

## Reflection | P5 Waste Site Story

This year is my graduation year from the masters track Architecture at the TU Delft in the field of maritime heritage. The historical identity of The Netherlands has played an important role of shaping the country. Water has been something to keep out of our country while still using the waterways for industrial purposes. There are several structures that show this identity like bridges, dykes, shipyards, canals, etc.

The design assignment for the studio is to revitalise a historical structure within the maritime heritage line in South Holland. In my case this is a wharf located in Slidrecht that used to house a ship wharf that was directly connected to the waterside (figures 2 and 3). Later on however, a new dyke was added around the wharf (that now functions as sort of a barrier between the water and land) and a metallurgy company now owns the wharf. In my project I am renovating this wharf and the site around it in order to attract people to the waterside and continue the green structure from the north of Slidrecht towards the Beneden Merwede (see figure 1). The main focus of this project is to reuse material in order to reduce the amount of waste generated within the built environment.

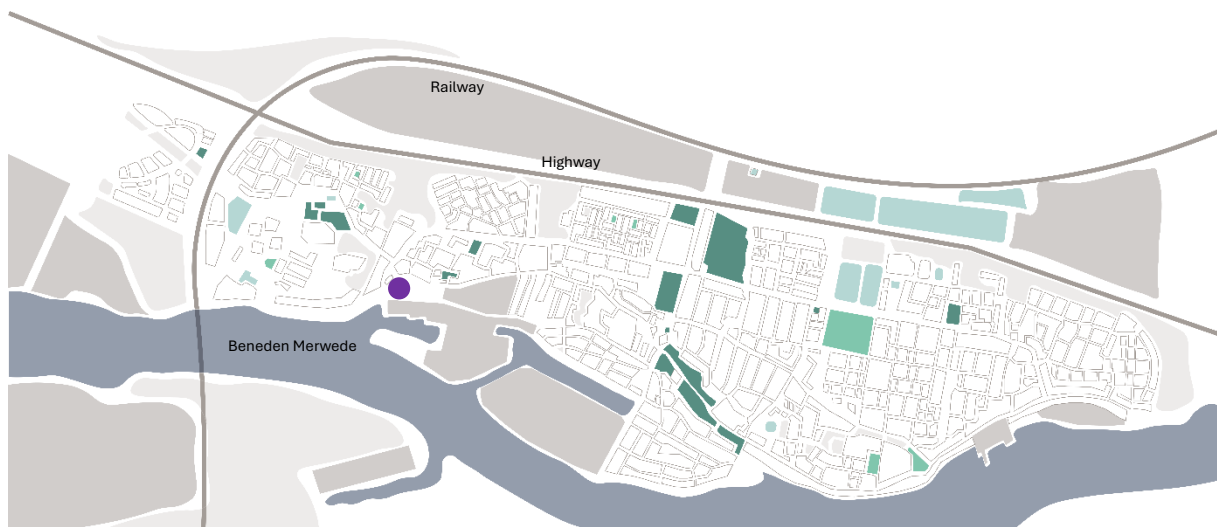


Figure 1. Site location in Slidrecht. Schouten, M. (2025).

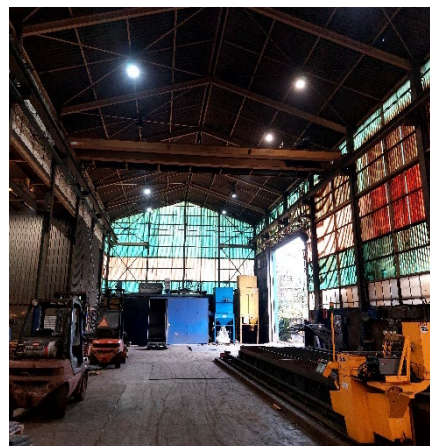
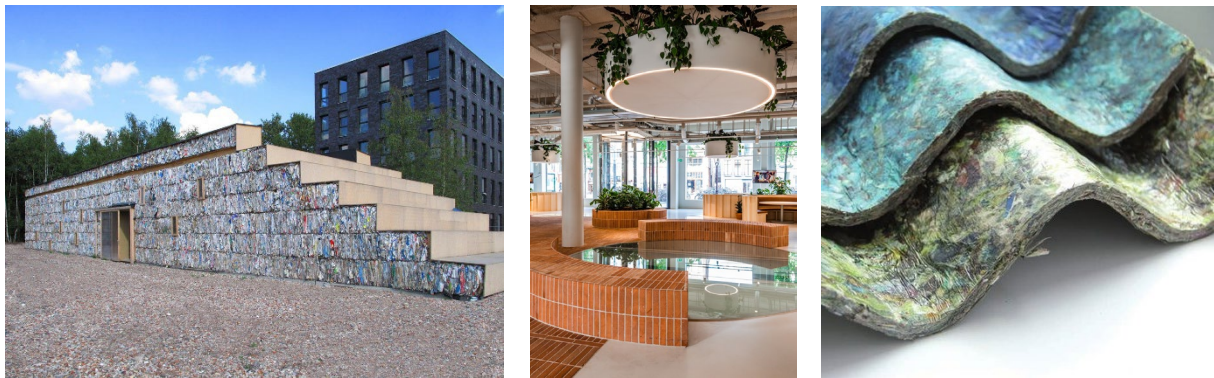


Figure 2 and 3. These figures show the existing situation of the wharf from the inside and the outside. Schouten, M. (2025).

During the P1 I was sure that I could implement R-strategies higher on the R-ladder, while currently the most used R-strategies rank the lowest 3. However, by researching reuse within the built environment I came to the realisation that it was a lot harder than I first expected. Many products and materials in the current building stock are made a long time ago, when we were not thinking of deconstructing or demolishing those buildings. Many materials are put together in a way in which deconstruction and reuse of materials is not possible, which is why so much waste is generated. Because of the large amount of waste, I started investigating the possibilities of reuse of building material. This led to some case studies that at first gave me the impression that I could use this for my design project. The case studies were bales of paper that could be used to make walls, Tuff Roof that uses drinking cartons to make corrugated sheets and WasteBasedBrick (figures 4, 5, and 6). While these case studies might look like a great new idea of using materials, the fabrication of these products often require a lot of energy which lead to the question whether the production here for does not do more harm than good. Still, repairing and reusing the initial projects require less alteration and are more beneficial.



Figures 4 (a wall made of bales of paper), 5 (a curved wooden structure) and 6 (a corrugated roof made of drinking cartons) show the case studies that were used in the research paper.

By researching the case studies I came to the realisation that a first step would be to reuse the materials at the site itself instead of gathering waste from the city/country and try to use it. The reuse of materials present at the site makes for a new view on architecture as currently a lot of primary resources and new materials are used to make impressive designs and a lot of waste is generated in the process of making those materials and creating new buildings. Instead, old structures and buildings could be renovated in a way so less new material is needed and used materials do not get wasted. This is also what my research is about: how to reduce the amount of waste generated within the built environment. And how to use waste as a resource for new designs.

While my research is not directly connected to the studio of maritime heritage, the application of the findings from my research at the specific site of Rotterdam Steel Works in Sliedrecht will be connected to the studio as it is an old building previously used to build boats and more recently for metallurgy. For my graduation design, I am repairing the old shipyard by using materials that are present at the site and were also used during their historical function to restore the historic narrative of the place. Additionally, any extra materials that are needed for the new design will be made from reused materials as much as possible.

Because of the massive amount of waste that is generated within the built environment, I tried to find out how to reduce the amount of waste by using waste within architecture. At first this meant looking into other businesses in the neighbourhood to see what material is available (preferable close by as this reduces the amount of transportation costs and exhausts). I tried to find materials that I could use for the new design, while I later realised that using the materials that are already present at the site can come a long way. Further into the research I came to the realisation that the assignment is not using waste to reduce the total amount of waste, but the underlying assignment was try to catch the problems at their roots. Waste is generated in the built environment because no/little thought is put into reuse and recycling when building the structure. Currently more and more thought is given before the buildings are built into how a building can be (partly) deconstructed. That way the materials can be reused or repurposed into other projects and waste generation can be prevented. Additionally, maybe in the future the design strategy will depend on the availability of material instead of searching for the right material while designing the contemporary way.

Within my design, this meant that the addition I will make to the wharf will be deconstructable and made from second hand materials. In order to use a r-strategy high up the r-ladder, the existing structure of the wharf will be cleaned and repaired where necessary and the gained materials from partly deconstructing the skin (to make the site more accessible) will be used to repair the existing building and used as a partition wall between the workshops and community center.

On the other side, the design influenced the research a little as well, while I needed information on how to create a box within the existing structure and how this will be self-contained. Working towards the P4, I came to the conclusion that not everything will be possible to make from reused material. In some instances, there are safety, sound and insulation requirements that need to be acquired. For example in the workshop spaces, the machines need to be separated from the working spaces because of the dust particles, noise, safety, etc. This is when I had to go down the r-ladder and change my strategy.

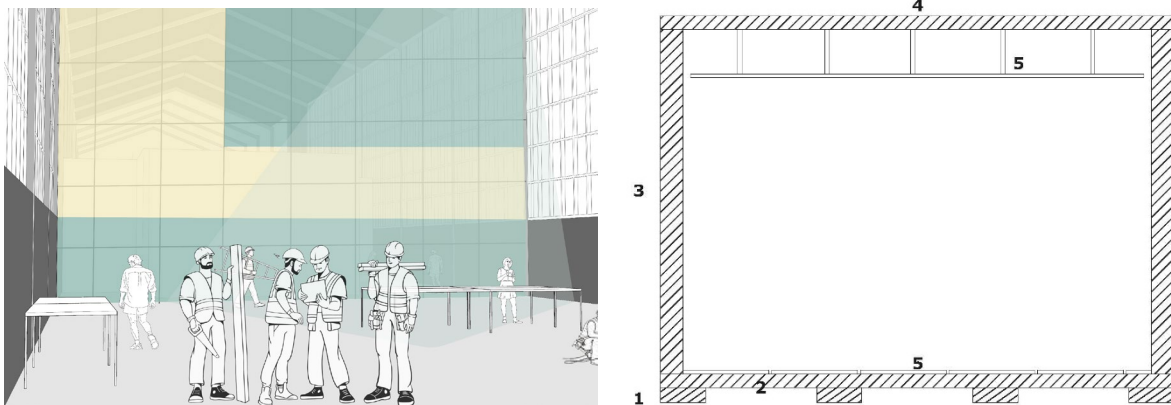


Figure 7 and 8. Figure 7 shows the partition wall at the workshop made from the selchim panels that were deconstructed from the northern side. Figure 8 shows the order in which the boxes on the inside can be made. These constructions can also be deconstructed. Schouten, M. (2025).

After the P2 I stagnated a little, because I started zooming in to the smaller elements of the project like the materialisation and the precise layout of the floor plan, because that were some concrete parts of a project that I am familiar doing. However, I might have started off too zoomed in into particular things like insulation material and the thicknesses needed for this. Now I know that it

would have been more beneficial to first look at the bigger picture, formulate some criteria and use this to base the choices on I make during the design process. I think the reason for the stagnation after the P2 was, because I did not know where to start and therefor started with something very specific. Later, I realised that I first needed to zoom out a little bit before I could move on. Luckily my tutors and fellow students helped me to get out of the stagnation and Rotterdam Steel Works as an umbrella was introduced by Lidy and Koen. To be able to use the existing structure, I made a damage overview in which I indicated where the damages are and where reparation is necessary. For this, I went on another site visit to the former ship wharf where the owners son guided me. He could tell me about the roof and some other interesting parts and he introduced me to the storage shed that is also located at the site. Using the materials from that shed would solve my window problem as there were too many broken ones to be repaired with only the materials from the ship wharf. This umbrella idea gave me a better understanding of how to continue the project and afterwards new ideas arose: the idea of inside/outside spaces. By creating a 'new' box within the original structure of the building, spaces around the box are created that can each contain their own environment (see figure 9). However, these environments need to be designed by the architect, which leads to the next stagnation point in the process between P3 and P4: how to design and sell the atmosphere I envision. By introducing a strategy and roadmap my vision for the overall design became more clear to myself and afterwards this could be better transferred into the details of the design. This scheme will be discussed later on in this reflection.

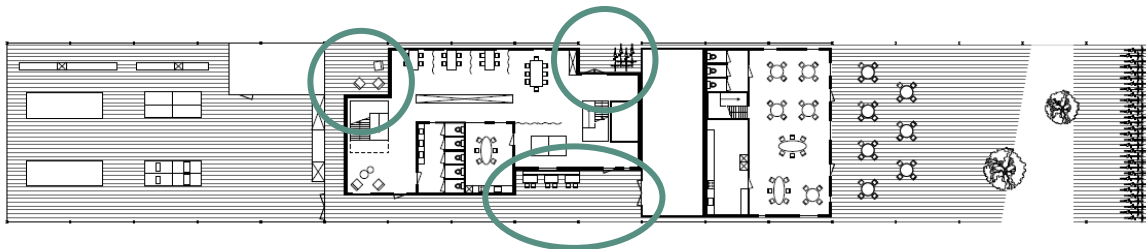


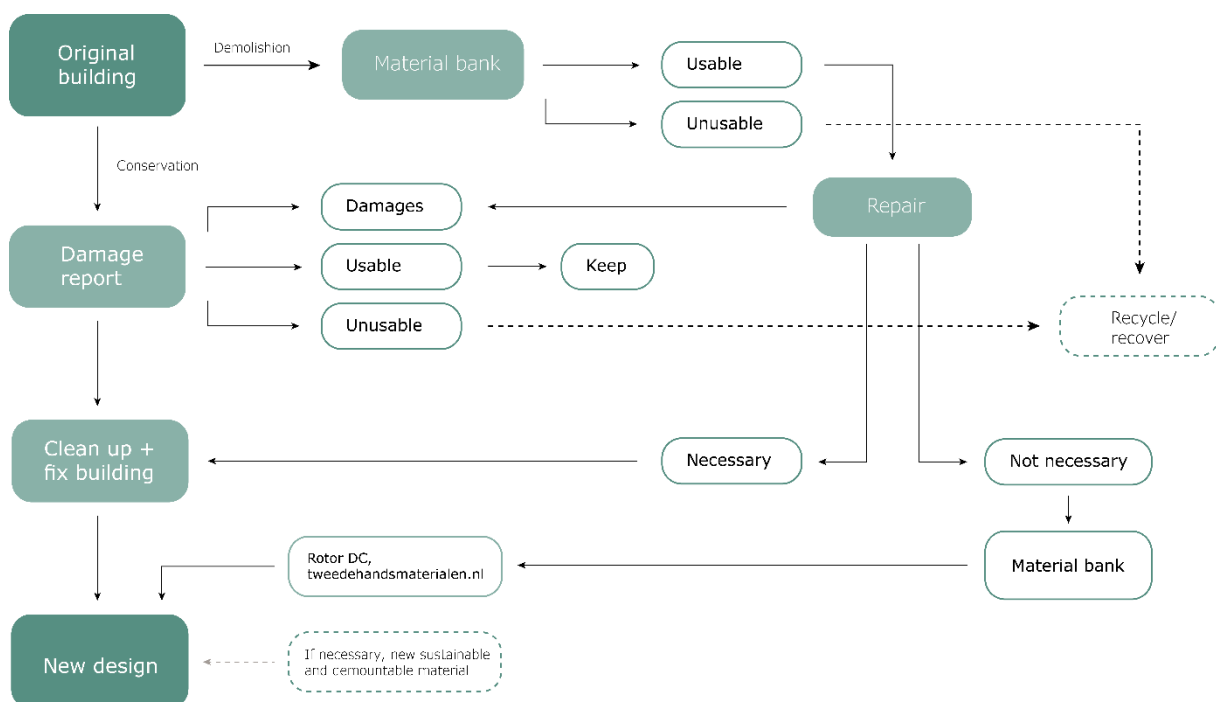
Figure 9. Floor plan (version of P3) with different semi outdoor spaces around the new design underneath the existing wharf. Schouten, M. (2025).

I believe that the way I am tackling this project could also be implemented at other places with the same kind of environment. Old wharfs or large buildings could be repaired instead of demolished and a new regulated design can be placed within. Besides the implementation of the umbrella in other places, making additions to an existing structure by using reused materials could also be implemented at other places as well as the reuse of material that might be deconstructed from the existing building.

Some of the feedback from the P2 was to connect the availability of materials and significance of the spatial design. I think this is partly done by keeping the skin of the wharf and placing workshops in there that do not necessarily require heat regulation. With the materials available, a new structure can be created inside the original structure.

Furthermore criteria had to be listed, which I did for the different elements within the design. The umbrella only needs to be repaired while it will still contain the same purpose: to keep wind and rain outside. Then only the spaces that need heating will be placed within the box and made from reused material. A last criteria for the design which is also a request from the municipality of Sliedrecht is the green structure. This should be continued from the north of Sliedrecht towards the waterside. After a conversation with a landscape architecture graduate, the waterside is now connected to the green structure towards the north of Sliedrecht by introducing an ecological corridor through the site.

The main feedback from the P3 was the question of how everything is connected and related. Working towards the P4, I tried to focus on the narrative I want to pursue although this was harder than I thought. In the end I made a scheme in which my strategy and roadmap is demonstrated which can be seen as a sort of guide to keep in mind while designing (see figure 10). Following this scheme, future designers could also implement the reuse of materials within their design.



Figuur 10. Strategy scheme I have used within the design process. Schouten, M. (2025).

What sustainable choices did I make and how effective are they in practice?

First of all, I am repairing the existing building instead of demolishing the whole building. It will be used as an umbrella which means that no alterations need to be made to the skin. If I would have used the skin as the skin for the complete design, I would need a lot more material in order to meet the requirements regarding insulation etc. Furthermore, a smaller box made of reused material is placed underneath the umbrella. A smaller object means less required material and the reuse of material means less waste. The only thing that might not be as sustainable as I have hoped is the roof as it currently contains asbestos and needs to be replaced to its entirety. Additionally, the materials that are going to be reused from other places may need some transportation (and so includes some exhaust and transportation costs). In the end I tried to

attach a number to the sustainability. I calculated the amount of CO<sub>2</sub> that would be saved by using reused material instead of new material. For the wood part of the design this came to the following calculation:

Circumference community center =  $13.5 + 2 + 9.9 + 7.6 + 4.9 + 1.9 + 15 + 3.6 + 3.5 + 7.8 = 70$  m

Building height = 8.5 m

Facade area without windows =  $70 \times 8.5 = 595$  m<sup>2</sup>

Façade openings =  $1.5 + 1.5 + 1.5 + 1.5 + 1 + 1 + 2 + 2 + 0.4 + 1.2 + 0.4 + 1.2 + 1.5 + 1.5 + 4 \times 1.5 + 5 \times 0.8 + 4 = 32$  m<sup>2</sup>

Façade area =  $595 - 32 = 563$  m<sup>2</sup>

CO<sub>2</sub> exhaust per m<sup>2</sup> façade

Without storage = 4.5 kg CO<sub>2</sub>/m<sup>2</sup>

Total CO<sub>2</sub> exhaust =  $563 \times 4.5 = 2533$  kg CO<sub>2</sub>

Saving by reused wood is 1.2 kg CO<sub>2</sub>/m<sup>2</sup>

$563 \times 1.2 = 675$  kg CO<sub>2</sub>

$(675/2533) \times 100\% = 26\%$  reduction of CO<sub>2</sub> exhaust

This is only the reduction for the wood part, the exhaust caused by other materials like steel and concrete will be much higher and far more beneficial.

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As the box is self-contained you can upscale, downscale or alter the shape of the box. One just needs to find the right materials for this. The precise measurements are not necessary per se, because the materials can be cut to size at the location. If in the future more room is needed for the restaurant, another floor can be added, or more space at the ground floor could be confiscated.

During the process after P2, I have mostly been working at the studio with my fellow students. I think this has had a positive effect, while we can help each other in the process, give each other feedback and motivation to continue working on the project even though you might not always feel like it. The period towards the P4 has been more or less the same, except more stress is now involved, because some of the students had their presentation two weeks before me. I think the stress of some of the other people has helped me to continue working during this period instead of not feeling the pressure yet (though I am still very nervous to do the P4) and setting the example of how I should do it as well. So a big thanks to them! Towards the P5 my motivation was hard to find. However, after some good talks with Lidy and the study counsellor, the excitement to finish the products that I enjoyed making for my graduation project came back! This meant making models and from there on alter a few drawings to create the final graduation booklet.

Looking back at my process, there were ups and downs, but all in all I enjoyed the year. I look back to an educational and fun process that challenged me both content-related and personally. I am curious to find out what the future will bring for this subject in architecture. A next designer that picks up this subject, could maybe look into the design a little more than I have done and find out what is possible and how certain challenges will impact the design.