## Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

<table>
<thead>
<tr>
<th><strong>Personal information</strong></th>
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<tbody>
<tr>
<td>Name</td>
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<tr>
<td>Student number</td>
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<tr>
<td>Telephone number</td>
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<td>Private e-mail address</td>
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<th><strong>Studio</strong></th>
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<tbody>
<tr>
<td>Name / Theme</td>
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<tr>
<td>Teachers / tutors</td>
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<td>Argumentation of choice of the studio</td>
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<tr>
<th><strong>Graduation project</strong></th>
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<tbody>
<tr>
<td>Title of the graduation project</td>
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<tr>
<td>Introducing the Circular Economy in the Building Specification</td>
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<tr>
<th><strong>Goal</strong></th>
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<tr>
<td>Location:</td>
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<td>The posed problem,</td>
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Aranda Usón, 2010). Attempts have been made to improve the sustainability of the Lidl stores. The Lidl tries this by having a A++++ grade on their buildings (LIDL, 2017), BREEAM grades on new structures like the distribution centre (BREEAM NL, 2012) and changing their construction principles and materials (Viereck & Graz, 2016). All these methods provide different means and views to improve their level of sustainability. Lately the interest in the Circular Economy has been on the rise, providing incentive to approach sustainability and construction from a different point of view. The difficulty with the Circular Economy is the methods to measure and compare your buildings and constructions to others. While the principles are known the actually assessment methods are still being developed as shown by examinations of the current assessment methods (Elia, Gnoni, & Thorese, 2016).

For the Lidl, with such a large portfolio of real estate, it provides multiple questions, how circular are we now? Where do you measure it? How do you measure it? The first question should be examined on the most basic level. How circular is our current building vision? It’s difficult to comprehend which changes have to be made if you don’t know what your starting point is.

As stated before, with a new subject like the Circular Economy, it’s difficult to understand where you stand currently as a company. On the subject of circularity in the built environment it’s necessary to take a first step to examine the current practices used. One of the most complete documents available on the current building philosophy is the Lidl’s Specification. This document provides insights in: materials used, involved actors, the responsibilities of these actors, assembly
methods and assembly sequence. All these factors are fundamental for the Circular Economy. Through these notions the main research question arose:

Which changes have to be made to make the Lidl’s Specification circular, with an emphasis on materials and assembly?

To answer this question the following sub questions were proposed:

- What are the principles for circularity in the built environment?
- How is the Dutch Specification currently implemented?
- What are the current methods to assess the level of material and building circularity?
- What are the circular bottlenecks in the current Lidl’s Specification?
- How can a building system, as described in the Specification, be redesigned into a circular one?
- Which changes have to be made to the Specification to allow for the redesigns to be implemented?

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<th>Process</th>
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**Method description**

These questions will be answered through the following research methodology:

For the first sub-question, the core principles for circularity in the built environment have to be determined. Through a literature study into current reports on circularity, the current definition for circularity will be formulated along with the principles for the Circular Economy. The application of these principles in the built environment, along with the consequences, will be examined. The same has to be done for the Specification. Before we are able to look in-depth into the Lidl’s Specification,
we have to examine how the current Specification is used and defined in the Netherlands. This will be examined through government sources, books, and further literature. For the assessment method, multiple papers and thesis reports into currently used assessment methods will be consulted. These will be used to examine assembly methods and materials used. The NIBE database will be consulted as the database for material properties.

With these assessment methods and the current use of the Dutch Specification in mind, the Lidl’s own Specification will be graded and where needed Lidl sources will be interviewed for additional information. It will result in one of three grades, a part is circular enough to be sufficient for the time being, a part can be made circular with few changes, or a part has to be redesigned completely with different materials and connections. Where needed, any material suppliers will be interviewed on material life-cycles. The NIBE database will be used to find circular solutions for materials. As a final step the redesigns will be re-implemented into the Specification, along with additions on circular grading method and policy to make them persistent.

Literature was used to answer the first three sub-questions:

The basis will be formed through the use of literature. The concept of the circular economy has been widely discussed and theorized about in the academic circles. The basis of the idea of the circular economy, lies within many different studies which have been done in the last few decades. The studies which will be focused on are sub-questions specific, for the sub-questions besides the first one Literature is also needed, but it won’t be the main defining feature.

Analysis will be done of the Specification:

The specification forms the basis for the Lidl’s standard free standing supermarket design. The current Lidl’s Specification will be analyzed on its circularity, through the use of the assessment methods determined by the literature.

Case study of a non-circular system:

With the knowledge from the Specification analysis a case study will be done, the complete system will be analyzed on its circularity, trough the assessment methods determined in question 3.

(Re-)Design of the non-circular system:

The system, for which the case study was done, is redesigned to allow for a fully circular design. By redesigning the current system, while sticking as close to the current methods as possible will be the technical redesign. The green redesign will fully redesign the system. Both to show what is currently possible and necessary.

Contact with the Lidl

The Analysis, case study and redesign will all be discussed and validated with the Lidl, what do they think? Is it possible to implement the suggested changes to the Lidl.
Literature Study


LIDL. (2017(1)). Our history. Retrieved from https://www.lidl.co.uk/en/About-Us.htm


Further sources on demountability still need to be examined.

Case studies

b. “CIRCL” 2017 by ABN AMBRO
c. “Brummen Town Hall” 2013 by RAU
Reflection

Relevance

Currently finite resources are used as if there is an inexhaustible supply. This linear approach leads to waste and an increasing carbon emission. The current use of these resources amounts to greater risks for manufactures over time. The amount of easily obtainable high value sources decreases while demand stagnates. The building industry is responsible for 50% of all the material waste in the Netherlands. The circular design approach could in theory address these issues.

This graduation project aims to test the current ideas behind the circular design approach within a real world, large scale case. It aims to unveil if the circular economy isn’t just a theory, but already feasible or which research and testing still needs to be done to make it a viable option.

Time planning

For P1:

Research into the circular economy and the application of the circular economy in the building industry.

For P2:

Finish the preliminary study on the circular priorities of the LIDL.
In depth research in the requirements for the circular building design and case studies on three existing circular buildings.

For P3:

The results of the literature study described in a brief. First steps towards the final supermarket design.

For P4:

Final coherent supermarket design, compared on a circular level to a current LIDL supermarket.

For P5:

Refining the materials for the final presentation, sections, floorplans and the life-cycle assessment.