Industrialised Energy Efficient Retrofitting of Residential Buildings in Cold Climates

E2ReBuild

www.e2rebuild.eu

The vision of E2ReBuild is to transform the retrofitting construction sector from the current craft and resource based construction towards an innovative, high-tech, energy-efficient industrialised sector. In this project, new retrofit solutions in planning, design, technology, construction, operation and use of buildings are implemented, researched and evaluated. Solutions are demonstrated in 7 projects in Finland, Sweden, the Netherlands, France, Germany and the UK.

Introduction

Today, the building industry in Europe is characterised by on-site production, which may not be cost and production time efficient. The construction process is very time consuming and problems are often treated as unique and solved on-site.

A large proportion of residential buildings from the post war era in Europe are in need of renovation. These problems are why an industrial construction process for retrofitting is needed. In E2Rebuild, we are aiming to speed up the development towards a more energy-efficient, attractive and safe construction and building sector, through a holistic, industrialised process.

Building on previous results from national and European research projects and energy efficient full-scale retrofitting projects, a project consortium was formed.

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Demonstration building in Roosendaal, the Netherlands, before retrofit.

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Demonstration building in Roosendaal, the Netherlands, after retrofit.

Partners

Coordinator: NCC AB, Sweden

Finland: Aalto University, NCC Rakennus Oy, PSOAS | **France:** Opac38 | **Germany:** Gumpp & Maier, Lichtblau Architekten, GWG München, SchwörerHaus, WBG Augsburg, TUM - Technische Universität München | **Netherlands:** AlleeWonen, Trecodome | **Sweden:** Apartment Bostad Väst, SP Technical Research Institute of Sweden, White arkitekter | **Switzerland:** Empa, HSLU Hochschule Luzern Technik & Architektur | **Poland:** Mostostal Warszawa | **UK:** Gallions Housing Association

Objectives

E2ReBuild investigates, promotes, and demonstrates, cost-effective and advanced energy-efficient retrofit strategies that create added value for existing apartment buildings. Buildings that are the fast-track, low-cost residential houses built everywhere in Europe in the period 1946-1980.

The project focuses on establishing and demonstrating sustainable renovation solutions that will reduce energy use. The targeted reduction fulfils national limit values for new buildings, in accordance with the Energy Performance of Buildings Directives (for 2010). This aims to reduce the space heat use by about 75%.

E2ReBuild focuses on creating a holistic industrialised process that aims to minimise technical and social disturbance for tenants. It also facilitates energy efficient operation and use of the buildings, including encouraging energy efficient behaviour.

Methodology

To meet the holistic ambition of the project, E2ReBuild is designed to cover innovation in planning, design, technology, construction, operation and use of buildings. The 7 full-scale demonstration building projects serve as prototypes for application, evaluation and monitoring of proposed technologies and processes. The demonstrations are in different stages of completion, from early planning to near completion.

From the start of the project, tools, methods and processes are developed and refined by continuous evaluation and feedback between research and demonstration. Knowledge transfer is central to E2ReBuild, as lack of knowledge is identified as one of the most difficult barriers for successful sustainable retrofitting activities. The work carried out in research, development and demonstrations will finally be integrated in an industrial platform for energy efficient retrofitting, providing a concept with tools and processes for energy and cost-efficient retrofitting.

Expected deliverables

E2ReBuild will develop holistic retrofit strategies with added value and high replication potential for relevant building types, creating a formalised process for the early integration of production planning, cost estimation, design and socio-architectural parameters. The project will also create a user-friendly, web-based decision tool which allows for the evaluation of simple repair measures, sustainable retrofitting concepts, or building reconstruction, at an early design stage.

E2ReBuild will significantly advance the production methods by moving activities from the construction site to a factory setting with better working conditions in a safer working environment. Solutions will also be developped for added value prefabricated building envelopes, including the integration of HVAC technologies and solar active components on the basis of existing construction methods.

Guidelines for survey, off-site production, and on-site assembly and logistics will be established, based on studies of optimisation and standardisation of the digital workflow throughout the whole process chain. For the operation and use of retrofitted buildings we will monitor and measure tenant behaviour and the buildings energy use, resulting in guidelines to tenants as well as operators.

The collected data will be forwarded to the EU database. Finally an Industrial Platform for Energy Efficient Retrofitting, integrating the results achieved in the demonstrations as well as the RTD work, will be created. E2ReBuild is still in a start-up phase and most deliverables are scheduled for the last month of the project.

Impact

The vision of E2ReBuild is to transform the retrofitting construction sector into an innovative, high-tech, energy-efficient industrialised sector. The project will supply standardised flexible, cost effective, energy saving strategies for retrofitting a major part of the European building stock constructed and built in the post war era.

The industrialised process minimises technical and social disturbance for tenants and facilitates energy-efficient operation and use of the buildings, including encouraging energy-efficient behaviour. The bad reputation of industrialised construction for creating monotonous living environments, often associated with social problems, will be washed away and replaced with a common knowledge among builders, housing organisations, architects etc. that an industrialised process can save both costs and energy as well as create functional, attractive and individual housing for millions of people.

As the building manufacturing industry will move a significant proportion of their activities from the construction site to a factory environment, accident incidence rates will be dramatically lower. Through the creation of new working environments and a new knowledge-based reduced service industry E2ReBuild will therefore greatly contribute to improved working conditions as well as increase the attractiveness of the industry to workers.

Key facts

Start date: January 2011
Duration: 42 months
Total budget: €8m

- Industrialised energy efficient retrofitting of residential buildings in cold climates
- New retrofit solutions in planning, design, technology, construction, operation and use of buildings are implemented, researched and evaluated in 7 demonstration projects
- The demonstrations represent typical building typologies from the period 1946-1980
- The aim is to reduce the energy use in these buildings, through an industrialised, replicable process and at the same time create attractive living environments for tenants and better working environments for workers, at a lower cost