



XXV Polish – Russian – Slovak Seminar “Theoretical Foundation of Civil Engineering”

## Research and Development for the International Standardization of Green Roof Systems

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### Abstract

The article considers the problem of implementation of innovative sustainable development initiatives in the construction industry. Dealing with matters related to the application of systems of standardization in the field of design and construction of green roofs. The analysis of the Russian and foreign experience in the application of standardization systems. Presents modern system of green roofs, aimed at solving the problems in the ecological construction and building relationships that promote environmental responsibility.

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Peer-review under responsibility of the organizing committee of the XXV Polish – Russian – Slovak Seminar “Theoretical Foundation of Civil Engineering”.

*Keywords:* Green roof; green technologies; system of standardization; environmental requirements; “pie” of roofing structure; green construction.

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### 1. Introduction

The tasks associated with the implementation of its national policies in the field of eco-sustainable construction determine the need to enhance the architectural and construction industry capacities in the field of environmental safety.

Green roofs are an innovative design solution coating with landscaping system of residential and public buildings; such types of roofs are perspective for using in ecological construction.

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## 2. The researching objectives of the green roof

One of the most promising directions research is the effect of Urban Heat Island (UHI) in dense urban areas [1], that shows that surface temperature of conventional roofs can reach up to 25°C hotter than the air, while green coverings remain significantly cooler. Characteristics of roof coverings can be defined by surface reflectivity, availability of moisture and thermal mass of construction materials. Since the system of green roofs in Europe, Canada and the United States were the subject of research, the additional benefits of structural steel device ecosystems become increasingly important. A study in New York City shows the heat mitigation potential of green roofs. The researchers have modeled air temperature reductions 2 m above the roof surface of the city, with assumption of changing all roofs to green ones. The results show an average 0.2°C temperature reduction for the whole city in the day [2]. Today, environmental benefits, such as reducing energy consumption for heating and cooling purposes, the collection of storm water and mitigation of the effects of overheating facilities are some of the reasons for the demand for the growing popularity of green roof technology. Secondary benefit of the device green roof will: create a comfortable living environment, filtering, acid rain and air pollution and even noise pollution reduction. In addition, the green roof protects the waterproofing material, which is fundamental in roofing “pie” from overheating and ultraviolet radiation, thus increasing its durability many times over.

Current estimates of water quality of green roof ecosystems are studied using a 46 m<sup>2</sup> green roof in Cincinnati, OH. Analysis of environmental variables [3] including air temperature, storm event magnitude, and estimated antecedent moisture shows the major controlling mechanisms for runoff water quality in this newly constructed green roof.

The economic effect of the use of buildings with green roof coating is increased by purchasing additional exploited areas; it improve the aesthetic appearance, the creation of ecological attractiveness.

## 3. The development of Russian and International standardization systems of green technologies

Omar Espinosa [4] in his research noticed that awareness of green building standards in the United States among the respondents is generally low, but the Leadership in Energy and Environmental Design (LEED) and the National Green Building Standard were the most recognizable. Buildings that are certified as green buildings are in the process according to the standard in 4 stages [5], picking up points at various levels on the LEED system.

Nowdays only in a few countries there are rules and guidelines that apply to the green roofs. One of the first regulations, which was published in 1990, is a German standard “Planning, execution and maintenance of green areas on the roof” (FLL), developed by the Research Society for landscaping and landscape development in Bonn (Germany). Recommendations include the types of green roof, different types of vegetation, requirements for engineering construction, describes how the device of green roof, as well as repair and maintenance of roofs. Recommendations are available in English, but the content is related to the climate in the European Region and in particular to systems of green roof, built in Germany.

Modern roofing systems require modular device structures (Figure 1). The unique configuration of the modular green roofing systems with an unusual combination of architectural and aesthetic design solutions gives a beautiful and original look of the space in urban areas, and also allows you to use landscaping techniques to create a “living” roof.

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