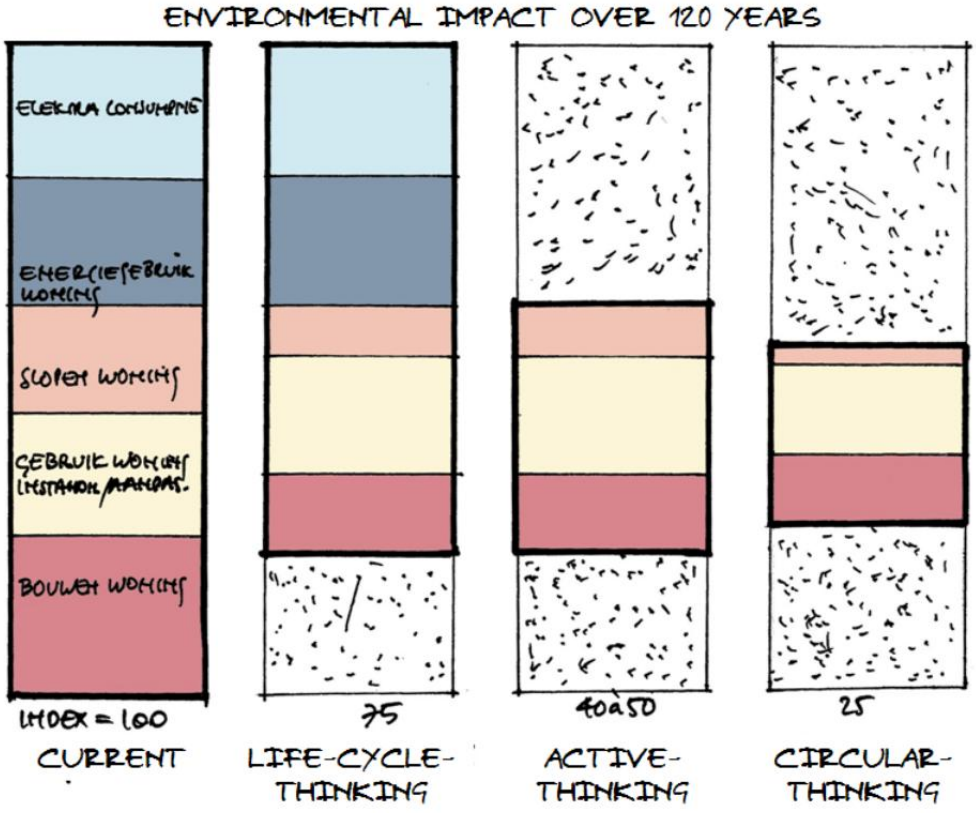
Repetition allows for sustainable solutions

-Active house and Alliances as solutions for sustainable construction-

Haico van Nunen (M.Sc. Phd)
BouwhulpGroep, Eindhoven, Netherlands
h.v.nunen@bouwhulp.nl

The task for the building sector is to provide a sustainable way of building and living for the 21st century, and beyond. To do so we must look at our current way of living and building and how that should be altered. But to achieve a sustainable way of building our way of thinking has to change.

In every day practice that means that the life span of every building should be longer (life-cycle-thinking), the energy use should be (nearly) zero (active-thinking) and material use should be minimized (circular-thinking). These steps are necessary to reduce the environmental impact of building (1). This figure is the visual representation of the results of the PhD study towards flexibility and the environment. From a sustainability point of view the ambition is set. However, this sustainability task is set in a different context. Nowadays the demand has changed. People want (individual) choices, not just in color, but also in quality and appearance. People want to decide for themselves when a refurbishment takes place, rather than a housing association plans to do the renovations. And because of that individualism and different moments, parts of a building need to be replaced, instead of the building as a whole.

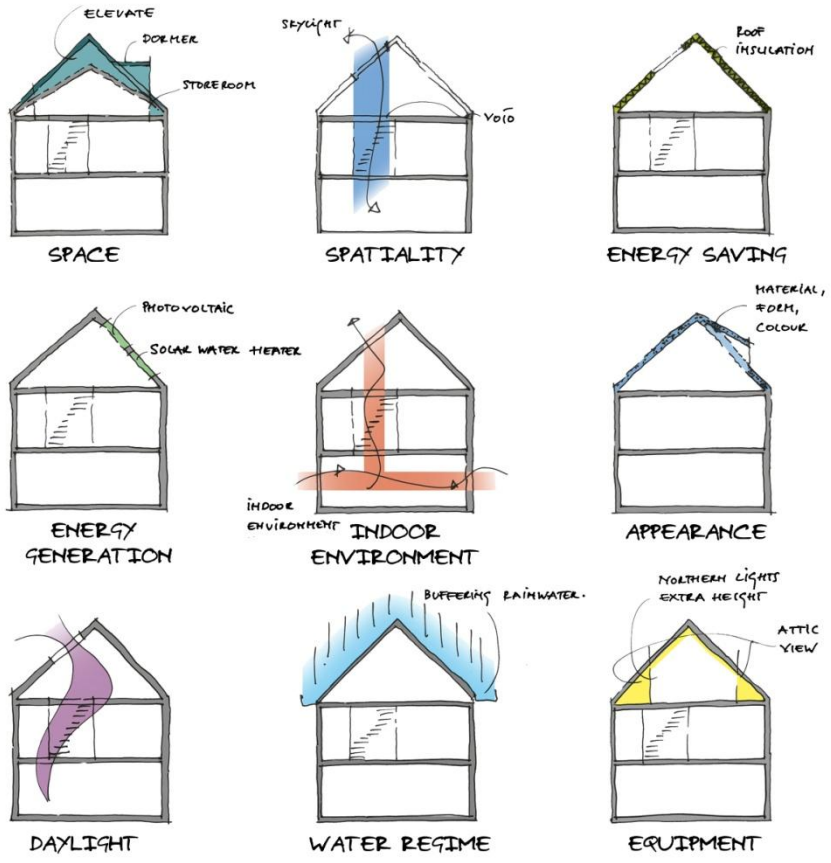


Next to a change in demand the existing housing stock plays an important role in today's refurbishment task. In the Netherlands, 2/3 of the houses were built after World War II. In those years affordable buildings could be built because of the mass. It is not a coincidence that non-traditional buildings (2) came into view in the period 1950-1975. Not only in the Netherlands, but also in the rest of Europe, for instance France (Coignet), United Kingdom (BMB) and Denmark (Larsen & Nielsen). But those times are gone. The new demands are difficult to achieve with mass production in mind. And not producing for the mass is too expensive. It is a sort of a standoff.

The problem above is one of the reasons to look at our housing stock in a different way. In the Netherlands we have roughly 7.2 million houses which can be divided into 35 different categories, based on type and period. And it is easier to look at a single category than to 7.2 million houses. The following section handles two examples of how to look at the building task. First an example of a renovation of a building in based on a category (Project Montfoort). Second the focus lies at the repetition between the parts of a building, (Component Renovation).

Project Montfoort

Montfoort: Active House as a vision
Let's have a look at one of the categories we discern: single family dwelling from the period 1965-1974. With 606.000 houses about 8 percent of the buildings in the Netherlands originated in that period. By looking at one example the possibilities of one project can be displayed, but at the same time the repetition will become clear, because this type of building s were built in different places all over the country.
In 2010 BouwhulpGroep was asked by Velux to design a refurbishment of a terraced house project. It was about 10 buildings in a project of 91 in total, that could be brought to a higher ambition level. The housing association had no set goal, just to explore all the possibilities. Velux proposed to renovate according to Active House principles. Active House originated as a vision of several industries in Denmark and is now a worldwide organization (with national branches (3)) that stands for a vision on building and living. Three categories are important: energy, comfort and environment (4). Nowadays there are specification for Active House, but at the start of the

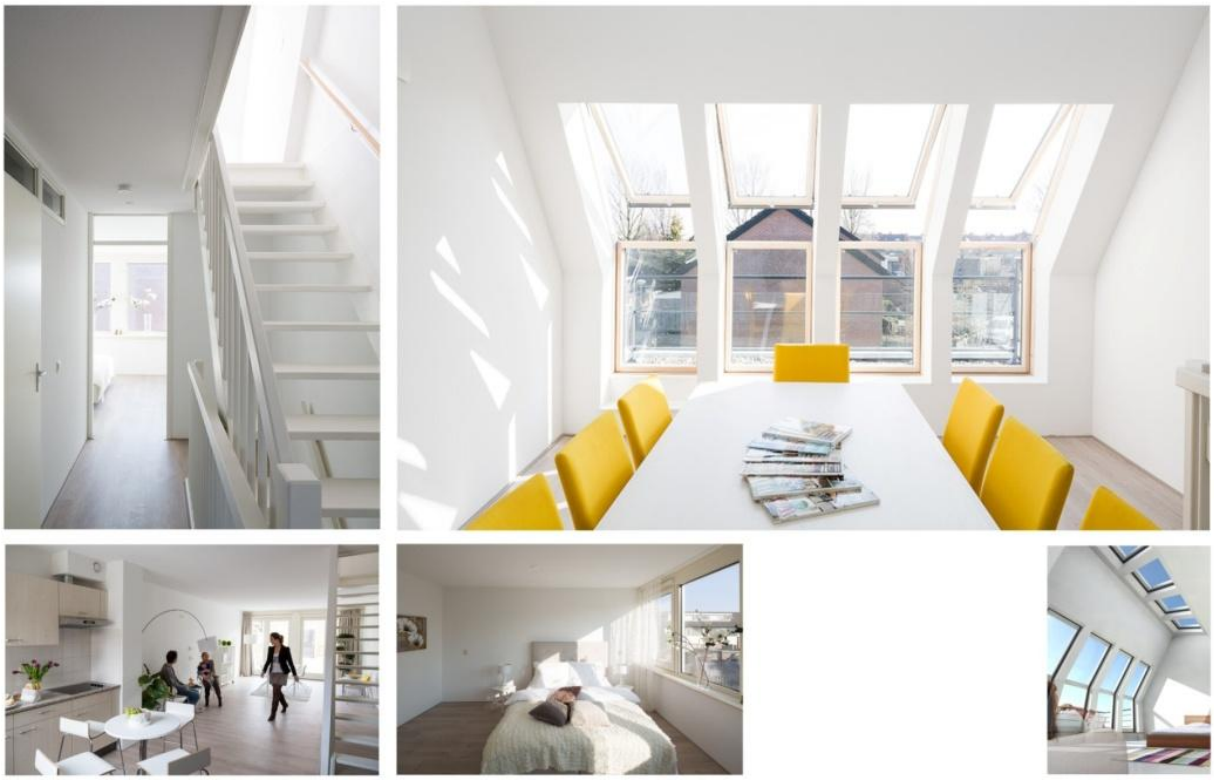


Montfoort project these were just in preparation. This is why we interpreted the Active House vision into three main topics that guided us through the design: light, air and space. To make it more practical we used nine story's to tell the ultimate solution. The nine story's, combined with interviews with the tenants and of course the housing association lead to the first sketches of the Active House Montfoort renovation.

Montfoort: the design

One of the aspects mentioned by the tenants was a lack of space. But because it was a rather narrow building an addition behind the building was not an option. Besides that it would block daylight, one of the key elements of Active House. The attic was only designed as storage room and had no fixed stair. So finally it was decided to add an extra floor, a new bedroom or atelier. The scope of the building lay 40 to 50 years ahead, so the building should be energy-reliant as possible (at that time energy zero building seemed faraway). This resulted in 18m² photovoltaic panels, 5m² solar panels, a heat pump and demand ventilation (CO_2). But the most important part is that the added roof consisted of extra windows that allowed for natural ventilation (chimney effect) and a lot of daylight. So a lot of the time machines are not needed, and the house is an active house.

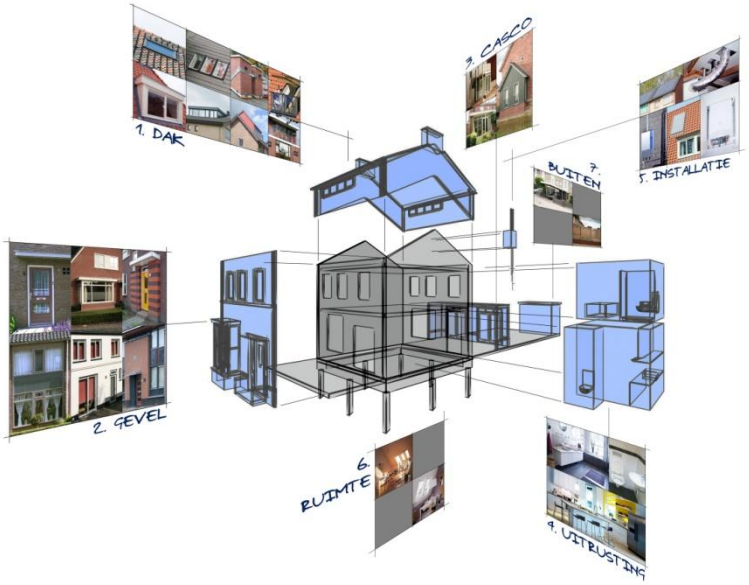
The lay out of the building changed as well. The entrance became more spacious, small doors were widened. The façade in the living room got more windows and a wall was placed that guides daylight coming in from the loft all the way down into the living room. At the first floor one master bedroom was created (former two small rooms), the bathroom enlarged with a second bedroom still in place. A fixed stair was added, so the newly added loft can be reached. The loft is an extra and bright room. Because of all the daylight this addition is truly a part of the Active House philosophy. Not only for the room itself, but it also acts as a carrier of light throughout the building.
The ten buildings got a real makeover. The large roof of concrete tiles now exists of PV panels combined with zinc. The façade was insulated (using smaller bricks ~70mm), with a stone matching the surroundings, but with a modern look. The windows were enlarged and new panels were placed.



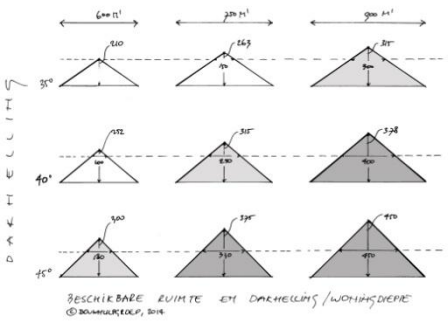
Montfoort: result
The effect of the refurbishment is a building that gives more than it takes, and which will last for another 50 years. No energy is needed for the house there is even a small surplus. The rent was increased, but the energy bill diminished. All the tenants agreed to the plan (4). After a year, the tenants pay about €15-20 per month for electricity.
This Active House refurbishment is an example of how a building can be renovated. But this kind of building is not unique in the Netherlands. So repetition is possible.

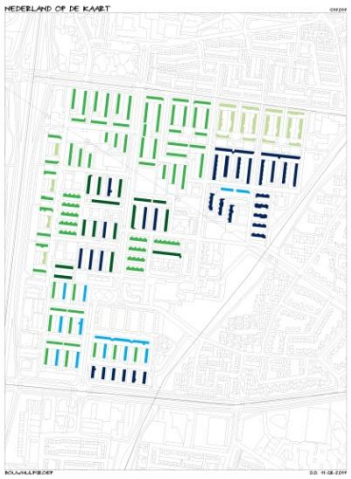
Component Renovation

Repetition could be a way to use existing ideas or plans and making the process cheaper. There is a way to look for more repetition. By not looking at a complex, but by looking at a component of a building. The origin of the idea came into life about 1990 when, together with the industry, we developed the improved kitchen' (5). It is a combination of installations and kitchen but designed as one component, where products and the process were integrated. It showed that a component on its own could be an improvement, and put on the market. The idea lingered on, but came full into view around 2007. The idea evolved into what we now call 'Component Renovation' or 'CR'. By dividing a house into components (cohesive building parts that together



fulfill in a function). The complexity of a building as a whole disappears. It is easier to develop one component than a complete building, especially when it concerns difficult tasks, as sustainability or individual solutions. And when it is about one component you can form an alliance between four or five industries that want to develop a new component with each other. That is the real power of cooperation, and not about product development, but about component development. But industries are not likely to participate in one project. Development costs are too high for one building or even for fifty buildings in one complex. But because components are similar in different buildings there is a cross-over market. For example look at a neighborhood. With 1200 buildings it contains 16 building types. Looking only at the component 'roof' these 16 types can be reduced to 5 different type of roofs. But when this is combined with four other neighborhoods we are talking about over 5100 buildings, in 43 different types and still only 8 roof types, or families as we call it. And this family is not only in this city available, but also in other cities, and even perhaps in other countries. And now it becomes interesting for the industry to develop a solution (component) for one of these families.





At this moment we are working with over 30 (global)industries to develop components. The formula 'Alliantie+' (reg.) (6) provides the solution, as a component, in a series of one, at the moment that the consumer decides. It is an integral approach, based on a system guarantee and part of a sustainable solution for the building. From our point of view, Alliances are the key to successfully building in the 21st century, because you can set your ambition and combine it with the client's wishes. New components will come to the market. Also with specific qualities, like cradle to cradle, low impact (bio)materials, or based on circular economy ideas. These can best be designed on a component level, rather than a complete building. It opens new doors.

Conclusion

The title of this article is about repetition. In the past, mass and mass production was the solution for affordable housing. Even nowadays, the optimization of a lot of contractors is based on more of the same, building concepts or bundling small projects into a large project. But mass production cannot give a solution for the problems of this era. We want an individual approach. Our own taste, our own price/quality and our own moment. So next to mass production we need to address the moment of the client, the price/quality ratio, and the interchangeability of components. And luckily we can use mass production on these themes, based on components. In Montfoort, it was one specific type, but this specific type was built in a lot more places in the Netherlands, so the plan can be repeated. According to the Active House view we looked at how high the ambition could become, and now it can be repeated. Component Renovation opens a new era for sustainable building. It actually turns the current building sector upside down; what is the demand, and who has an offer for that demand. It opens new possibilities for the industry, that in their turn can provide in a cheaper, and better, solution. It leaves more freedom, in choice for the moment but also in quality (diversification), and it is no longer obligate to do all the buildings at once, but you can do one if you like. It really places the occupant in the driver's seat. Repetition, based on a type or based on a component, allows for a cross-over approach so innovation can start.

Sources:

(1) *'Assessment of the Sustainability of Flexible building. The Improved Factor Method: service life prediction of buildings in the Netherlands, applied to life cycle assessment', H. van Nunen, 2010, PhD. thesis*
(2) *'Documentatie systeembouw '50-'75', Collection of non-traditional buildings in the Netherlands, BouwhulpGroep, 2013 (in Dutch) http://energieling.nl/uploads/attachment/file/4/78/Documentatie_systeemwoningen-1395931244.pdf*
(3) *ActiveHousenl is a national branche of the activehouse.org. BouwhulpGroep is one of the founding partners of this network.*
(4) *Active House discerns three main themes: energy, comfort and environment (www.activehouse.info)*
(5) *In the Netherlands 70% of the tenants have to agree when a housing association plans to improve the quality of a building. If 70% is not reached it is legally a 'ill–fitted plan' and the plan cannot be realized. This 70% rule does not apply for maintenance works.*
(6) *'the improved kitchen' was a collaboration between BouwhulpGroep, a kitchen industry and two industries in the appliances market.*
(7) *'Alliantie+' is a registered mark, by BouwhulpGroep. Under the Alliances several formulas originated, each of them target at a specific category of the (Dutch) housing stock. An alliance consist of industries and BouwhulpGroep for the coordination. The actual mounting of a component will be done by local alliances-partners. The alliance stands for quality, marketing and system guarantee. www.alliantieplus.com*