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Additional floors in old apartment blocks

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Abstract

A national programme of research was carried out in Finland to explore a concept for renovation of apartment blocks. The aim of the project was to develop an industrial-scale, economical and efficient concept for renovating, expanding and adding floors to apartment blocks. The technical solutions forming part of the concept make effective use of the opportunity provided by new Finnish fire regulations to use wooden structures when renovating. The apartment blocks built between the 1960s and 1980s now need to be renovated. One alternative that has come to light for the covering costs of renovations is additional construction. Buildings often have flat roofs, which makes the addition of a floor both architecturally and technically easier.

Prefabricated modular units were developed in the project in cooperation with the industry. The size of the units chosen has implications for structural planning as well as for the planning and implementation of the construction site and installation. Prefabricated wood-framed units can be installed on existing concrete slab. The direction and placement of the units are usually determined by the location of the load-bearing structures below. Installation of an array of beams upon the roof of the original building is often the best solution. The beams distribute the load from the new units over the old structures.

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1. Introduction

Urban sprawl is a problem in Finland also. This term describes the expansion of human populations away from central urban areas into low-density, monofunctional and car-dependent communities. The goal of retrofitting is to

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create a more sustainable urban environment within the context of the existing urban form. Sprawl retrofitting projects are focused on increasing density and diversity in a failed area. The main approaches to retrofitting are called reinhabitation and redevelopment. [1]

The choice of materials used in refurbishment, also, is significant from the standpoint of the sustainable ecology of the entity. Materials used in renovations should be renewable, recyclable, long-lasting and such that their manufacture has consumed only a minimum amount of energy and has created as little emissions as possible. The use of wood as a construction material is advantageous from the standpoint of climate, as a growing tree binds carbon dioxide from the air and wooden structures thereby function as carbon stores. Studies show wood products are associated with far less greenhouse gas emissions over their lifetime than building materials such as steel, concrete, aluminum or plastic. [2]

The use of wood brings benefits in building based on prefabricated units: wood-framed solutions are light; the degree of heat insulation can be freely chosen; and dimensioning to meet specific needs - tailoring of individual elements - is also feasible. The integration of components of the façade – windows, doors and cladding – into units as part of the prefabrication process is possible and if desired the interior cladding of prefabricated units may also be installed. [3]

From 2012 to 2014, an extensive national programme of research, known as KLIKK, was carried out to explore a concept for user- and business-centred renovation of apartment block neighbourhoods in Finland. The active participants in the project were University of Oulu, Aalto University, Tampere University of Technology, VTT Technical Research Centre of Finland, as well as numerous cities and companies in the construction sector. The Ministry of the Environment was involved as a cooperating partner. The project pursued a range of aims. Firstly, it sought to explore the opportunities for additional construction in the neighbourhoods and to develop innovative area planning practices and research into solutions for renovating apartment blocks; the particular focus here was to generate ideas for how to best build additional floors in apartment blocks and to develop the planning and building solutions this would require. Secondly, the project focused on exploring opportunities to develop operational models for carrying out renovations; of particular interest were opportunities for interactive planning and for implementing the project collaboratively among all of the participating parties using the alliance model. This article is based on the final report of KLIKK research project and project's outcomes. [4]

The overarching aim of the project was to develop a user-centred industrial-scale, economical and efficient concept for renovating, expanding and adding floors to apartment blocks. The technical solutions forming part of the concept make effective use of the opportunity provided by the new Finnish fire regulations to use wooden structures when renovating. In tandem with this work, the KLIKK project has engaged in research and development geared to developing new practices with which housing associations can implement renovation projects. For building managers and housing associations, user-centredness means that the planning, cost estimates and implementation of renovation projects can be handled reliably through a single partner and that these are based on a jointly drawn up and agreed project description. [5]

Renovation projects involve an unreasonable amount of work and inconvenience for building managers, housing associations and building residents. It is hard to find partners who are willing and able to take on renovation of an apartment block, and often it becomes necessary to seek out and assemble a range of contractors, whose work is then very difficult indeed to coordinate.

On the level of practical implementation, renovations of apartment blocks are slow, expensive processes that bring dirt and disorder and disturb building residents. The reason for this is that renovation projects in Finland typically apply operational models conceived for new construction. The renovation of apartment blocks uses methods designed for new buildings and the work is done for the most part on site, disrupting life for residents, the area near the construction site and the local community. The increasing amount of overdue renovation of apartment blocks in neighbourhoods built in the 1960s, 1970s and 1980s and the impending regulation requiring improved energy efficiency in existing buildings pose a challenge that cannot be addressed without tapping the efficacy offered by industrial-scale building.

In its component projects, KLIKK developed a range of solutions for additional construction in neighbourhoods and for adding floors to existing buildings using prefabricated units. Solutions were also developed for upgrading building envelopes, in particular the external walls, for energy efficiency, for renovating facades using a variety of materials, for building balcony systems and for installing lifts.

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