

## **LIVING HOUSE – Building as a process**

**Adaptable and flexible Domino housing** (image 1) is an affordable rental apartment building in Helsinki completed in 2024. It is based on the Living House- concept developed by Karin Krokfors Architects, in which the sizes of the apartments and their spatial configurations can be easily modified throughout the entire lifespan of the building. The aim is to reflect changing needs of people and societies, thereby supporting the resilience of the built environment and extending the life of buildings. These changes are easy to implement, resource-efficient, and, when necessary, reversible. This is made possible by a new patented design and building concept including shaft element system that enable modifications without limiting architectural design or building typology. The idea is scalable and can be adapted to different building sizes, regulations, and contexts.

The Living House project was part of the *Developing Apartment Building* programme run by the City of Helsinki. The programme promotes innovation in housing design and construction, renewing design thinking and among other things emphasizing residents' ability to influence their own housing solutions. It allocates suitable sites to developers and builders, who are benefitting through site allocation for implementing experimental projects.

### **New housing design thinking**

The concept renews both housing design thinking and building construction from new starting points. The flexible objectives and residents' ability to influence their housing solutions guided the technical choices. The concept affects how we configure dwelling spaces, construct buildings, use them, and maintain them. To residents the apartments appear "normal," simply tailored to their needs. The ability to adjust one's living environment is built into the design concept itself: the building has an inherent capacity to generate diversity, rather than offering a fixed set of apartment sizes and layouts. The modification potential is easy to understand and resource-efficient to carry out. Because this flexibility is innate, the building can continually adapt, eliminating the need to predict future needs or preferences—its structure naturally accommodates them.

The concept is based on three main ideas for adaptability and flexibility:

#### **1. Space-unit thinking**

In Domino housing, a new spatial unit-based approach is used. The building is organized into spatial units that can be easily combined or separated to form apartments or workspaces of different sizes throughout the building's lifespan. The architect defines the building typology and the size of the spatial units according to the programme requirements. The potential permutations of dwelling types are almost endless and can evolve over time. This also influences the wider urban context, as dwelling types and spaces can quickly respond to changing societal needs (diagrams 1 and 2).

Diagram 1. Space unit thinking.

Diagram 2. Plans of Domino housing.

## **2. Load-bearing service shaft element**

The shaft elements combine both the load-bearing structure and technical services into a system for the entire building. They carry the building structurally while also providing most of the service technology when the building is erected. These structural–technical elements include water mains, drains, and ventilation ducts. Because of this system, the spaces adjacent to the shafts can be transformed into any type of room. No horizontal service installations are required, allowing free room division and enabling easy, high-quality spatial modifications.

A new plug-in system has been developed for the shafts. Connections are predetermined and identical for different room types, including bathrooms and kitchens. This allows bathrooms and kitchens to be located freely within dwellings, next to any shaft element, rather than having to be stacked vertically above each other on different floors (diagram 3).

A certain degree of “overcapacity” compared to conventional housing—such as additional shafts and multiple entrances—creates an almost unlimited number of dwelling and spatial configurations that can adapt to changing needs. The shafts, however, take on several new roles not typically assigned to them.

Diagram 3. Shaft element system including the plug-in system.

## **3. Easy construction and maintenance**

The concept addresses the entire life cycle of the building—from affordable, streamlined construction to flexible use and easy maintenance. As the building is erected floor by floor, most of the technical infrastructure is installed simultaneously, significantly shortening the on-site construction period. All material choices remain possible for structures such as floors and façades, as the shaft system does not constrain architectural design.

The interior of the service shaft elements provides open space for future infrastructure upgrades, supporting later changes as building technology evolves and mechanical systems age. The shafts can be opened for major pipework renovations—even entire shaft lines at once—and all service technology can be easily replaced. (diagrams 4, 5, and 6).

Diagram 4. The structure of the building in one floor plan. The shaft elements run vertical through the entire building.

Diagram 5. The shaft element.

Diagram 5. The building structure + service technology constructed through shaft elements.

### **Sustainability – Spatial resilience**

Life cycle thinking in the concept is expressed spatially, promoting spatial resilience and the long-term endurance of the built environment. The adaptability and flexibility integrated into the building extend its lifespan and reduce the need for new construction, as the structure can respond to unpredictable future needs. In this project, potential changes are also highly resource efficient.

Extending a building's lifespan reduces the energy and natural resources required for new construction, which also supports biodiversity. Since future needs cannot be predicted far ahead, buildings are viewed as continual processes rather than fixed products. Domino housing can adapt to changes in its urban context, helping prevent unnecessary demolition.

A major reason for demolition is the inability of buildings to adapt to new uses or neighborhood changes. In Finland, the average age of demolished buildings is 50 years—a period that often does not even cover the energy payback time of new construction. Early demolition therefore compromises overall energy efficiency.

The ability to continually adjust dwelling sizes and spatial configurations reduces the risk of vacancy and inefficient use. Spatial units within a dwelling can be rented or sold, improving resource efficiency at both building and city levels. This adaptability enhances urban quality and coherence, diversifies resident profiles as housing needs shift, and promotes economic activity by extending the building's lifespan and enabling natural renewal. It avoids repeatedly reinvesting in same structures that would effectively amount to rebuilding.

### **Inclusiveness now and in the future**

The Living-house concept used in Domino housing also aims to serve broader societal needs. In an aging society, it is important that people can remain in their homes and

neighborhoods longer, staying close to familiar social networks. Parts of dwellings can be rented—or in owner-occupied buildings, sold— among other things supporting multigenerational living, attachment to place, and new forms of communal living. Because each space unit include its own entrance and has potential for all kinds of rooms, different generations can live independently yet close to one another.

The flexible room configuration also supports group housing or co-housing, where solo dwellers share common spaces while retaining private bathrooms—made possible by existing service connections that allow easy addition or relocation of wet rooms.

In current purpose-built housing, people often face major housing decisions at their most vulnerable moments—after bereavement, divorce, or unemployment. With a flexible building concept, residents have more options: they can give up, rent, or sell part of their dwelling instead of being forced to move entirely, gaining more financial stability and choice.

For rental housing owners, adjusting the number of space units assigned to each resident is straightforward. Many large dwellings in Finland are occupied by elderly widows who may move to senior housing unnecessarily early because they cannot manage a large apartment. Younger residents may also convert parts of their home into workspaces or small production areas to support their income.

The building's adaptable framework supports diverse inhabitant profiles, as dwellings can be reconfigured from single-room units to family apartments or group housing. There is no need to predetermine for example a fixed number of small units; single-room dwellings can always be created when needed.

While reusing existing buildings is vital, it is equally important to rethink how we design and construct new buildings so we do not repeat past mistakes—ensuring the built environment that can endure and support both human and ecological wellbeing.

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