

Development of the Forest Prefab Transit Element

The Design and Integration Process of a Transit Element into the Forest Grid Through Performing Analysis, Ideation, and Concept Development

Forest Living is a start-up company that has developed its own sandwich panel, or element as they call it, which functions as a building block. Put these building blocks together and a house begins to take shape. Their goal is to solve the housing shortage by providing a building method for fast and affordable housing in a way that has a minimal impact on the environment. There are different variations of their building block in order to form a functional and liveable house. However, Forest Living misses an element that allows for transitioning of plumbing and ventilation ducts through their house.

This thesis aims to answer the research question: **“What is the best design for an element that allows for transitioning of the technical installations, with a focus on the plumbing and ventilation system, designed in a way that aligns with the existing designs of the Forest grid and philosophy of the Forest concept?”**.

Through research and analysis, a better understanding of the current Forest Elements is formed, the boundaries in which the transit element has to be designed are explored, everybody who comes in contact with the element and their impact on the design process is examined, and lastly, the regulatory aspects by which the transit element has to comply regarding the building decree and everything it entails is looked in to. The goal, by conducting this research, is to gain an understanding of what should and what should not be included in the design. By including as much insight as possible in the research phase, the hope is to encounter as few problems as possible down the production and integration phase, because finding or dealing with problems and limitations in the early stages of the development process can save a lot of time and money down the road. All these findings, together with the wishes of Forest Living, are represented in the list of requirements, in order to provide a clear overview of what requirements the transit element must comply with.

In the ideation phase, a variety of ideas on how to integrate the technical installations into the building or even into the element is presented. These ideas are sometimes in line with the list of requirements, but sometimes divert a bit from these requirements. This is to not limit the design process to a very specific set of boundaries, but rather, use the requirements as guidelines that can be crossed to explore more ambitious ideas. All these ideas are cross-referenced against the most important requirements to decide which ideas have the most potential and to conclude on a concept direction.

In the last stage, a final design is fabricated from the created concepts. Here, all the insights, understandings, ideas, and concepts come together to form a well-functioning overall system. The final design does not just exist out of a single transit element, but rather out of multiple variations of a transit element in combination with auxiliary design components, which together form a platform for a well-integrated plumbing and ventilation system. The different variations of the transit element are recreated in scale models (1:10). A life-sized model is made of an intersection point where the transit wall meets the transit floor. These are made to gain insight into the functioning of the transit elements and to locate possible flaws. The same goes for conducting the HTA and FMEA.

Concluding, we end up with a promising design that has potential. When comparing the designed system to the requirements and the envisioned solution going into this project, it ticks most of the boxes. The developed transit element should be well implementable into the standard Forest building and with minor changes, can also fit and function well in future projects of Forest Living. However, by the end of this project, the transit element is not yet fully developed and more testing on its load-bearing capabilities and implementation in real-life scenarios have to be done to uncover more possible flaws in the design or to simply improve on its current design. If, after performing these simulations, it turns out the transit element is not implementable after all, Forest Living has the option to further develop and continue with design concept 2, the double floors and ceilings.