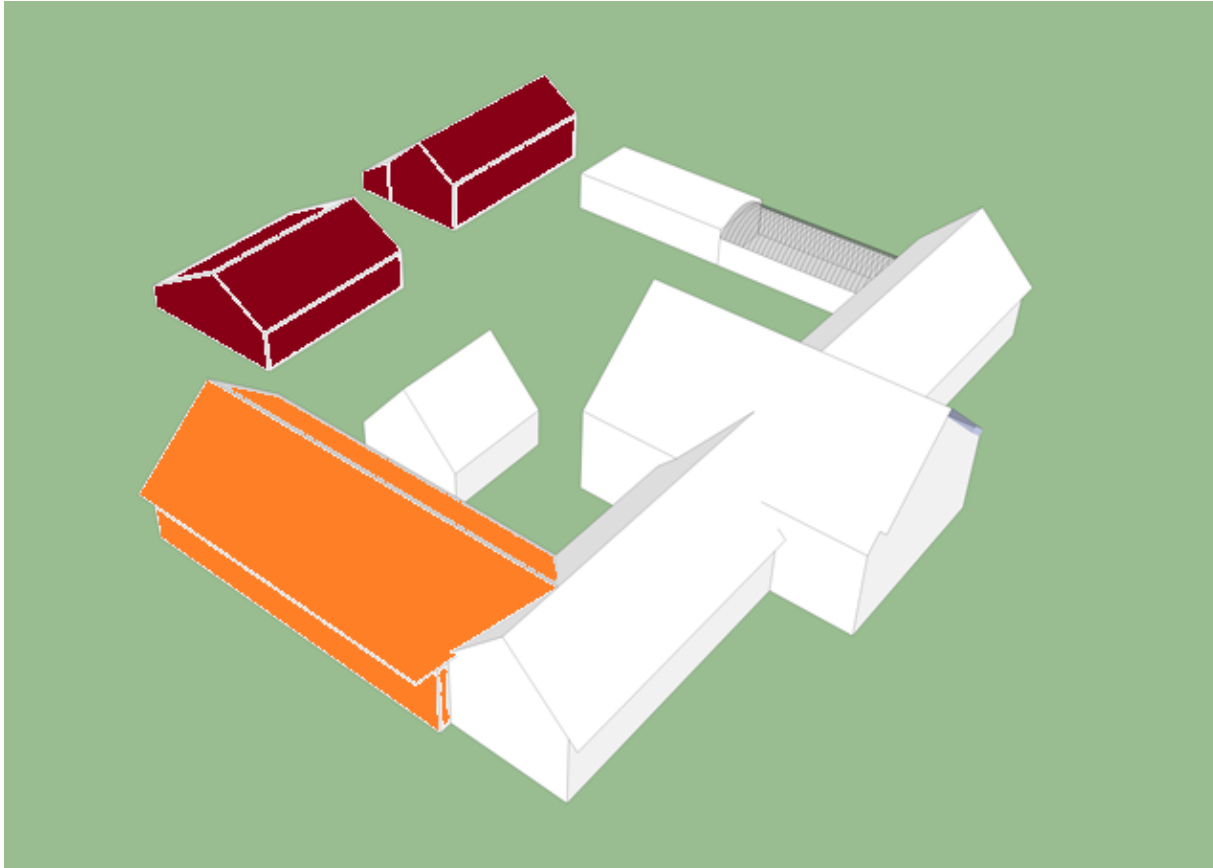


Figure 1: The outbuilding of Hof Ter Laken. Red: the two barns that are deconstructed. Orange: the northern wing of which the interior is deconstructed in DDC

The project is carried by a founding, named Stichting Kempens Landschap. This is a Belgian organization, that is part of the provincial government of Antwerp. The organization aims to preserve and revitalize heritage sites and valuable landscapes for the community. Since 2018 she owns the castle grounds of Hof Ter Laken, together with the municipality of Heist-op-den-Berg. In the coming years, a major restoration of the castle and outbuildings will take place, for which the current demolition works form an initial preparation.

For the guidance, supervision and follow-up of the deconstruction, Kempens Landscape enlisted the services of the architectural firm Erfgoed & Visie, which worked together with their sister organization U-Mine.



Picture 3: the exterior of the northern barn, situated behind the former stables and residential wings



Picture 4: the interior of the northern barn



Picture 5: the exterior of the southern barn, next to the northern one



Picture 6: the interior of the southern barn



Picture 7: the exterior of northern wing of the outbuildings, of which only the interior has to be deconstructed



Picture 8: the interior of the northern wing of the outbuildings

The following document brings together the different steps before the demolition of the two barns and the interior of the northern wing of the outbuildings. Then we will describe the progress of the deconstruction works, which started on the 13th of June 2022.

2. Preparation for the deconstruction

In Belgium, different steps must be followed before starting a deconstruction, especially when it comes to protected heritage. These steps include an audit for the materials, a pollutants analysis, an environmental permit including a demolition permit with a demolition follow-up-plan, an authorization for the demolition by the Flemish heritage agency, a public tendering to find a contractor and the execution of the deconstruction works.

2.1. Pollutants analysis

In order to have an overview of which hazardous materials were present in the castle and outbuildings, an asbestos inventory was already carried out by Kempens Landschap before the start of this DDC project. This happened in November 2019. The actual removal of the asbestos-containing materials continued in the autumn of 2020.

2.2. Audit of the materials

To get an overview of which materials were present in the buildings, to be able to make choices about which materials should be preserved and recovered on site (in the restoration of the castle and the other parts of the depot), to organize the tender and to efficiently organize and carry out the works, Erfgoed & Visie drew up a materials inventory together with U-Mine.

They did this on site, where they manually collected all the information regarding materials inside and on the facade of the building. A file was drawn up for each material, containing the description of the material, the quantities, the dimensions, the condition, the (heritage) value, etc. This inventory is in the Appendix 1.

Based on this audit, Kempens Landschap could make up their Reuse Strategy (see also DT3.2.3)

2.3. Environmental permit and demolition permit

In each Belgian city of municipality, any big transformation to a building (construction or deconstruction) needs a permit from the city authorities. Stichting Kempens Landschap therefore had its architectural firm draw up an application for an environmental permit with demolition permit to deconstruct the two barns behind the building complex of the outbuildings.

In Flanders, A “demolition follow-up plan” is mandatory when applying for an environmental permit for certain demolition, dismantling and renovation works. The demolition follow-up plan is a tool for selective demolition and selective collection on site. It has following purposes:

- Hazardous waste can be removed from the building or construction prior to the actual demolition.

- Selectively collected fractions on site can be taken directly for recycling as pure fractions.
- When the site is monitored by the demolition management organization Tracimat, the rubble can be transported to a crusher as a low environmental risk profile.

We submitted the necessary documents on July 16, 2021. Since the demolition works were already foreseen in the spatial implementation plan for the castle park of Hof Ter Laken, the permit was granted even though the buildings were protected as monumental. The approval took place on November 3, 2021.

2.4. Authorization by the Flemish Heritage Agency

To also be allowed to demolish the interior of the north wing of the outbuilding, we submitted an authorization request to the Flemish Heritage Agency on November 18, 2021. This application consisted of a document justifying the deconstruction and the reuse inventory drawn up by U-Mine. The Heritage Agency gave its admission on December 16, 2021.

2.5. Public tender

The documents for the public market consultation were drawn up by Erfgoed & Visie in the winter of 2021-2022. The documents were ready on January 24, 2022. The procedure was organized with a negotiation procedure without publication. The tendering documents were delivered to 9 contractors. Six contractors did not submit a tender due to lack of time to prepare the documents and/or carry out the work. Of the remaining three candidates, contractor PIT Eiffage was the most advantageous. The works were dedicated to them on May 5, 2022.

2.6. Organization of the works: storage management, safety measures,...

The great advantage of the large amount of available space in Hof Ter Laken is that the materials that could be removed completely intact during the deconstruction and would be used in the later restoration works, could be stored on site. Clear conditions were included in the specification documents of the public tender.

Clear provisions were also included in the specifications with regard to safety, site closure and organisation of the deconstruction works. The safety measures for the worksite were coordinated by the safety and health coordinator.

3. Overview of the deconstruction progress

On June 13, 2022, contractor PIT received an order to start the works from Kempens Landschap. The execution period was set at 50 days, which is sufficient for a demolition site of a total of 400 m² ground area. They started on site right away.

Since the materials to be reused would be stored in the northern wing, of which the interior had to be deconstructed as well, PIT started its work there. The false ceiling was removed, sanitary appliances broken out, heating removed, the walls broken out, and the floor removed.



Picture 9: Deconstruction works in the interior of the northern wing

The materials were sorted by type. Some were removed if this was necessary or if this was determined within the established reuse strategy. Other materials, such as the wooden beams of the false ceiling, were carefully removed, cleaned and preserved.

After the works had been carried out in the north wing, the deconstruction of the barns was started. PIT started with the dismantling of the roofs, of which the roof tiles and wooden beams were recovered.



Picture 10: Dismantling of the roofs



Picture 11: Storage of the roof tiles



Picture 12: Storage of the wooden beams

Then they started with the interior of the northern barn, followed by the exterior. Since there were almost no valuable materials to be recovered here, the execution of this was done fairly quickly and roughly, with larger machines instead of manual operations.



Picture 13: Demolishing of the northern barn



Picture 14: Banner with the necessary information and the Interreg logo

The last building to be deconstructed was the south barn. It contained the most valuable materials, and was therefore carefully dismantled step by step.



Picture 15: Ongoing deconstruction works of the southern, most valuable barn

All materials were sorted. The non-valuable (e.g. metal pipes) were removed, the valuable materials, such as the bricks in the walls, old floor tiles or reusable windows, were carefully cleaned, counted, measured if necessary and safely stored on site.



Picture 16: Cleaning, measuring and storing of the materials to be reused

4. Conclusion

In the current context of resource scarcity and especially climate issues with the reduction of CO2 emissions, countries and companies are increasingly seeking to develop the local circular economy and the recycling of elements designated as waste. Many demolition projects recover their waste in recycling centres where the element is destroyed, and the raw materials are recovered to make other elements. But actually, this waste is not a waste but a new resource. The importance of reuse becomes more important in this context.

This is what we also want to demonstrate in the project of Hof Ter Laken. The demolition works were carried out in such a way that maximum efforts were made to recover and reuse materials.

Instead of using large machines, roof tiles were removed one by one, wooden roof trusses were dismantled beam by beam and the valuable brick walls were carefully demolished. In this way, the historical and/or economic valuable materials were preserved as much as possible. Contractor PIT Eiffage from Kapellen was hired to carry this out. They emerged as the best bidder from the tender that ran in March-April and were able to start work from June. These progressed well, so that all demolition work has already been done today and the reusable materials are now neatly stacked in the north wing and outside on the site. These will come in handy during the restoration work on the buildings in the coming years.

It can be estimated that 55% of the released materials will be reused on site and 44% will be recycled elsewhere.



Picture 17: Result of the deconstruction works

5. Appendix – Material inventory