



INNOVATIVE FRAME WOOD CONSTRUCTIONS CONCEPT FOR HIGH ENERGY EFFICIENCY ECOBUILDINGS

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Introduction

Abstract. The aims of the research are to investigate the durability and compliance of patented innovative low or zero heat energy consumption buildings constructions.

To develop and study high-quality, energy-efficient and long-lasting low-cost eco-buildings construction technology by using locally sourced building materials and involving local labour, using various low-cost recyclable ecological materials and their recycling residues as eco-thermal insulation.

As a result of the research, it was established that by using building materials of appropriate size cross-section - spruce boards it is possible to make a sufficiently strong building construction frame by using a significantly smaller amount of building materials.

By filling the frame of the innovative construction building with thermal insulation in the appropriate thickness, it is possible to build up houses with high energy efficiency that correspond to the parameters of low or zero heat energy consumption buildings.

In climatic zones, where for buildings have increased energy efficiency and thicker layer of thermal insulation requirements, it is expected that double windows and doors design solutions will be used to reduce heat loss of cold bridges, and the air gap between them increase the energy efficiency of buildings.

Methodology



Figure 1. Prototype frame of innovative building constructions



Figure 2. Innovative roof construction with increased mechanical strength creating process

The scientific work describes an innovative, high efficient wooden frame buildings construction solutions, which differs from the existing types in that the wooden construction frame is designed to be fill up with various bulk thermal insulation materials. The width of the frame structures is determined by the necessary thickness of the thermal insulation layer required for the corresponding climatic zone in each component of the building structure - the floor, walls and roof.

The aim of the research is to develop low-cost but high-energy-efficient buildings constructions solutions by using locally sourced ecological and reusable building materials and local labour.

Results

The application of simple construction principles makes it possible to use the local medium-level specialization and cost labour force, ensuring the availability of such housing for people with an average income.

This is important for the wide and long-lasting sale of innovative technology in the global market. In this way, the costs of building eco-houses and the harmful effects on the environment will be significantly reduced.

It is an alternative solution to the use of exclusive, knotty and expensive short-live technologies that are financially available only to a narrow amount of wealthy clients why want build up expensive and complex buildings, which also require expensive, frequent service and complex disposal.

At the end of their service life, that does not reduce but increases the long-term harmful impact on the environment, the ecological footprint to Earth and global climate change.

Main conclusions

1. The lattice frame described and tested in the calculations is safe and may be used in building constructions, if provided characteristics of the elements defined in the calculations and scheme are complied with the defined loads and are not exceeded.
2. The experimentally created eco-building frame construction structure corresponds to the parameters set in the theoretical calculations and the constructive solution, therefore it can be used for the experimental object, practical load tests and exploitation.
3. The innovative building construction solution of the experimental object enables to perform energy efficiency research by filling the building frame construction with eco-thermal insulation materials included in the theoretical load calculations, as well to use other thermal insulation materials whose volumetric weight does not exceed the mass of in to calculations observed eco-thermal insulation materials.

