

# BIM-based inventory to prepare a circular demolition

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They are called the twin revolutions, digitization and sustainability. And they are gaining momentum. In construction and deconstruction, digital tools are proving their value to help reach a higher level of circularity. Lionel Bousquet applied a BIM model to make a digital inventory of all the materials in Communication Centre North (CCN), making possible a more accurate and circular demolition.

CCN is an iconic building next to the Brussel North railway station. It was part of the Manhattan plan in the sixties. Constructed in 1973, the building grew over time. In the eighties, two levels were added as office

space and in the nineties, another office building was placed on top. The distinction between the three parts is clear: the new levels are dominated by steel structure glass panels.

## 90.000 M<sup>2</sup> FOR DEMOLITION

Today the CCN and its 90.000 m<sup>2</sup> are destined for dismantling and demolition. The current owners Atenor, AXA and AG-Real Estate united under the company CCN Development want to transform the space to modern standards. The monolithic building has to make way for four towers that will be constructed on the original foundation

allowing a broader range of uses; offices, a shopping mall, housing and public space for the community. The iconic bell towers of the railways station Brussel Noord will be visible again. This concept is in line with the plans of the government of Brussels to turn the North quarter into a more mixed neighborhood.

## A BIM FOR CIRCULAR DECONSTRUCTION

To get a better idea of what the demolition would entail, Lionel Bousquet of BX-LMRS Architects was contracted to make



Large quantities of marble slabs were carefully dismantled and packaged by reuse operators. © Build-wise

a Building Information Model (or BIM). “All they had to go on were the original plans, but the reality is always very different from what is mentioned on paper. A BIM would give them more detailed information of what is in the building. BIM is a modelling technique that is certainly becoming more popular for new buildings. But the possible advantages for demolition are not widely explored yet. One of the challenges is to build a BIM with the appropriate level of detail to fit the objectives of the project. I focused on making a digital inventory of the existing building that captured all the spaces and all the materials inside. The perfect start for a circular demolition.”

## WAY OF THE FUTURE

Lionel Bousquet, who pitched the idea to the building owners himself, is convinced that this is the future way to go. He also applied it on his own house. “I live in a typical house in Brussels, for which a renovation was required. So I used BIM to calculate, evaluate and execute the design and also to carefully deconstruct each material. The more knowledge we gain about the differ-

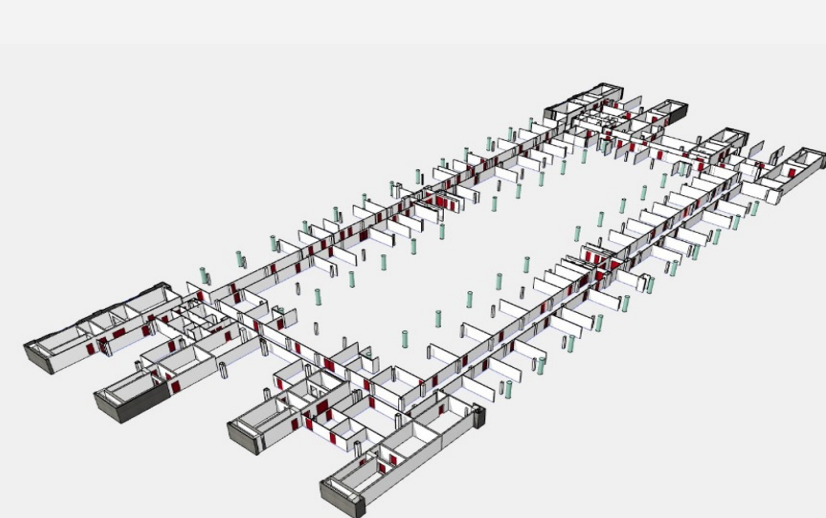
ent elements in a building, the more possibilities we can see to reuse and recycle materials. The inventory was transformed into a depot of materials for professional builders interested in reuse of materials. I also calculated the cost per hour to see if it was worth the while financially.” The project earned him a BECircular Award.

*“The more knowledge we gain about the different elements in a building, the more possibilities we can see to reuse and recycle materials.”*

## MODEL FIRST, ADD INFORMATION LATER

Lionel Bousquet applied the same principles to the CCN. First order of business: get an idea of the situation on the site. Bousquet entered the CCN physically and visited every room to map out the entire volume. “Constructing a BIM of the building is the first step. Then you go back and start adding more information to the model. Like what type of lighting is used in each room, what heating system is present, what materials are on the walls ... I did not need to

model every element in detail, as the objective was to use the information for deconstruction. For example, I choose not to model marble slabs individually, but to indicate the marble-covered area. I also used IFC spaces, to represent rooms, to which I attached specific properties, such as lighting and flooring, to avoid modelling them in 3D. You can also use the software to model certain elements and then copy them into every room, an advantage when modelling



CCN Inventaire Portes R+8							
Etage	Vue 2D	ID	Type	Taille L x H	Seuil	Surfaces	Quantité
R+8, Porte		Porte bois mélaminé	Double	1,32x2,04	0,269		2
		Porte bois mélaminé	Double	1,44x2,04	0,294		2
		Porte bois mélaminé	Double	1,52x2,10	0,318		2
		Porte bois mélaminé	Double	1,93x2,04	0,394		4
		Porte bois mélaminé	Double	2,13x2,04	0,435		2
		Porte bois mélaminé	Simple	0,63x2,04	0,145		2
		Porte bois mélaminé	Simple	0,73x2,04	0,166		8
		Porte bois mélaminé	Simple	0,83x1,40	0,3129		1
		Porte bois mélaminé	Simple	0,83x2,04	0,187		120
		Porte bois mélaminé	Simple	0,93x2,04	0,208		4
		Porte bois mélaminé	Simple	1,03x2,04	0,228		24
		Porte bois mélaminé	Simple	1,73x2,10	0,364		1
		Porte bois mélaminé	Simple	1,77x2,10	0,371		1
		Porte bois mélaminé	Simple	1,91x2,10	0,401		2
		Porte vitrée	Simple	0,83x2,04	0,187		5
						371,71 m²	180

The BIM of the CCN can be used to extract material quantities, such as the number and types of doors © BXL MRS Architects



Lionel Bousquet (BXL MRS Architects), shows the BIM of the CCN on a tablet, through a user friendly app.

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buildings with repetitive features. Adapting the modelling strategy to the required level of detail helps to be efficient." For his next projects, Bousquet thinks of first entering the building with a 3D scanner, to cre-

ate 3D point clouds. Quick to obtain, point clouds do not provide geometric information, nor allow quantity take-offs. They can, however, be used as a support to speed up the modelling process.

*"Once you have your BIM model and the level of information you need, the possibilities for the building owner are endless."*

## 518 HOURS TO PREPARE

In total Bousquet worked 518 hours on his detailed BIM model of the CCN. "I spent most of my time (73,5%) on the implementation of the BIM model and the survey and control of the plans (13%). Once you have your model and the level of information you need, the possibilities for the building owner are endless because you have a detailed digital inventory. A database of building in-

formation. You can for instance calculate with just one click of a button how much steel is still present for reuse. You can define what you want to keep, sell or demolish in a very accurate manner. Everything a building owner needs to negotiate a better demolition contract and to incorporate circularity into the design of his new building. Something the BREEAM standards ask for."

## WORK TO BE DONE

In this instance the BIM model was only used during the negotiation of the demolition contract. It proved to be a valuable instrument to make precise quantity take offs on which demolition contractor De Meuter based his offering. The deconstruction started with the cautious dismantling of reusable elements, such as marble flooring and Corten steel ceiling elements. ROTOR was one of the reuse operators involved on site. The building was then stripped of non-structural elements. Finally, important quantities of metal beams and concrete, destined for recycling, were deconstructed. “Despite the BIM being made available, De Meuter not use it during the demolition. A transition phase indeed seems necessary for all actors to learn how these tools work and integrate them in the their way of working today. The promotion of digital tools can be one of the levers to in-

crease implementation of digital tools in the deconstruction sector”, adds Eléonore de Roissart from Buildwise. With the Interreg project Digital Deconstruction they aim to do just that.



The metallic structure, revealed after the strip-out of the building. After sandblasting of fire-resistant flocking, it will be deconstructed by De Meuter, and sent to a smelter for high-value recycling.  
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## PRAGMATISM AS A RULE

For Lionel Bousquet, BIM modelling is the ideal starting point for any circular demolition. “Because you can offer the right information to each party involved. The biggest hurdles for a larger deployment of these techniques in deconstruction are the cost and the lack of trained personnel. In addition, you have to know what to model and what not, to make the process affordable. A good dose of prag-

matism is required”, adds Bousquet with a wink. “But the more you familiarize yourself with BIM software, the more time you will gain and the easier it gets to make the right analysis for your clients. You don’t just get a list of the materials, you also get the plans in 3D to make everything much more visible. BIM modelling is a very powerful tool to produce plans and manage information.”

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