FINAL REFLECTION

AR3AH105 Graduation Studio Adapting 20th Century Heritage

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17-06-2024

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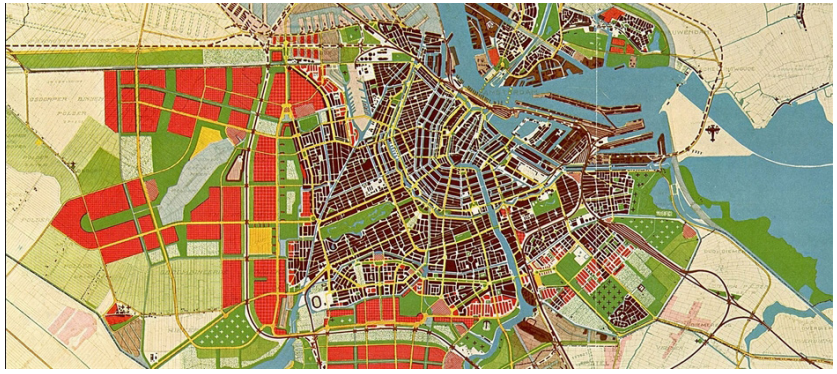
1. Introduction

The overarching brief drawn up from the chosen heritage studio 'Adapting 20th Century Heritage' involves choosing an existing building from the 20th century and renovating / transforming / restoring it etcetera. My fascination within this theme is the issues I identify around the large-scale demolition of housing *(picture 1)* in city districts that were built on a large scale and at a rapid pace after World War II to answer the immense housing shortage. Amsterdam Nieuw West, the designated location from the studio, is such a district. The neighbourhoods, and its buildings, are a product of a revolutionary urban plan: Cornelis van Eesteren's general expansion plan. *(picture 2)* The neighbourhood construction and plan logic belong to an important piece of architectural history, for the Netherlands and for the development of housing all over the world. Yet many of the buildings in New West are scheduled for demolition. The reason for this massive demolition is mostly to do with the poor condition of the properties. They were built at a time when thermal insulation played little or no role, resulting in poor living comfort and high energy bills. However, the fact that these problems can also be remedied through renovation seems to be generally ignored. The advantage of renovation is the undeniable difference in CO2 emissions and energy consumption due to the production of new building material. Much less new material is needed in a renovation, and this automatically translates into a much more sustainable renewal than demolition and new construction. The need to rapidly make the building process of the built environment more sustainable is evidenced by its share in global greenhouse gas emissions (15% of all global emissions come from the production of building materials), its share in European waste production (36% of all solid waste) and the huge amounts of raw materials it requires. In my research, 'Renovation with reused materials as feasible alternative to reconstruction', I look beyond the benefits of renovation versus demolition and new construction. I examine the impact of renovation with reused building materials compared to conventional renovation, where only newly produced material is added. The conclusions of the study provide an insight into effective strategies to minimise the climate impact of a renovation project.

Picture 1: demolition in Amsterdam Nieuw West



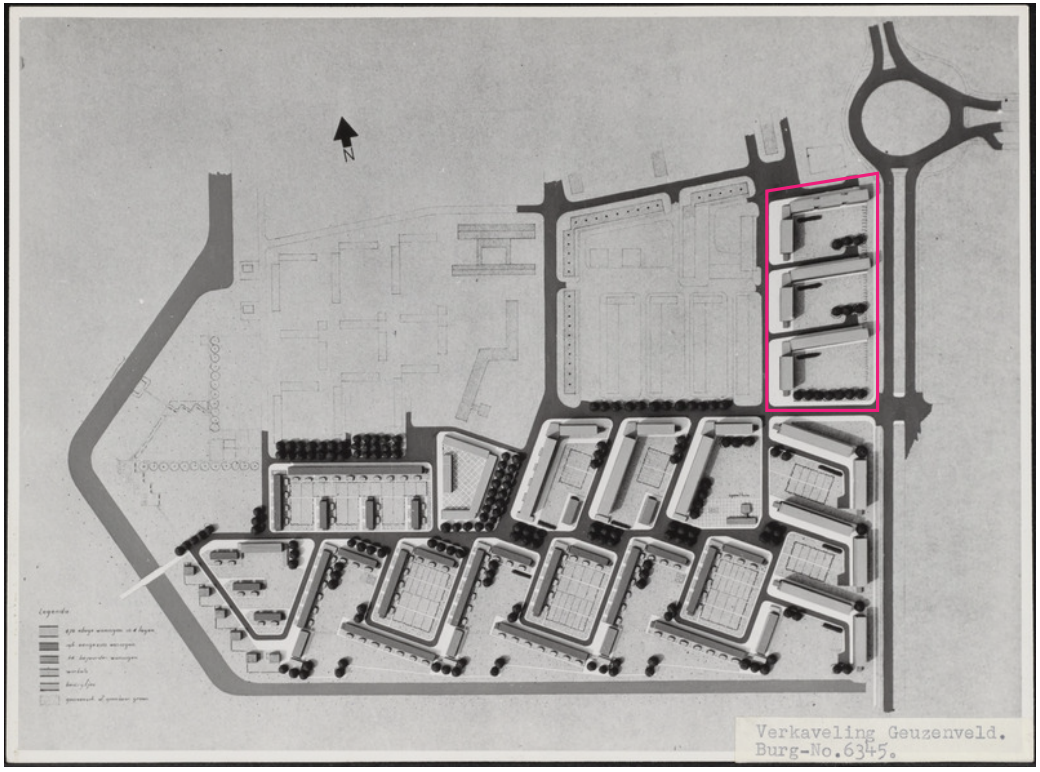
Picture 2: the ' Algemeen Uitbreidings Plan' (general expansion plan) by Cornelis van Eesteren

2. The Design Case

This is how my fascination of the demolition problem in post-war housing areas and my research come together: In order to save post-war real estate from demolition, I am investigating the possibility of renovating/ transforming it where reuse and preservation are central. The buildings I have chosen for this exercise are the “van Tijen flats” built in 1954, designed by Willem van Tijen, in the Geuzenveld neighbourhood in the north-west of Amsterdam New West. The flats were demolished in 2022. So although in practice it is too late to renovate/ transform these flats, it is a nice case study to experiment on a theoretical level. Indeed, the product of my design research can be compared with the realised new construction and is a nice case study for ‘Renovation with reused materials as feasible alternative to reconstruction’. It should be noted that the focus on feasibility became less prominent in the design. This proved too much of a hindrance in the development of design in this architecture studio, where the value of financial and organisational feasibility is subordinate to social, technical and ecological aspects. In my design, I assume that the flats have not been demolished.

The six flats, three long blocks facing west-east and three short blocks facing north-south, are the last remnants of the neighbourhood designed by Willem van Tijen in collaboration with Cornelis van Eesteren. The flats are portico flats of five storeys high and designed according to the system of so-called ‘standard construction’. This is a typology widely built in the Netherlands and this fact contributed greatly to my choice of these flats as a design case study. I hoped to develop a renovation/transformation technique for this archetype which could then be applied to more flats in the Netherlands to save them from demolition as well.

Picture 4: the typology of the flats: 5 storey portico flats.



Picture 3: the Masterplan by van Tijen en van Eesteren. The pink line circles the remaining ensemble up to 2022.

3. Reflection in 7 questions

1. What is the relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?

My graduation topic focusses on exploring a radically sustainable alternative to conventional building practices. Its main relation to the studio topic 'resourceful housing' is its high consciousness on resource use and the fact that it concerns dwelling typologies. The master track 'Architecture' focusses on "dealing with the technical, social and spatial challenges encountered in the built environment".
(Track: Architecture. 2024. TU Delft) The global ecological issue that my graduation project addresses will have great influence on technical, social and spatial aspects of our surroundings. The proposed solutions, and their challenges, operate in these areas also. The master 'Architecture, Urbanism and Building Sciences' blends knowledge and skills from design practice, the physical and social sciences and technology and engineering. The programme explores innovative ways to create more sustainable development. (MSC Architecture, Urbanism and Building Sciences, 2024, TU Delft). My graduation topic focusses on sustainable alternatives for conventional development strategies.

2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?

I chose the graduation studio because I wanted to increase my knowledge around reusing building materials. I knew from the start that reuse was going to be a central theme in my design. From this starting point, I started to shape my research. I see the overlapping theme of this graduation studio: the reuse/ repurposing/ transforming of post-war architecture, through the lens of material use. In my view, it is the most concrete form of reuse. Through my internship with architecture firm Superuse, I came to know about a project they are currently working on: a renovation proposal for a 1930s residential complex in The Hague. The proposal Superuse is making is a renovation design with new building materials, and that while Superuse specialises in building with waste streams and reused building materials. In an interview with Jan Jongert, partner and architect at Superuse, it came to light that the potential impact that applying reused material can make in a renovation plan is still relatively unexplored. I then chose to calculate and evaluate precisely this potential impact in my research.

The outcome of this research is fairly technical and quantitative. It provides insight into the availability of certain building materials and how effectively they can be applied in a renovation task (of similar typology and size to the case study) to minimise the project's carbon footprint.

The outcomes of this research is applied in the further development of my design. The design provided an opportunity to explore the qualitative consequences and opportunities of renovating with reused materials. What kind of decisions do you make as a designer if minimising (new) material use always weighs heavily in the equation? How do you re-use materials in the design that you take away elsewhere? How do you ensure that this creates added value for the design? If it does not create added value, but poses an additional challenge, how do you deal with this?

A good example of additional challenges is that of the reuse of the original windowframes in combination with the preservation of the original casco. The design goal to improve the insulating qualities of the facades showed an increased difficulty when both casco and windowframes are to be preserved and

reused. Illustrated in picture 5 and figure 1 and 2 are the fixed dimensions of both elements.

Picture 5: historical photograph of facade fragment. Seen in the picture are the storey-high windowframes that lead to the balcony.

Figure 1: facade section. Scale level 1:20 of responing facade fragment.

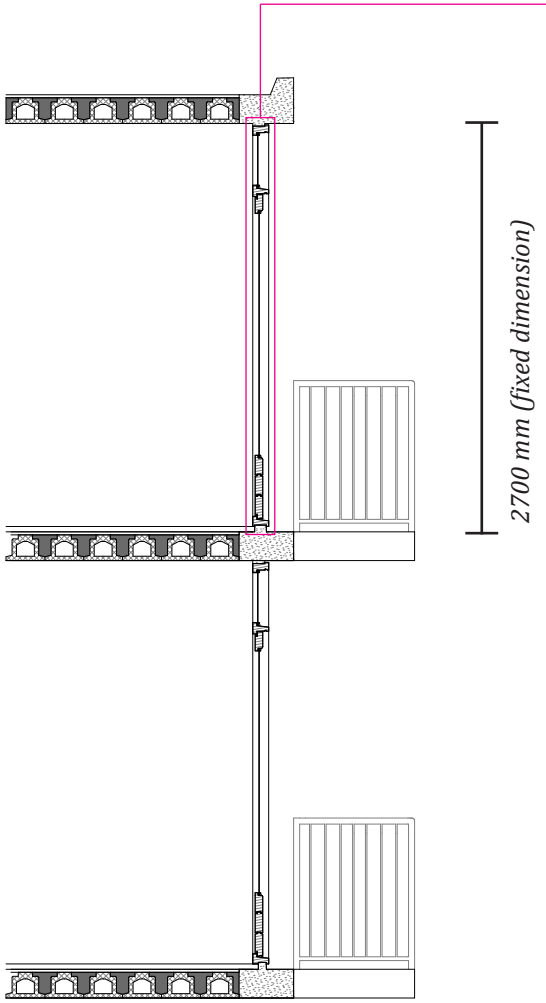
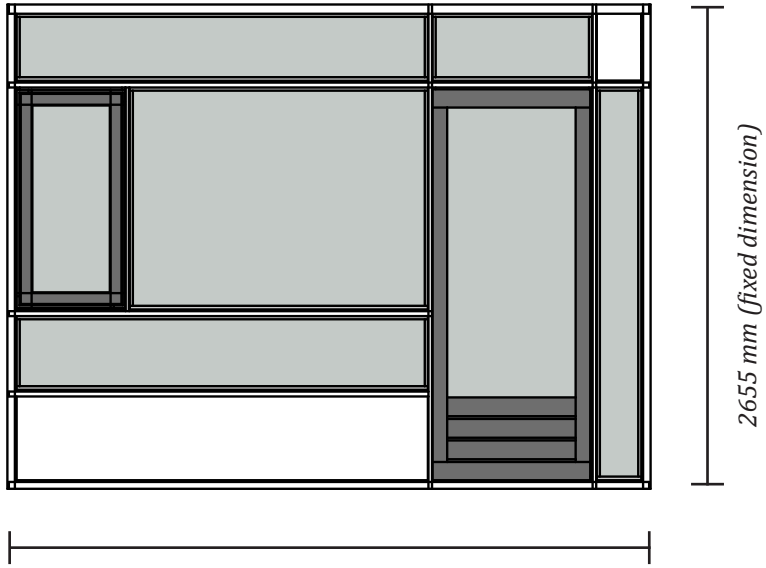


Figure 2: front-view elevation of storey high window frame.



Note: the actual height of the frame is not 2700 mm but 2655. The concrete riggs on both floor and ceiling in which the frame sits makes up for the remaining 45 mm.

Quite early in the design proces came the idea of double stacking original window frames in combination with their counterparts from the other buildings within the ensemble (which are removed in transformation interventions) to introduce a better thermal resistance. (figure 3) How to deal with the exposed facade parts such as protruding floors and roof however was the real challenge.

The first attempt to insulate this facade while reusing the windowframes and preserving the casco, as presented at the P3 presentation showed insatifactory. (figure 4)

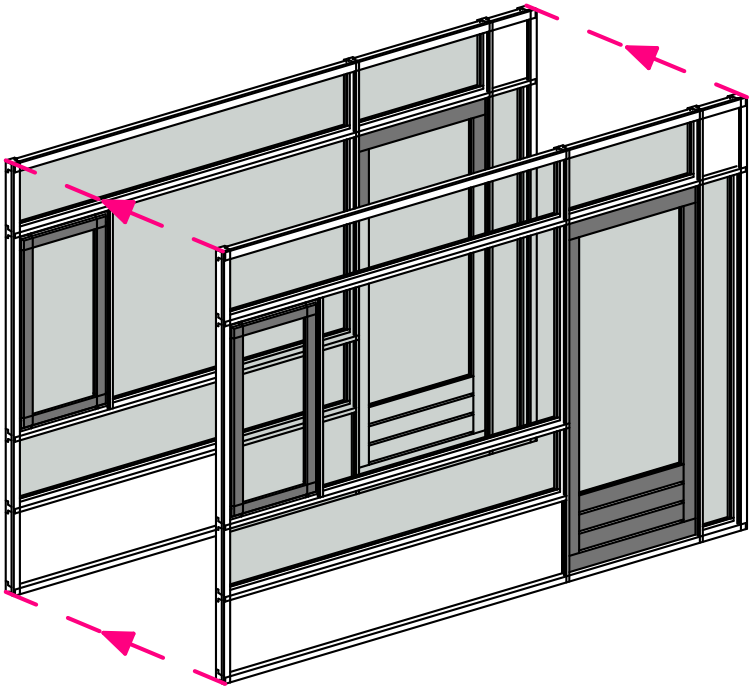


Figure 3: axo illustrating the stacking of identical window frames.

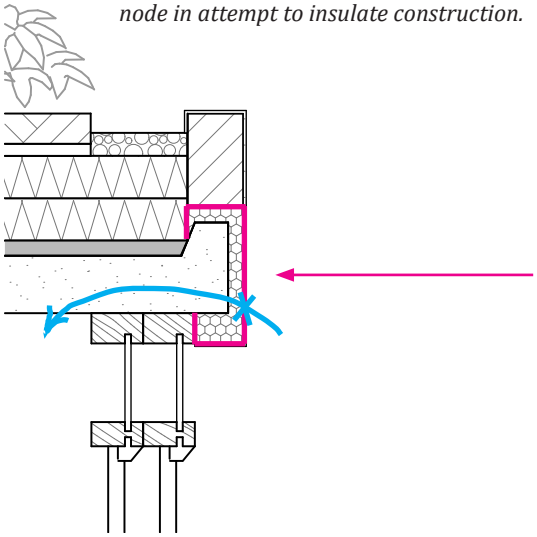


Figure 4: preliminary detail of roof and facade node in attempt to insulate construction.

In an attempt to break the coldbridge that would exist through the existing roof structure the roof edge was wrapped in an insulating block of styrofoam. Apart from styrofoam being an absolutely unfitting material for a design that seeks to minimize its ecological footprint, the solution hides the wooden boundary frame of the window construction. This was something unacceptable in relation to the appointed heritage value of the visibility and architectural articulation these frames provide.

Eventually the solution lay in setting the whole thermal defense line just infront of the original placing of the facade elements. This allows for insulating protruding roof and floor elements while keeping the boundary frames visible. (figure 5) The downside of this solution is visible in floorplan (figure 6) and elevation (figure 7). The need of extra wooden framing in order for the windowframes to be attached to the building means extending the visible width of the frames which covers in its turn a part of the original masonry walls between which the frames originally sat, changing the total amount of visible masonry between the original appearance and after renovation.

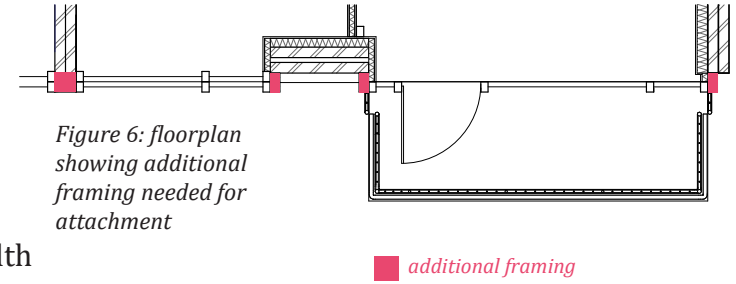


Figure 6: floorplan showing additional framing needed for attachment

additional framing

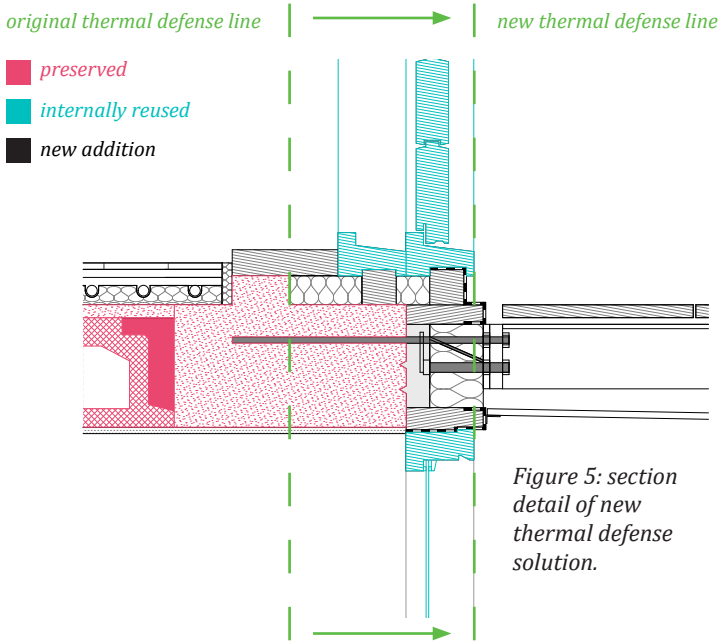


Figure 5: section detail of new thermal defense solution.

masonry wall visibility

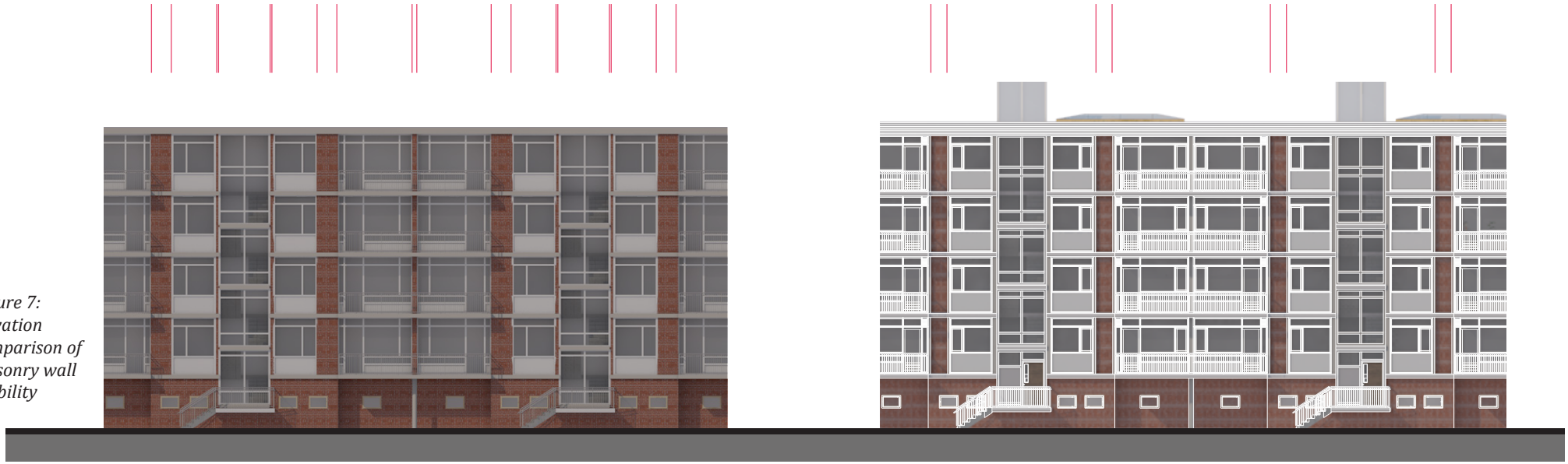


Figure 7: elevation comparison of masonry wall visibility

facade as-found

facade as-built

3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?

Most of the research I conducted has involved calculating and comparing the impact that the production of building materials brings. This has created a strong awareness in me that every intervention you make in a design translates directly into CO^2 emissions and energy use. Despite one of the conclusions of my research: that renovation is always more sustainable than demolition and new construction, I have become convinced that even in a renovation task, every addition of material must be well substantiated. Is a modification or renovation just a 'nice addition' or is it actually crucial to the success of the design? In my redesign for the "VanTijenflats" , this question has always been at the forefront of my design decisions. In a nutshell: material is sacred. This radical circular strategy can be summarised in three actions:

Action 1: preserve: Material and building elements that perform adequately within desired design remain intact.

Action 2: reuse. In cases where the material has to be removed anyway, I looked for a new function for this material within the design. This also works the other way round: if I wanted to add something, I first looked at whether I could take this material out of another part of the building where this material was less prominent. These actions ensure the most closed system possible with regard to material use because in this case material is moved and not removed. Eventually, material must also be added. Again, the addition is done only if it is necessary for the success of the design. This is where the third action in my circular strategy comes in:

Action 3: reclaim. If 'new' materials were needed to achieve the intended intervention, I have focused on applying second-hand building materials. These materials do not come directly from the building itself but are the residual product of demolitions and renovations in the rest of the Netherlands. This is where the results of the study had the greatest impact. It is also this strategy that was used in the research into the renovation plan for Complex 70, the used casestudy. The reused materials used in it came from the second-hand market.

Although I was convinced beforehand that this methodology will lead to a radically sustainable circular design, it also brought obstacles. The overall concept quickly became something of an 'anti-concept'. Not for nothing is the most circular ' R' in the 10 R's model of circularity: 'Refuse' . Many ideas and inspirations I received to improve the architectural design of the ensemble in the sense of both residential quality and urban design and the interaction the building can have with the ground level were soon blocked by my own methodology. This created some frustrations. A tension arose between circular and architectural ambitions. The positive side of this discovery is that I gradually began to discover that this very field of tension is the essence of my design. How to make this field of tension clear in drawing and image became the next challenge. Developing this is an ongoing process. Writing this reflection, for example, has

4. How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

I believe my research and my design project address a very relevant and urgent issue. The climate crisis is one of the biggest challenges facing mankind today. To ward off this crisis, all industries will have to go through concrete change. The construction industry plays a huge role in polluting the earth and can therefore also play a huge role in solving the problem. At the same time, the Netherlands suffers from a housing shortage and a large amount of post-war property that is severely outdated and in need of replacement or improvement. In current practice, people almost always opt for reconstruction which, in turn, contributes to the polluting production of building materials and thus only further fuels the climate crisis.
My solution: renovating and transforming this post-war property where reuse minimises the ecological footprint, lies exactly at the intersection of all these issues and thus has the potential to formulate an answer to this complex problem.

5. How do you assess the value of the transferability of your project results?

Transferability of Research:

The results of my research provide insight into the effectiveness of using reclaimed building materials to minimise the carbon footprint of a renovation project. In this, the final conclusions are project specific. They have been calculated and assessed based on a specific case study. However, it can be reasoned that similar results will apply to similar typologies and projects of the same size as the case study in question. In order to make these specific calculations, many general properties of materials have also been investigated, these are universally interpretable and are therefore fully transferable.

Transferability of Design:

The design shows how re-use as a guiding theme influences a design decision: it shows which opportunities arise and which challenges and obstacles. The design is also an architectural task for a specific location. This specific location creates a unique program of requirements which has a lot of influence on the design. The design case however, was carefully picked out for its representation of a large number of postwar dwellings. The typology of the 'VanTijen-flats', a five-storey portico flat constructed via the rules of 'standard construction' is a common typology in postwar neighbourhoods. The expectation is therefore that the interventions that my design consists of are highly transferable within this typology.

6. How has the specific topic or concept of your design influenced the type of required products?

My design is a renovation and transformation of an existing ensemble of buildings. These buildings were once delivered in a certain state. Over the years, these buildings have been modified to arrive at their current state. These are the first two layers in the narrative: the original state of the buildings and the current state of the buildings. The third layer is how, as a product of my interventions, the buildings are designed to be. In a sense, these layers can be considered static. The methodology I apply to get from the second layer to the third layer: preserve, reuse, reclaim, creates a dynamic intermediate layer. The second strategy in particular, reuse, creates a complex dynamic that requires extra attention to products that have to tell the story of the design. In the design, window frames are dismantled and put back in other places. Floor sections are cut out, in favour of a light shaft and enhancing the natural ventilation capacity. In turn, these floor parts find a new place in the ensemble as structural elements for newly added pavilions in the courtyards between the buildings. In turn, the facades of these pavilions consist of dismantled window frames that could not find a place within the renovation and transformation of the flats. These are two main flows, but through all scales of the design there are puzzles like this. For instance, the balconies are replaced, but the fenestration of the original balconies are put back on the new slabs.

This added complexity in the narrative requires new drawing techniques. Just drawing what was there before, and what is to come, is not enough. The drawings must also show the material flows. Producing such information has proved particularly difficult. Figure 8 shows the product I created to show the main material flows between the three largest flats. As can be seen, I had to unfold the blocks for this purpose to show all six facades in one perspective. Indeed, a perspective drawing proved necessary to make it clear what kind of material is involved. The cross-section (*Figure 9*) I presented in the P3 did not have the desired effect.

If we want to deal with transformation tasks in a similar way in the future, in which material that is removed is given a new function within the design as much and as well as possible, this requires the development of new drawing techniques. A technique I hope to have made a start on with my project.

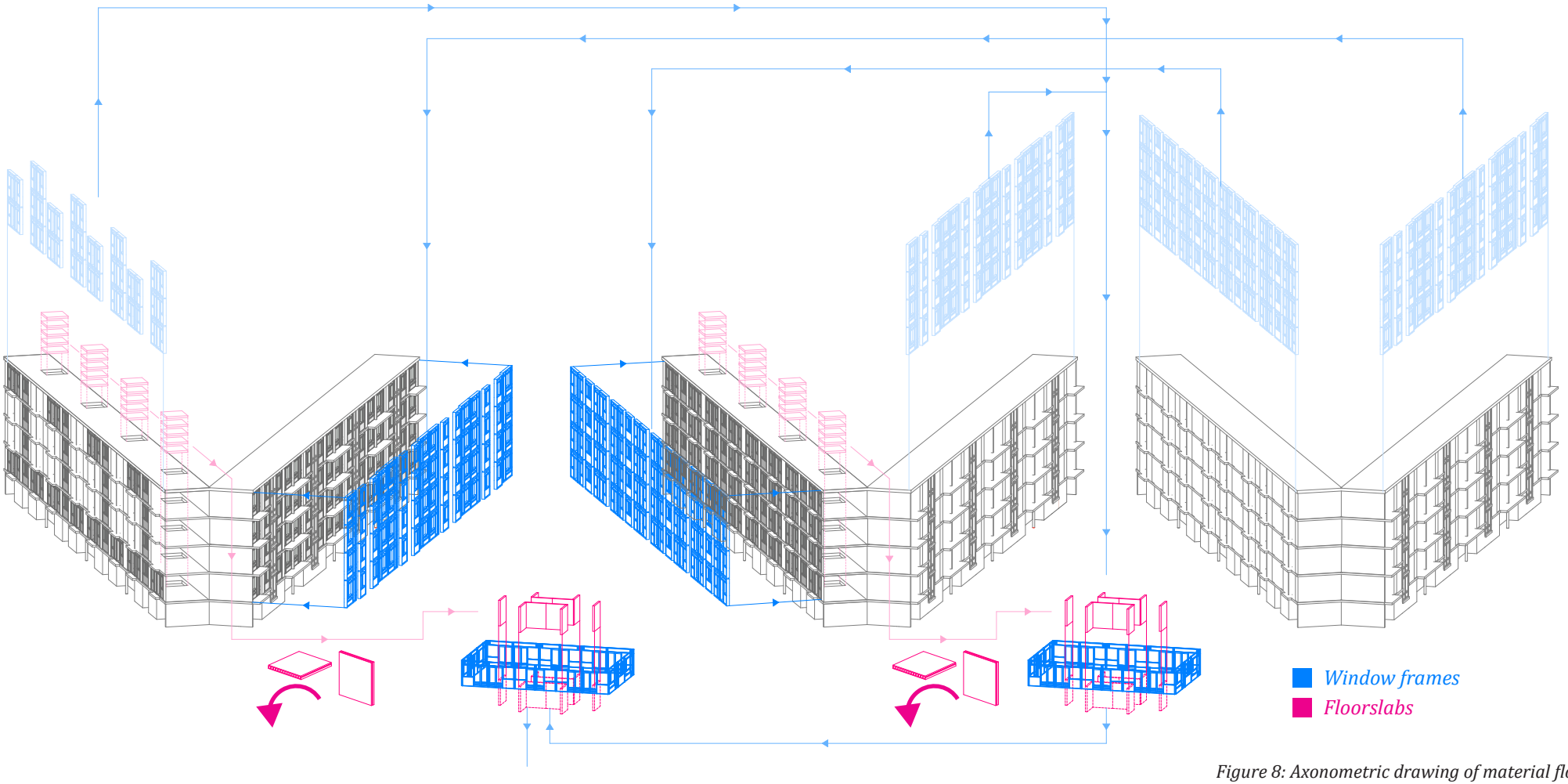


Figure 8: Axonometric drawing of material flows window frames & floor slabs

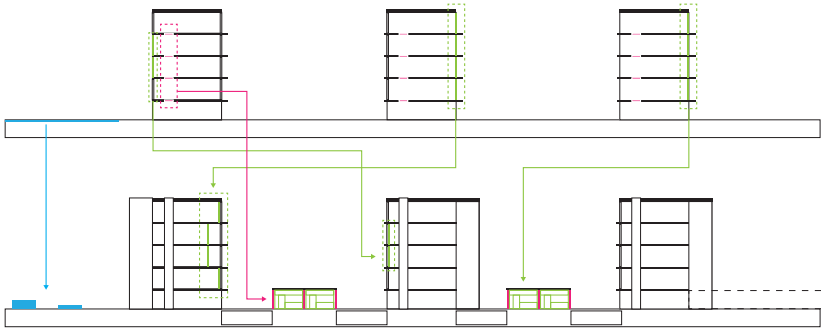


Figure 9: Material flow section as presented in P3.

7. Is the specific approach in your project representative for your view of the future of building practices?

My three strategies are intertwined in an interesting way. To recover materials there must be demolition waste. If we treat our buildings more consciously and renovate or transform more often instead of demolishing, this actually results in less demolition waste. If these projects also deal with the removed material as consciously as I do in my design, there will hardly be any residual streams available to reclaim. For example, my transformation and renovation of the VanTijen flats produces zero usable demolition waste. In this way, this strategy eventually makes itself redundant.

Within new construction projects, circular innovation such as modularity, demountability and spatial flexibility, in turn, also ensures that demolition will be needed less and less often in the future.

While my methodology is absolutely relevant and applicable in the near future and for the renewal of current real estate, I believe that in the longer term it is more a matter of a new awareness. The awareness that materials are precious and that producing waste is a problem that does not stop at the dumpster. This awareness will create a new standard. The main design concept will then no longer be reuse or circularity. These values will have become an integral part of any task.

At least, so I hope.

Additional reflection

Initially, my approach to the project was pragmatic and systematic, focused on the materials puzzle. The feedback after assessments highlighted that sustainable architecture should encompass more than just clever use of materials. My project, although systematic and sustainable, lacked true architectural value. The value of a building made of 98% preserved, reused, and reclaimed materials seemed logical to me. However, a crucial question arose: "Why this building at all?" What qualities does it add to the city, its surroundings, and its residents? These questions prompted a critical reassessment and revision of my design.
Upon reflection, I realized that while many of these questions were answered in the design, the evidence of such qualities was missing. In other cases, the reassessment led to specific design adjustments such as the redesign of the public plinth on the north side. Initially, this plinth, consistent with the rest of the design, used reclaimed materials, resulting in a closed appearance due to the unavailability of large second-hand glass panes. I then decided to construct this plinth from new materials, creating a high, open plinth with a strong visual and physical connection to the public square. This design choice enhanced the visibility of the arcade interior and better showcased the façade's preservation. Although it increased the carbon footprint, the architectural value justified the ecological impact.
This balance between carbon reduction and architectural appearance is also recognizable in the reuse of the window frames, although this strategy was proven to be relatively ineffective in my research. There are two reasons my design incorporates this strategy nonetheless. Firstly, the window frames were relocated internally and not retrieved from external sources, relieving the material from transport or the need for active sourcing. Secondly, the window frames provided a visible symbol of the design's circular ambitions, resonating with residents and passers-by. The façades of the pavilions mirrored the surrounding buildings, reinforcing this visual connection. A comparable principle applies to the in-between spaces created by the double window frame placement.
Conversely, the use of reclaimed PIR insulation material, though effective in reducing CO^2 and energy consumption,

lacked symbolic value as it remained hidden behind walls. This dichotomy between visible and hidden sustainable elements highlights the importance of both ecological effectiveness and architectural storytelling in my design.

Finally, I ask myself whether reuse can actually create qualities that new construction can't. In my project I haven't been able to proof this. I imagine that a building that is built with materials that are not brand new has a very different atmosphere than a new conventional building. A certain "patina" that gives it a distinctive character. I found it very hard to simulate this atmosphere however in drawings. As far as established architectural qualities go: space, light, comfort etc. reuse can't necessarily achieve things new construction can't. However, measured against climate impact, it can be reasoned that a lot of qualities can be achieved through reuse and that new construction is not always necessary. The quality of the in-between spaces in my design proofs this.

4. Reference list

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Picture 5: (1954). Nolenstraat te Amsterdam (2) Collectie Stadarchief Amsterdam: photo's. (archief/10003/43088)

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