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PLANNING AND DESIGN OF A SEMI-INTENSIVE GREEN ROOF SYSTEM

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Abstract

The study conducted in this paper is about how to design and realize a semi-intensive green roof system with all the technologic necessary elements regarding: safety, drainage and irrigation systems, substrate and vegetation. Modern green roofs, which require a whole technology for development of plant communities, appeared recently and are improved from year to year. A good design of a green roof should be planning in detail to facilitate implementation process. The result of this study is to design a model used to build for semi-intensive green roofs and also to calculate material requirements and costs.

Keywords*: green roof, design, semi-intensive system, implementation*

INTRODUCTION

Planting on roofs began in Europe, but it is now becoming popular all over the world. (Dunnett et al., 2004).
In the last five years, the term green roof has taken on ecological and social significance beyond its seemingly simplistic description. As commonly understood, the term has become an epithet for the reduction of pollution and urban heat islands, for large-scale mitigation of storm water runoff, and for maximum utilization of urban land. (Weiler et al., 2009).
In just a few years, green roofs have gone from a horticultural curiosity to a booming growth industry – primarily because the environmental benefits of extensively planted roofs are now beyond dispute, whether for industrial or governmental complexes or for private homes in urban or suburban settings. (Snodgrass et al., 2006).
Engineering design and arrangement of a green roof has advanced every year. Many people are still reluctant when it comes to such a roof mount her, for fear that it would not affect their home, so in Romania there are few companies that offer such services. In recent years in our country began to build green roofs on buildings with different utilities.
To better understand the concept of green roofs need to think about those buildings that have roofs wholly or partially covered with soil and vegetation that grows naturally over a protective layer through which water passes.
A good design of a green roof involves much more than special membrane substrate soil and vegetation. For a long longevity of these roofs underneath the soil can install protective systems that prevents too deep root barriers drainage or irrigation systems.
Green roofs modern technology requires a whole green underneath visible, newly emerging and improved from year to year.

MATERIALS AND METHODS

Green roof design was performed using 2D and 3D design program Google Sketch Up. For materialization of green roof have been used the following: galvanized pipe, fir beams, wooden board, membrane waterproofing and insulation, protective coating, mechanical separation, drainage layer, filter layer, soil and vegetable seeds lawn.

RESULTS AND DISCUSSIONS

To materialize this concept took a detailed design each component layer and substrate. This project was done on the computer step by step with the help of Google Sketch Up. (Figure 1.)

Figure 1. Design 2D

After completing the design of the panel 2D and 3D was much easier to calculate materials and costs necessary (Figure 2.)

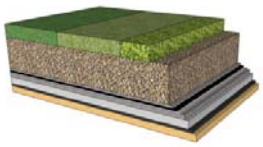

Figure 2. Layers of material

To materialize the design was done a panel with a length of 3 m and a width of 2 m to mimic the smaller roof.
Support panel (Figure 3.) was made of pipe ZN 2 ", over which were installed five fir wood beams caught screwing 10x8 cm at a distance of 66cm from each other.

Figure 3. Installing skeleton layout

Over these beams caught two of 2.5m x 1.5m wooden board, thus achieving basic roof and layout support (Figure 4).

Figure 4. Making panel

On the recommendation of two companies with prestigious planning green roofs, Simacek and Diadem, we used the highest quality materials and durability.
Over wooden boards there have been caught the following protective layers: the top two layers consist of waterproofing membranes and insulation. Such membrane protects against seepage and provides good insulation of the roof. Over these layers to put a protective layer anti-roots for vegetation root systems do not penetrate the protective layers (Figure 5.).

Figure 5. Putting waterproofing

The fourth substrate separation is made, storage and mechanical protection, over which was placed a drainage layer for aeration and water retention with a thickness of 40 mm. This system helps to drain rainwater and excess rainfall, and the irrigation system, avoiding stagnation. Another advantage of this system is that it helps drainage and aeration of the root system of the vegetation. To ensure stability of the system at various inclinations green roof

drainage catch this layer from place to place with iron supports for a better fit.
The sixth layer, the filter layer will be placed over the drain to prevent the passage of impurities and substrate and drain clogging. Above this layer is the filter layer will especially green roofs ground, then it will resemble grass.
Substrate ground, especially for semi - intensive green roofs are composed of perlite, broken pieces of brick, expanded clay and peat. This substrate allows optimal development of vegetation, drainage better and has a higher weight.
For future research is used the same soil substrate for 3 lawn seed mixtures in various proportions. Lawn seed mixtures are: *Poa spp, Festuca spp* and *Lolium spp*. in different proportions.
In order to compare which is more efficient irrigation system studied area was divided into three equal parts that were used as follows: an area of 2x1 square meters to install a drip irrigation system on a surface of a square 2x1 sprinkler irrigation and an area of 2x1 square not mounted any irrigation system.
The cost of a well designed and installed green roof varies depending on the building structure and type of existing roof, and the plant species to be bred. It is also often take into account the costs related to the aesthetic quality of coverage, some spectacular species requiring special care and attention. Such semi- intensive roof cost 100 euros per m^2 , and can reach up to several thousand , to an extensive system cost is decreased about 50 euros per m^2. System costs not included.

CONCLUSIONS

Making a green roof scares many because I do not know the details of how to realize such a roof and proper care. All these details are currently available on the internet or specialized companies in the field.
The materialization of a green roof is pretty easy and has many benefits for home and for our environment.
Ecological advantage of these green roofs is that a green roof retains and recycles rainwater, thus avoiding overloading the sewage system. A much better method of storm water management is to recycle water for irrigation these covers on sunny days.
The realization of this concept has been done to study infiltration, nutrient analysis drained of excess water, the studies on the benefits of each irrigation system in part, materialization and maintenance cost comparison between a tile and a green roof.
The model was made and to be used as teaching material as related Botanical Garden is located in the University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca campus.

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