BoKlok – Skanska & Ikea's innovative and sustainable wood building concept for the many people in Sweden, Norway, Finland and the UK

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BoKlok

BoKlok was founded in 1995 as a joint-venture between the construction company Skanska and the furniture company IKEA, with the aim to build qualitative, affordable homes for small households, with normal incomes. Two individuals were instrumental for the collaboration, Ingvar Kamprad, founder of IKEA and Melker Schörling, chairman of Skanska.

Figure 1: BoKlok's founders Melker Shörling and Ingvar Kamprad

Today, BoKlok is active on four markets: Sweden, Norway, Finland and the UK. On each market we offer market specific products, single family homes and apartments in multi-family residential buildings. These products (building types) are produced in the same way, based on wood-based volumetric elements, produced in factories, but with market specific configurations.

BoKlok builds around 1000 homes annually, adding to the approximately 15.000 homes that have been built since the start.

Already from the start, it was clear that BoKlok should be a concept based on a product approach, industrialized production and using a wood-based structure for the building of the homes.

1. BoKlok's development in three steps

The development of the BoKlok concept followed three main steps:

1. Investigation of the customer and market segment
2. Developing the products
3. Developing and establishing the production system

1.1. Investigation of the customer and market segment

The development started with customer investigations and analyses of cost limits and the target customers' needs and priorities. Further, insights regarding demography, customer groups and segments, cities' expansion plans etc gave important input to what BoKlok should focus on and answering the questions for whom shall we build? where do they want to live? what do the need in their home?

A result of these investigations was a target customer identification, illustrated by a single pre-school teacher with one child, who always shall be able to afford a home from BoKlok. This method has been part of BoKlok's continuous processes ever since, meaning that we constantly investigate our customer group's financial ability, needs and priorities, to make sure we develop customer offerings in line with our customers.

1.2. Developing the products

The second step in developing BoKlok was to use the customer insights as input to product development.
The chosen formula was a narrow range of highly defined products, consisting of the homes, the buildings and surrounding green spaces.
The products are structured in a Product Platform with a very high degree of pre-definition of included solutions. This enables a fast and reliable configuration of the projects, with well-known solutions that are suitable for production, transportation and assembly all the while high-quality homes and buildings are built.
An important part of the Product Platform is the choice to build with volumetric elements. Standardized apartments are divided into standardized volumetric elements, to be factory-produced. Rules define how these volumetric elements can be combined. For example, our multi-family buildings in Sweden can be combined into 2-, 3-, or 4-storey buildings with a variation in length. Facades, and roofs can be varied and in that way project-specific solutions are created, but with very high level of pre-definition. The apartments are standardized with a range of different apartment sizes that can be combined according to the need in the project.
The apartments have few customization options, however the apartments are designed for high functionality giving high utilization of space. Experts from IKEA are involved in the design, contributing with knowledge about furnishing to get the layout flexible with different furnishing combinations, making the compact apartments fit different family structures and needs.

Figure 2: A BoKlok apartment in Sweden, here with furniture from IKEA.

As mentioned above, BoKlok is specialized in building affordable homes for its selected customer segment. This specialization affects the whole company, from marketing and sales, through product development, manufacture, sourcing, land acquisition etc., by setting cost limits that need to be managed in order to successfully deliver according to the selected customer segment.

1.3. Production System

The third step in the development was to develop the production system for the developed products. Since BoKlok is specialized in a narrow range of products, the production system could be optimized to deliver only these products. In Sweden, BoKlok has our own factory, producing modules only for Swedish BoKlok-projects. This means that the factory is optimized for this and nothing else.
The factory produces flat panels for walls, floors and ceilings. These panels are then put together into volumetric elements (modules) that are completed to a very high degree of prefabrication. Approximately 85% of the total production work is executed in the factory, including the structural frame, insulation, windows, doors, electrical and HVAC installations, flooring, painting, complete kitchen, bathroom, external cladding, etc. Selected parts of the factory production utilize digitally controlled machines and robots that enable automated production and highly efficient processes. This is achieved through a strict structure of the building system which is managed in a software connected to the production equipment as well as to traditional CAD software. In the factory Lean Production methods are used to achieve high efficiency, quality, safety and engagement.

Figure 3: Automated machine producing wall elements in BoKlok’s factory

Figure 4: Robots working on wall panels

Figure 5: Elements are put together to a volumetric element

After completion in the factory, the volumetric elements are transported to the building sites for assembly. This is a fast operation and in 3-5 days a 4 storey building is assembled.

Figure 6: Wood-based volumetric elements are assembled fast on the building site

The building sites have the nature of final assembly sites. After ground works and foundation follows assembly of the volumetric elements, roof elements and external structures are assembled. Complementing works and connection of installations and finishing works follows along with finalizing the site into a housing area with gardens, parkings, complementing buildings, play grounds etc. All site work follows standardized processes.

Figure 7: After assembly complementing work and installations follow

BoKlok's own factory has not enough capacity to build all modulesneeded in BoKlok's complete operations, whereas additional, external factories are producing for BoKlok, as suppliers. This complex flow of modules from different suppliers is managed by a supply chain management team within BoKlok.

2. Vertically integrated value chain

BoKloks business model is vertically integrated. Already from the start it was decided that BoKlok is a project development company, meaning that we acquire land that is turned into housing areas built up with the company's predefined «products» (the homes, buildings and the housing areas).
To achieve a high-productive and scalable production, BoKlok has established a vertically integrated value chain including land acquisition, in-house product development, technical department and a factory producing volumetric elements with a high level of prefabrication. BoKlok controls the whole process from land acquisition, through product development, factory production, site works and direct sales to customers. This has enabled us to optimize the processes.

Product- and building system development is executed by BoKlok´s engineers and long-term hired architects and consultants. The product platform is reviewed annually, following a structured program, and based on continuously collected experience and follow-ups throughout the company's processes as well as through

3. Sustainability

For BoKlok, sustainability is about making it possible for the many people to own a sustainable, quality home in a safe and prosperous community. We have set out a goal to be climate neutral by 2030, throughout the entire value chain. Building with wood is our starting point, but we are increasing our efforts in terms of installing solar PV on all our buildings since 2018, minimizing waste in factories and on sites, changing materials to lower carbon alternatives etc.
We are also planning for a full-scale pilot-project with innovative solutions for decreased water usage (60% decrease), local energy harvesting (solar PV, solar heat, geo thermal solutions, wind turbines) and improved thermal insulation. This project will be our test-bed for solutions that will be standard in BoKlok's product platform in the coming years, contributing to being climate neutral.

Figure 8: BoKlok's planned pilot-project «Grönhult» with innovative solutions for energy and water

4. Architecture and design quality

BoKlok has initiated a partnership with one of Sweden´s most influential architects, Tomas Sandell. This collaboration has resulted in a new version of our residential buildings with a distinct BoKlok identity and care for details and design. Tomas Sandell has a background as both architect and designer which shows in the way he has worked with the BoKlok buildings, treating them as products that can be varied in many different ways, but re-using the solutions and giving the details extra care.

Figure 9: Details and architecture in BoKlok's latest product version in Sweden