

## Semi-selective demolition: current demolition practices in Flanders

Jef Bergmans<sup>1</sup>, Philippe Dierckx<sup>2</sup>, Sofie De Regel<sup>3</sup>, Annelies Vanden Eynde<sup>4</sup>,  
Philippe Van de Velde<sup>5</sup>, Kris Broos<sup>6</sup>

<sup>1</sup>VITO, Unit Sustainable Materials Management, Boeretang 200, 2400 Mol, Belgium, (+32) 14335616, [jef.bergmans@vito.be](mailto:jef.bergmans@vito.be)

<sup>2</sup>VITO, Unit of Sustainable Materials Management, Boeretang 200, 2400 Mol, Belgium, (+32) 14335680, [philippe.dierckx@vito.be](mailto:philippe.dierckx@vito.be)

<sup>3</sup>VITO, Unit Smart Energy and Built Environment, Thor Park 831, 3600 Genk, Belgium, (+32) 14335819, [sofie.deregel@vito.be](mailto:sofie.deregel@vito.be)

<sup>4</sup>Vlaamse Confederatie Bouw, Tracimat vzw, Lombardstraat 34-42, 1000 Brussels, Belgium, (+32) 25455860, [info@tracimat.be](mailto:info@tracimat.be)

<sup>5</sup>OVAM, Team Eindverwerking en Bouw, Stationsstraat 110, 2800 Mechelen, Belgium, (+32) 15284143, [philippe.van.de.velde@ovam.be](mailto:philippe.van.de.velde@ovam.be)

<sup>6</sup>VITO, Unit of Sustainable Materials Management, Boeretang 200, 2400 Mol, Belgium, (+32) 14335636, [kris.broos@vito.be](mailto:kris.broos@vito.be)

### ABSTRACT

Construction and demolition waste (C&DW) represents one of the EU's largest waste streams. Eurostat (2010) estimates a C&DW generation of 970 Mton/year in the EU-27 ( $\pm 2$  ton/inhabitant), with an average recovery rate of 47% [1]. To reach a higher recycling rate, **higher-purity material streams from C&D works** are required. These can be obtained by a better sorting at the source, i.e. selective demolition.

We performed **5 demolition case studies** in Flanders to assess the opportunities and challenges of selective demolition processes, both on industrial and residential buildings. Furthermore, a **new quality management and traceability system**, developed by Flemish construction confederation VCB, was tested in 3 of these case studies. This monitoring system aims at the certification of waste streams that originate from selective demolition. For the different case studies, different bottlenecks and best practices were defined.

In these case studies, the **selectivity of the demolition** is driven by the **economic incentives** of the Flemish market (high landfill fees and differential gate fees at recycling plants) and **obligations from Flemish/Belgian legislation** (e.g. mandatory elimination of asbestos and other hazardous materials). These incentives make “**semi-selective demolition**” current practice in the Flemish region. We define semi-selective demolition as a demolition work where the demolition company selectively collects all hazardous substances and that part of the non-hazardous substances that would overly reduce the quality of the stony fraction. The selective collection of the latter is determined by their value, the acceptance policy of the crushing installations of the stony fraction and by the time consumed for selective removal.

**Keywords:** case studies; demolition; stony fraction, current practices

## INTRODUCTION

Construction and demolition waste (C&DW) represents one of the EU's largest waste streams. Eurostat estimates an annual C&DW generation of 970 Mton in the EU-27 (almost 2 ton per inhabitant), with an average recovery rate of 47%. In the Flemish region (Belgium), this recovery rate is >90%, since the stony fraction of C&DW is recycled for almost 100% as recycled aggregates. However, these recycled aggregates are mainly used in low-grade applications (e.g. subfoundations) and this market is getting increasingly saturated. Therefore, the development of more high-grade applications is needed. These high-grade applications require higher-purity material streams, which can be obtained by a better sorting at the source, i.e. selective demolition.

## METHODOLOGY

VITO, in cooperation with OVAM and VCB, performed 5 different demolition case studies in Flanders to assess the opportunities and challenges of selective demolition processes, both on industrial and residential buildings. These case studies were performed within the H2020 project HISER and in projects commissioned by the Flemish waste agency OVAM. The case studies were monitored by field visits and a follow-up of the treatment certificates of the produced material streams.

In 2 case studies, the demolition works were documented without interfering in the process in order to assess the Flemish business-as-usual (BAU) demolition practices. We selected a complex with 20 apartments and an old milk factory for this task (Figure 1).



**Figure 1. BAU case studies (left: apartment complex, right: old milk factory).**

Furthermore, a new quality management and traceability system, developed by the Flemish construction confederation VCB, was tested in 3 case studies. This monitoring system aims at the certification and quality assurance of waste streams that originate from selective demolition. We selected the following buildings: a single family house, a residential care center and part of an incineration plant (Figure 2).

From the different case studies, different bottlenecks and best practices were defined.



**Figure 2. Case studies for the testing of the monitoring system (left: single family house, middle: residential care center, right: incineration plant).**

## RESULTS & DISCUSSION

In a first stage of a BAU demolition project, the hazardous substances (e.g. asbestos, mercury-containing lamps, PCB-containing equipment) that are present in the buildings are removed (decontamination). The performance of this decontamination step mainly depends on legislation and law enforcement.



**Figure 2. Hazardous materials (left: PCB-containing transformer, middle: mercury-containing lamps, right: asbestos).**

Afterwards, easily removable materials (e.g. furniture) are removed. After the building is stripped the structural elements are demolished by a crane or other equipment. Also in this phase, several material streams are sorted separately (e.g. window frames, metal pipes). This selective collection of non-hazardous substances is driven by economic incentives. For selective demolition to become standard practice, the following challenges have to be tackled:

- **A lack of cost efficient techniques for the selective deconstruction and removal of “complex” materials.** In several studied case studies, this was the case for the removal of gypsum plaster. The presence of gypsum plaster in the stony fraction hampers high-grade recycling but selective removal is labor-intensive. A similar problem arised with the removal of organic insulation materials (e.g. PUR foam) (Figure 3). The presence of the latter is expected to be higher in the demolition projects of the future. It is important to continue to invest in research to efficiently remove these complex materials and design construction products that are easier to dismantle.
- **A need for valorization pathways for the selectively removed fractions.** The extra costs for selective demolition (including labor costs, extra containers and transport) need to be countered by lower disposal costs (or a higher positive value) for the produced fractions. Better valorization routes and/or improved logistics are needed for certain fractions (e.g. insulation materials, gypsum).

- **Market development for high-grade recycled aggregates.** The production of a stony fraction that is suitable for high-grade recycled aggregates requires extra demolition steps (e.g. selective removal of gypsum, glass). A more and better valorization of high-grade recycled aggregates (e.g. the use in high-grade concrete) will lead to differential gate fees for stony fractions of different qualities at recycling companies. Next to technological challenges, this also requires an increase of the public acceptance and a change in norms and standards.
- **Public procurements often have a strong focus on the financial aspects of demolition works.** If authorities want to promote selective demolition, they could demand the selective removal of certain fractions in the specifications of their public procurements.



**Figure 3. Examples of complex insulation materials that are difficult to dismantle (left: expanded polystyrene, right: polyurethane foam).**

The case studies also indicated a big quality difference in pre-demolition waste inventories. Some inventories are of such low quality that they are not considered useful by the demolition contractors. An incomplete inventory can seriously hamper the selectivity of the demolition process. Additionally, there is often not enough knowledge on the potential presence of hazardous substances (e.g. PCBs, tar). Therefore, the contractors recommend training and a certification program for the experts composing the inventories. This is one of the problems that the quality management system developed by VCB tackles.

## **ACKNOWLEDGEMENT**

Part of this research has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No642085.

## **REFERENCES**

[1] C. Pacheco-Torgal, “Eco-efficient construction and building materials research under the EU Framework Programme Horizon 2020”, *Construction and Building Materials*, vol. 51, pp. 151-162, 2014.