Interreg North Sea Region ProCirc
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Pilot Case Study

Circular Building ‘t Centrum

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English version - Kamp C: centrum voor duurzaamheid en innovatie in de Bouw

Introduction

‘t Centrum is the first fully circular office building in Flanders. It has a well-thought-out circular design and a conscious choice of materials, techniques and innovative business models. The building, including the roof construction, can be entirely dismantled and thus reused as such. The foundations can also be easily recovered and reused. All materials are included in a so-called Building Information Model (BIM), containing an integrated material passport that allows an inventory to be drawn up at any time. The building has an open structure with moveable walls, so it can easily be adapted to new needs.
‘t Centrum is the result of Kamp C’s holistic approach to what it believes circular construction means. As the regional centre for sustainability in construction, Kamp C developed ‘the seven pillars of circular construction’ and set up this demonstration project to show how this theoretical framework can be put into practice.

Procurement process

A description of the process and experiences can be found in this Interreg NSR ProCirc webinar. The chosen procedure is a competitive dialogue (two-step procedure). All tender documents and an elaborate evaluation report can be found on the Kamp C website (in Dutch).

Because of the circular ambitions and the wish to do things differently, it was important from the outset to get the right parties around the table with a similar, circular mindset. In 2019, masterclasses were organised with well-known speakers to discuss circular procurement. During these masterclasses, the plans for ‘t Centrum were highlighted. These masterclasses attracted considerable interest and enabled participants to team up and start cooperating.

A brief vision document was written, containing **four ambitions:**

1. Future-proof sustainability – Circularity: transition from traditional to circular, a prominent example of a circular building.
2. Future-proof sustainability – Flexibility: ability to respond to changing spatial and functional needs.
3. Responsible sustainability - Health & well-being: a building with a healthy and comfortable environment.
4. Image: Kamp C is an accelerator of the circular economy, so the building should set an example for the construction sector.

The scope was set:

- Design, build, maintain and ensure energy for 20 years for a fixed budget (EUR 1 million in building resources and another million or EUR 50,000/year for the operational phase).
- The tenderers could receive extra points for the use of circular business models. A relatively low investment budget and high operational budget was established to encourage this.
- One building consortium from the start. An architect, engineer, constructor, energy consultant and so on were involved from the beginning.
- 100 workspaces. Initially, the scope was 1,000 m^2 of office space. However, the fixed budget was quite tight. During the dialogue sessions, the ambition was lowered from 1,000 m^2 to 100 workspaces. In the final document, the amount was further lowered to 60 workspaces and 40 flexible workspaces.
- Extra possibility to develop up to 3,000m^2.

Specifications:
Functional needs were specified, combined with a qualitative selection procedure. This choice was made to create as much scope for innovative solutions as possible.

The tender emphasised both the product (the building) and the process (the way to achieve it). The cooperation between the consortium members and Kamp C contributed to a successful project.

Selection and award phase:
In addition to the selection criteria, the subscribers had to submit a note with a maximum of 2,000 words. Seven consortia ended up expressing interest. A jury with an independent chair narrowed the choice down to three. Subsequently, dialogue sessions were held with each of them to talk in detail about the procurement documents and improve them where necessary based on feedback from all parties. The winning consortium consisted of seven companies: Beneens, TEN, STRENGth, Muurtuin-Ecoschelp, West Architectuur, Tenerga and VITO.

Results

- Over 50 different companies participated in the procurement process for this pioneering construction project. It was a huge success, especially in light of the fact that this sector is still considered to be conservative. This underlines the need for change, also from the side of the executing parties (e.g. suppliers, builders and architects).

- A well-thought-out design, prefabrication and dry connections resulted in an extremely short building time of 11 months (from the moment construction began to the moment the building was taken into use). This design was achieved by chronologically reversing the design process, imagining different future scenarios for the building and trying to ensure that these complement the design. This also ensured that the design covered more than just the current needs: for example, what if this piece of land will be needed for other purposes and the building will need to go? What if the province ceases to exist and this building will have new occupants? What if the organisation grows or shrinks? The short on-site building time was therefore

a natural consequence of the search for a flexible future building design.

- Compared to concrete and steel constructions similar in size, this building saves 108% on CO_2 emissions over a span of 20 years. 't Centrum will therefore have a net capture of CO_2 over the course of 20 years due to the use of natural building elements such as wood. On the other hand, business-as-usual scenarios such as steel and concrete, would undoubtedly generate far higher emissions (an average area of about 100 soccer fields of forest would be needed to capture these emissions). Link to the LCA analysis.

- Employees of Kamp C and other co-owners of the building have been moving in since May 2022. User feedback is positive thus far, emphasising the benefits of working in a healthy, pleasant and facilitating workplace.

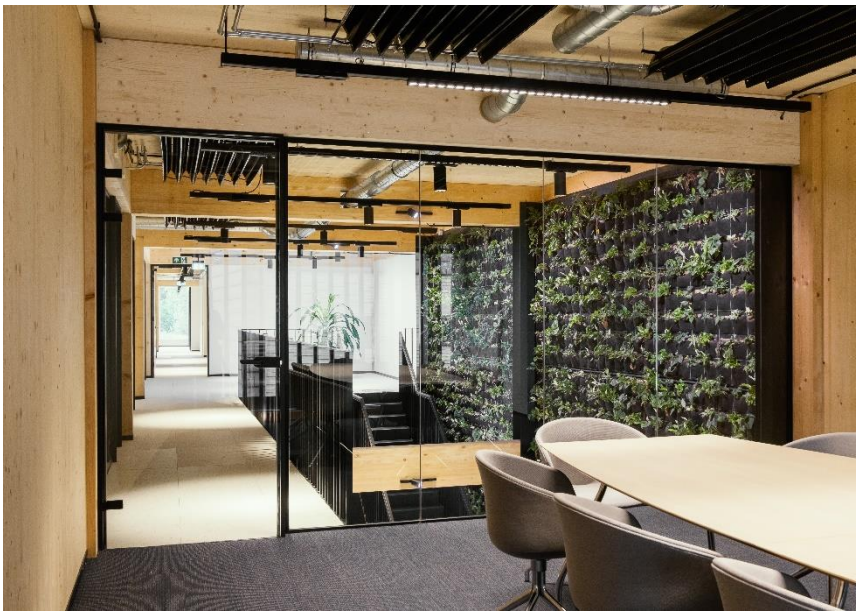
- Kamp C offers guided tours explaining the entire process from procurement to end result. These tours are highly frequented by all stakeholders in the construction industry, and this tangible and open approach seems to be motivating parties to take action themselves.

Lessons learned

Overall: Contrary to what most people seem to think, circular construction is not only about climate action and environmental impact. It is also about enriching the environment and lives of everyone involved. You get out what you put into it. If the main tendering criterion is a low price, then the best offer will often be submitted by companies driven by a profit motive with little regard for sustainability. If the main tendering criteria are health, future-proof qualities and comfort, on the other hand, then the best offers will be come from companies that share these same values. The chances of mutually rewarding cooperation in this kind of construction process are much higher (mutual interests) than in one that focuses mainly on the price (opposing interests). The latter often leads to a conflict-based relationship.

Other lessons learned:

- To ensure that the circular ambitions succeed, create a support base at every level of the organisation
- Find the right partners to cooperate with
- Involve all stakeholders from the beginning
- Do not start from scratch: plenty of pioneers are willing to share
- And finally, do not get stuck analysing things, simply get started



Background information

Interreg NSR ProCirc pilots aim to save at least 25% on CO_2 emissions, waste or virgin materials. This chapter explains how our pilot 't Centrum lives up to this goal.

An LCA analysis was performed by Muheeb Al-Obaidy from the University of Liège.

Reduction in CO_2eq

Please refer to the analysis of the global warming potential in the aforementioned LCA study. The building of 't Centrum was compared to simulations of the same building in different materials (concrete, steel, hybrid). Over the course of 20 years, 't Centrum will have a negative carbon impact of -62 tonnes of CO_2eq (due to the biogenic carbon storage in the timber frame) whereas the other three hypothetical scenarios (referred to as 'business-as-usual' scenarios) represent a carbon emission of 866 tonnes of CO_2eq, 655 tonnes of CO_2eq and 718 tonnes of CO_2eq respectively for the steel, concrete and hybrid constructions.

't Centrum will therefore have a net capture of CO_2 over the course of 20 years, whereas the other hypothetical buildings would undoubtedly generate far higher emissions (an average area of about 100 soccer fields of forest would be needed to capture these emissions).

The goal of Interreg NSR ProCirc is to save at least 25% on CO_2 emissions. The aforementioned numbers relate specifically to the used materials of this building. Energy consumption is assumed to remain the same (HVAC: heating, ventilation and cooling). A reduction of 25% on an average emission level (746 tonnes of CO_2eq) would result in a net emission of 560 tonnes of CO_2eq, whereas we achieved -62 tonnes of CO_2eq, a **108% reduction**. It is thus safe to state that this goal has been achieved.

Even if we were to ignore the biogenic carbon storage within the timber, a **57%** savings on CO_2 emissions would be achieved compared to the business-as-usual scenario.

Virgin materials

It is harder to quantify the reduction in the use of virgin materials. The different scenarios used in the LCA analysis mainly focus on the structural components (wood, concrete, steel), and apart from that the baseline is the same. This baseline takes into account elements such as the building design, choices of secondary building materials, which have already been approached in a circular way:

- Compact building design with shared ownership and shared spaces
- Reused elements such as carpet tiles, stairs, façade cladding, toilets
- Low impact materials such as sea shell insulation, wood fibre insulation, zero cement concrete foundations, calcium screed with recycled aggregates

All these elements will contribute in a positive way to the amount of virgin materials used; however, they are not reflected in numbers in the LCA comparison as they are part of the common baseline.

That aside, the sheer impact of the primary materials is highly significant. The table below is based on table 2 on page 9 of the LCA report *(Breakdown of primary material groups based on their weight for four construction scenarios)*:

	Timber ('t Centrum)	Steel construction	Concrete construction	Hybrid construction	Avg Steel-Concrete-Hybrid	Difference Timber-Avg
Material	kg	kg	kg	kg	kg	kg
Timber	216,585	0	0	12,324	4,108	212,477
Steel	2,800	312,881	42,852	71,749	142,494	-139,694
Concrete	135,000	780,464	1,303,213	863,325	982,334	-847,334

Therefore, 212 tonnes more timber is used, on the one hand, but 140 tonnes less of steel and 847 tonnes less of concrete than in average construction. The timber is renewable and comes from sustainably managed forests. It is safe to state that a 25% reduction (ProCirc target) in the virgin material use was achieved.

Waste reduction

This building was designed to be disassembled: all the building elements from the foundations up to the roofing layers have dry/loose connections which are fully reversible. For example, insulation shells, cementless foundation blocks, dry screwed columns and beams, window frames without spray foam insulation on the sides, prefabricated and standardised façade elements, screwed claddings, loose vapour barrier, insulation and top layer on the roofs, pipes, floor tiles, the screed, staircases and interior walls.

This means that all building components can be recuperated from the building without having to generate waste and with the full potential to serve in its original form (no downcycling).

On a building element level, the mitigation of waste streams was also taken into account:

- The cementless concrete and cementless screed contain recycled granulates
- The wooden façade cladding served a first life in another building and would normally have ended up as waste
- The same goes for the main stairs, the fire escape, the carpet tiles and the toilets
- This is illustrated to the visitors by reusing old windows to construct an internal separation wall in the meeting rooms

The table above lists the primary materials. It is safe to state that this timber, even if burned at the end of its life, at which point it will generate heat, will not end up as waste, whereas the much higher amounts of concrete and steel in the business-as-usual scenarios will generate significantly more waste in their end-of-life stages.