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The Role of the Solar Light Quantity in the Architectural Forming of Buildings

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Abstract

The influence of solar energy to the architecture of buildings is undeniable. From the seventies of the twentieth century, lots of terms and definitions appeared, trying to describe a style of architecture based on the principles of taking into account the climatic conditions and the exploitation of the potential of local energy resources such as solar energy.

Theory of Architecture usually focuses on the mutual relation between building constructions and architectural forms. But, in the process of architectural forms design, the elements that are not directly related to the structural base of the building, are included too. Sustainable ways of heating, ventilation, water supply and so on, directly or indirectly affect the architectural planning. One of the important factors that affect the shape of the building is the elements associated with the solar energy.

Issues of how to Influence of solar energy on the architectural shaping of buildings are described in this article.

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1. Introduction

The term “passive solar building design” was created not so far. On practice it means the control of the heat flows by the means of architectural formation. Architectural formation is based on the rules of appearance of the heat

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flows and movement. Nowadays, an architectural shape has no direct relation to a structure as close as it used to be

before. Methods and means of energy efficiency advanced and became a considerable shaping factor.

The influence of the elements of solar systems to the architecture of buildings is undeniable. From the seventies of the twentieth century, lots of terms and definitions appeared, trying to describe a style of architecture based on the principles of taking into account the climatic conditions and the exploitation of the potential of local energy resources such as solar energy.

This is the very first serious approach to the architecture, as a science, indicating a significant impact of the overall ecological stability, in connection with ubiquitous knowledge of the necessity for environmental protection, reduction of technogenic and anthropogenic pressure on the biosphere. The energy crisis of the twentieth century brought a certain contribution in the form of a new architectural style, as well as the desire to achieve energy independence for countries which lost their reserves of traditional energy resources.

The history of architecture, in a certain sense, is the process of aesthetic conquest of new technical means, used in civil engineering, "Conversion of utility to elegance", in the words of A. K. Krasovsky. Theory of Architecture usually focuses on the mutual relation between building constructions and architectural forms. But, in the process of architectural forms design, the elements that are not directly related to the structural base of the building, are included too. Sustainable ways of heating, ventilation, water supply and so on, directly or indirectly affect the architectural planning. In other words, the whole gamut of technical means used in the construction industry, in one way or another affect the process of the forms' design in architecture.

The progress of contemporary architecture consists not only of the implementation of innovative constructions solutions, but also the implementation of the latest facility for the objects support, which in turn affect forms' design. One of the important factors that affect the shape of the modern building is the elements associated with the use of solar energy.

Analysis of the current experience of energy efficient modernization of buildings, monuments of history and culture, based on solar energy has shown the existence of principally different approaches.

2. The Influence of sunlight on the architectural shaping of buildings

Humankind always considered and used natural local resources in the long run of history. Unique local features of buildings and structures were formed due to this reason. Historical examples of structures designed to protect buildings from heating are broadly known, as well as methods used to improve thermal properties of conventional dwellings in Northern lands.[1]

Prevailing winds and incoming solar radiation were considered in city planning and buildings construction. Consider a few examples.

Acoma Pueblo is a settlement built by American Indians in the 12th century A.D. which is still

inhabited. Acoma Pueblo has rows of three-level, apartment-style buildings which face south. The roof for one level would serve as the floor for another (Fig. 1). Settlement was designed to make maximum use of solar energy in the winter period and to minimize solar heating of buildings during the summer period [2].



Fig. 1. Acoma Pueblo

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