The gallery flat (or fallen tower)

A design for a transformation of an office building into dwellings taking into account circularity, demonstrating how circularity offers freedom for (non-traditional) households

Reflection
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This document provides reflections on the theses and design conducted as part of a double degree program for the master Architecture and the master Construction, Management & Engineering (CME). This program comprises of two research parts, see also Figure 1. Part I provides mainly an Architecture-perspective, whereas part II provides mainly a CME-perspective, although both perspectives are (to a certain degree) visible in both theses. Anyhow, part I clearly offers input for part II. It clarifies certain pivotal concepts and indicates knowledge gaps relating to CME. After part II a design will be made in order to succeed the Architecture graduation program. Most likely, both theses will also provide input for the design.

Before I started my graduation, I was already intrigued by the topic of sustainable building. Specifically, I was fascinated by the fact that although we can already construct sustainable buildings, not all buildings that are being build are sustainable buildings. What’s more, not everyone seems to care for and aim at designing, constructing, maintaining, and dismantling buildings in a sustainable way. For me, it is obvious if one designs a building that it should be a sustainable building.

During my double degree graduation I have focused on investigating ways to 1) design a building in such a way that it can be disassembled and reused, 2) accelerate implementation of sustainable or circular building with respect to the building process, and 3) to find tools and guiding in positioning myself as a future practitioner with focus on building sustainably – as an architect or another actor in the built environment.

The research for part I is titled “Design for Disassembly - a way to minimize building waste” and focuses on designing a building in such a way that it can be disassembled, concerning its materials and connections. The research for part II is titled “Talking circularity - the influence of actors on the building process: A study into actor networks and influence on decision-making regarding the implementation of circularity into the building process” and focuses on the building process and its involved actors to facilitate implementation of circularity. The design (part III) concerns a transformation of an existing office building into dwellings taking into account circularity.

This reflection continuous as follows. First, a reflection on part I is presented. Second, a reflection on the step from part I to part II is provided. Third, a reflection on part II is presented. Fourth, a reflection on the step from part II to part III is provided. Last, a reflection on part III is provided.

Figure 1 Timeline of graduation process.
Part I (research arch)

Within the broad field of sustainability, the research conducted for Architecture, focuses on ‘design for disassembly’. This is a way of building that focuses on designing a building in such a way that it can be disassembled when it becomes obsolete in order to minimize waste. The research relies on case study research as the main method. Additionally, a literature study has been conducted to provide ground to understand the concept ‘design for disassembly’. This literature study includes context about the development of design for disassembly and related concepts in the architectural discourse; such as the concept of flexible and open building, standardized building, and cradle to cradle design. Additionally, the literature study provides knowledge for proposing ‘design for disassembly’-criteria. Subsequently, case study research was conducted on three projects that have implemented the concept of design for disassembly (to a certain extent). These three projects were chosen based on a selection of several projects. The selected cases are: ABT office in Delft by BiermanHenket built in 2001, Townhall in Brummen by RAU built in 2013, and The Green House in Utrecht by cepezed built in 2018. These projects were analyzed on the basis of predetermined criteria, as extracted from the literature study. In addition, interviews were conducted to include the vision of the architect regarding to the project. The analysis of these cases provides design guidance that will help to implement design for disassembly in the design phase even better today. The results from the case study research have been translated into a matrix in which the different aspects concerning design for disassembly are visualized for each case. This matrix provides guidance on how to design for disassembly for myself and other practitioners, see Figure 2.

This research offers scientific relevance by providing information regarding circular building within the context of each case study. Besides this specific relevance, this research also offers general knowledge about how to design a building so that it can be disassembled at the end of the building’s life time. The research showed that although the term ‘circularity’ is rather new its way of building can be considered as already quite common in some contexts.

OUTLOOK TOWARDS DESIGN ASSIGNMENT

When finishing this research at the P2, some criteria for the design were formulated. In sum, these concerned the life time of the building, its function and program, and location. Based on the research, the design should be temporal and should consider the phase before and phase after the building’s life. Regarding the program, a library was chosen based on its current uncertain spatial requirements. Although libraries are still functional in our society today, in the future probably the spatial form of a library will be highly uncertain due or thanks to online provision of knowledge. Based on the above requirements and by means of a location analysis, the following location was chosen as suitable for the design: Lloydkade part of the area ‘Schiemond’ in Rotterdam.

Obviously, these design intentions are subject to change and could be adapted based on ‘new’ knowledge acquired during the CME research (part II). And in fact, after the CME research these criteria were indeed changed.
<table>
<thead>
<tr>
<th>Level of Disassembly</th>
<th>Seperability</th>
<th>Homogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ABT Office</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>parts</td>
<td>split</td>
<td>hybrids</td>
</tr>
<tr>
<td><strong>The Green House</strong></td>
<td></td>
<td></td>
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<tr>
<td>components</td>
<td>offset</td>
<td>natural materials</td>
</tr>
<tr>
<td><strong>Townhall Brumen</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>raw materials</td>
<td>offset</td>
<td>biological nutrients</td>
</tr>
</tbody>
</table>

*Figure 2 Matrix summarizing the results from the case study research done for Architecture, figure made by author.*
→ **Step from part I to part II**

After one semester the research for Architecture was finished and the thesis for CME could start. Although I had become quite familiar, the past semester, with doing research, the start of the CME research felt difficult. I could not just continue doing research as I had started. It required for me to take a step back and find a motive for positioning the research for part II. This included doing some skimming and reading of articles, re-thinking the research objective, and finding a clear gap to be filling in with the research for CME. In the end, the research proposal was slightly adapted and refined even when conducting the research for CME. Inevitably, the research objective could only be refined by starting with doing the research.
As already described, the previous research focused on design for disassembly. Part II reconsidering the position of ‘design for disassembly’ with respect to literature regarding circularity. It was concluded that ‘design for disassembly’ can be perceived as a design strategy, which can be positioned within the wider perspective of circularity. Nevertheless, this thesis started with focus on the concept ‘design for disassembly’ as this was the central concept in part I (previously conducted research for Architecture). During the research process the focus shifted by zooming out to circularity and its implementation in the build environment.

In part I, attention was attracted to the other than traditional ownership models and unconventional divisions of responsibilities that were experimented with in the case study projects. For instance, the ‘product as a service’ strategy was attempted to be implemented. These aspects – circular strategies, and different roles and relations that will follow from that – became the focal point for the research of part II. In addition, the implementation of secondhand building components in the design and construction phase seems to be in its infancy. From the case studies it was concluded that preparations for reuse at the end of life have been implemented more thoroughly than preparations for reuse at the start of the building process. Since the beginning of life includes preparations for the end of life of the building and implementation of secondhand components upfront, this phase of the building process offers a crucial moment in time that is interesting to study for this research.

Based on these gaps and points for further research, and after some more literature research, part II has the following research objective. This research aims to analyze and improve the actor network in the building process to facilitate circularity, by studying the following aspects: circular strategies, involved actors, and influence of actors on the decision-making. In addition, it aims to test the benefit of early on decision-making in the building process for implementing circularity.

The case study research conducted in part I evaluated three building projects on the implementation of design for disassembly – this included evaluation of materials, connections, reuse and recycling possibilities, etc. From this study it appears that some cases implemented design for disassembly more thoroughly than others. Therefore, in order to gather sufficient and interesting information for this research and learn from the case studies, the suitability of the three cases needed to be re-evaluated. Especially, the appropriateness of the ABT Office case with respect to reuse upfront and afterwards, and implementation of circularity, needed to be evaluated. After re-evaluating the cases, the ABT Office was replaced with the building that involved a transformation of an existing building: EDGE Olympic in Amsterdam by Architekten Cie. built in 2018.
Figure 3 Matrix summarizing the results from the case study research done for CME, figure made by author.
**DESIGN PRINCIPLES CASE STUDIES**

- **initiation**: building as a material bank
- **resource efficiency**: reduce dimensions
- **technical cycles**: recycled masonry
- **biological cycles**: bio-based materials

- **initiation**: take-back, vacant plot
- **resource efficiency**: reduce dimensions

- **initiation**: existing building
- **resource efficiency**: transformation
- **long-life building**: reuse structure
- **technical cycles**: recycled facade tiles
- **biological cycles**: nutrients
- **component extension**: PSS
- **building life extension**: demountable
- **technical cycles**: cradle-to-cradle

- **design strategy**: begin of life scenario
- **design strategy**: end of life scenario
OUTLOOK TOWARDS DESIGN ASSIGNMENT

With respect to the design assignment as formulated after conducting part I, some aspects needed to be reconsidered. By reflecting on the research as done for part II some aspects should be adapted.

After part I the design objective was to consider a vacant plot and design a temporary building. With part II in mind it can be argued that this is not the most circular option. Since it followed that deciding for beginning and end of life should be based on the following hierarchy: 1) reduce, 2) reuse, 3) recycle. Thus, the design objective, as formulated after part I can be considered as option 2) reuse, whereas option 1) reduce is actually preferred. If one considers this aim, one would arrive at transforming an existing building that is currently obsolete or vacant. Favorably, this requires no (or less) transport, in comparison to reuse of components from other locations.

By means of desk research and by carrying out enquiry (at Michel Baars from New Horizon) the following possible transformation was identified: Metropolitan, Buitenveldertsebaan 3,5,7, 1082 VA Amsterdam. This former office building from the seventies is currently transformed into an office building suitable for the current spatial needs and requirements. The transformation of this building (not necessarily again into offices) provides a realistic assignment, with existing actors who are involved and currently working on the transformation of this building. This also offers the possibility to talk with these actors.
Step from part II to part III

Based on research part I and part II, and the matrices that were made based on the case studies, some lessons learnt can be provided. These lessons learnt can be used as backbone for the design (beside the general design requirements, such as program of requirements, etc.). Part I and part II provided some pivotal definitions and explanations of circularity and design for disassembly. From part I: “anticipating the temporality of a building by means of designing a building to be demountable, to be able to reuse or recycle building components, thereby reducing the need for raw materials and minimizing the generation of waste”. From part II: “a circular building process focuses on reducing waste and minimizing use of raw materials. It does so by means of prevention, reuse, recycling, or decomposition (in case of decomposable materials)”. Based on these definitions, the following lessons learnt are provided:

The design (part III) should:

• Consider reduce, reuse, and recycle for the building and its components, in this order (see also Table 1).

• Start with a material inventory, before a (detailed) design is made (see also Figure 2), including:
  
  • First, identification of the materials from the existing building.
  
  • Second, identification of secondhand materials in surroundings (within 10 km, i.e. by use of a harvest map).
  
  • Third, remaining needed materials should be circular materials (thus, no hybrids, no toxics, and to be demountable and separable).

These aspects also influence the role of the architect. It shows that my personal role as an architect will be somewhat different from the traditional one. Specially, my role is not merely to deliver a design, but also to sensitively think about materials use and choices with respect to circularity upfront.

• Consider the beginning and end of life phase for the building (time aspect).
  
  “So what happens before and what happens after?”

  • Assembly & disassembly: the following design principles can be utilized (from part I): separability (demountability: visible connections), homogeneity, standardization (modularity), lifetimes of layers, (clarity and simplicity).

Apart from these aspects related to circularity, the objective is to deliver a great design, also in architectural terms.
Figure 4 Location of the Metropolitan in Buitenveldert, Amsterdam, map made by author.
Figure 5 View from Buitenveldertsebaan (west of Metropolitan, seen from the currently adjacent located VU building) in 1974, source: Beeldbank Amsterdam.
Part III (design arch)

THE RELATIONSHIP BETWEEN RESEARCH ON DESIGN FOR DISASSEMBLY & CIRCULARITY AND DESIGNING A CIRCULAR BUILDING

The step from doing research to making a design was harder than I had imagined. I had done research for almost a year. I thought this had provided me with a thorough basis to start making a design. And although I could consider myself an expert on circularity by now, my research knowledge could not directly be translated to input for the design. As you can see in the previous section ‘step from part II to part III’, I drew up some quite concrete guidelines for the design. I perceived that designing needs something in addition that just these recommendations, lessons learned and design guidelines that followed from the research. Interestingly, when I started to design, I suddenly could better understand some of the choices that were made in the case studies. These were choices on which I had been quite critical, because they had favored the representation of the building over circularity. This is, for instance, the choice to open up an existing facade (to provide more daylight), while this also leads to (perhaps more than necessary) material loss.

THE RELATIONSHIP BETWEEN THE THEME OF EXPLORE LAB AND CIRCULARITY

Besides the practical reasons for choosing the graduation studio Explore Lab (this studio offered freedom in my situation to do a double degree and combined graduation program), this studio offered the opportunity to find suitable research methods in line with my topic and fascination. By doing case study research including interviews I was able to gather knowledge that would not have become visible merely by doing a literature study. Apart from the academic value of this knowledge, for me personally, this research method helped me to position myself as an architect and learn more about our field of practice. Moreover, the term ‘circularity’ is rather new. As a result, a lot of knowledge has not yet been internalized into literature. Therefore, doing case study research including interviews helped to extract and capture tacit knowledge.

THE RELATIONSHIP BETWEEN THE METHODOLOGICAL LINE OF APPROACH OF EXPLORE LAB AND THE CHOSEN METHODS

The chosen methods for the research were: a literature study in combination with case study research including interviews. Since the Explore Lab studio aims to provide the opportunity to students to choose a research topic themselves, the methodical line of approach of Explore Lab is not omnipresent. If at all there, it is probably most present in the mentors assigned or chosen to guide your graduation. For me the methodical lines of approach mainly helped to strengthen and deepen my line of inquiry. And especially, when starting the design more input was necessary to cover some untouched aspects. In the design phase, especially in the period towards the P3, it became clear that merely following the ‘circularity’ line of though was not sufficient. Regarding the design, some addition studies were necessary, such as in relation to the architectural element and spatial qualities of a building. And also on how to make tradeoffs between architecture and circularity. These were (at first) perceived as opposites, which resulted in tension. In addition, designing required a different attitude. When conducting scientific research one is benefited by a structured line of reasoning. Whereas designing is a much more iterative process, and also a process
that requires experimenting, playful sketching, and not immediately looking for solutions but first identifying the problems, opportunities, strategies and alternatives.

THE RELATIONSHIP WITH THE WIDER SOCIAL, PROFESSIONAL AND SCIENTIFIC FRAMEWORK

Although the design could be perceived as modest, its effort to follow circularity principles while also providing architectural and use value, strengthen its significance as an example for others. Especially in relation to the current designs made in practice. Although almost all transformations and new-built projects are termed ‘sustainable’ or ‘circular’ their real impact on sustainability can be questioned. The amount of removed and demolished materials is still quite high. The amount of newly used heterogeneous and not-to-be-disassembled materials (although sometimes bio-based) is also quite high. And the extent to which these projects deal with reuse of existing and secondhand materials is limited. This clearly shows that knowledge on circularity is in practice not up-to-date. And that practitioners could definitely learn from this project. Since this project demonstrates how to reuse materials upfront, whereas in practice most projects only demonstrate how to reuse afterwards.

ETHICAL ISSUES AND DILEMMAS WHEN DOING RESEARCH AND DESIGN

Following (only) the circularity perspective seemed to imply a very standardized and strict architecture, following specific standardized measurements and producing space plans with rectangular forms and shapes. This type of aesthetic also influences the quality of living of the dwellings and the use and activities that it stimulates. Merely following the material aspect of circularity, thus seemed to neglect the social dimensions. Following this line of thought I considered it important to investigate how circularity could also offer freedom to implement these social and architectural qualities. Although circularity serves sound and moral intentions, it is important to balance this with architectural and use value. In the end, a long life building that is cared for by its inhabitants can also be considered sustainable.

As an architect, one should be aware that by designing and constructing buildings we merely contribute to solving complex social problems. We are not in the position (alone) to solve these problems. This also holds for this design. Although it does contribute to becoming more circular and sustainable and it does contribute to the current body of knowledge on how to build and transform according to circular principles, a humble attitude, as an architect, is appropriate.

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Figure 6 Tensions.