Ecological Principales in Design and Operation of Media Libraries

Tatiana Rumilets

Urban Department, Odessa OSACEA The Odessa State Academy of Civil Engineering and Architecture, UKRAINE, Odessa, 4 Didrihsona st., E-mail: tanya.rumilets@gmail.com

Abstract* – *The design solutions have to be aimed at minimizing construction and maintenance costs (specifically, cooling, electricity and heating costs), following the principles of green architecture. In addition, the building has to be designed in order to function with a minimal number of staff.

Key words – ecology, green architecture, design principles, media libraries construction, library reconstruction, sustainable innovations

I. Introduction

The period of crisis has brought to an increased interest towards renewable sources of energy and saving fuel and energy resources, which are used for heating supply of buildings. As a result, a new ecological thinking has emerged and a new vision of human environment has formed. The increase of the anthropogenic impact and drastic development of science and technology have enhanced the negative influence of a man on nature. Buildings emit to the atmosphere nearly half of the general amount of carbon dioxide, so protecting natural environment has become a new goal of humankind.

In the general, the notion of "green architecture" combines a great variety of attempts to decrease heat losses due to the deepening buildings into the ground, opening spaces oriented to the south, complicating the constructions of walls and roofs by using rather effective isolating materials. Such a building functions with the help of alternative sources of energy and becomes a brilliant example of ecological design. On the whole, the architectural structure becomes a living organism. Its technical systems, sensors and other different constructions are the "respiratory organs", "digestion organs", "blood vessels", "nerve system" and its "supporting-motor apparatus" which are controlled by intellectual objects being able to exchange information. In other words, a building is a living, being artificially formed by a human, which is both equipped with microprocessors and components of organic nature, which is able to grow, evolutionize, become an object of transformation and "mutation" [1]. "… this time buildings are not embedded into the natural landscape, but nature is embedded in the building".

An important means of development and sanitation of urban ecosystems is using such environmental elements as flora. This is the reason why a huge attention has been given to the nontraditional design (planting greenery on flat roofs, including into the architecture and interiors elements of biotic environment – living plants, water, stone, materials imitating wood texture, fragments of certain natural zones with a sustained microclimate, etc.) [1].

Let us specify the major principles of those mentioned above which affect the architecture of library buildings:

– Optimal "efficient" space planning and constructive solutions, beneficial orientation with regard to cardinal points, maximum usage of natural light by including atrium or seamless vitrification in the structure of the building. Or, on the contrary, using a controlled solar protection by means of pergolas and mobile blinds.

– Using systems of rainwater collection, systems of cleaning and recirculation of technical water.

– Energy saving climate system of heating, natural ventilation and air-conditioning.

– An exploitable green roof as a synthesis of a natural landscape and an architectural form.

– Alternative sources of energy: solar batteries, applying ecologically clean materials, which could be reused and processed later.

– Enhancing "intellectual" systems of automatic maintenance of the building and energy saving technologies of artificial lighting.

An intellectual building is not mere external effects, but the invisible efficient work of engineering systems, which create ideal conditions for living of the building's residents.

A telling example of the principles mentioned above is Hennepin County Library Maple Grove – a library, which fully corresponds to the contemporary requirements of ecological design Fig.1.

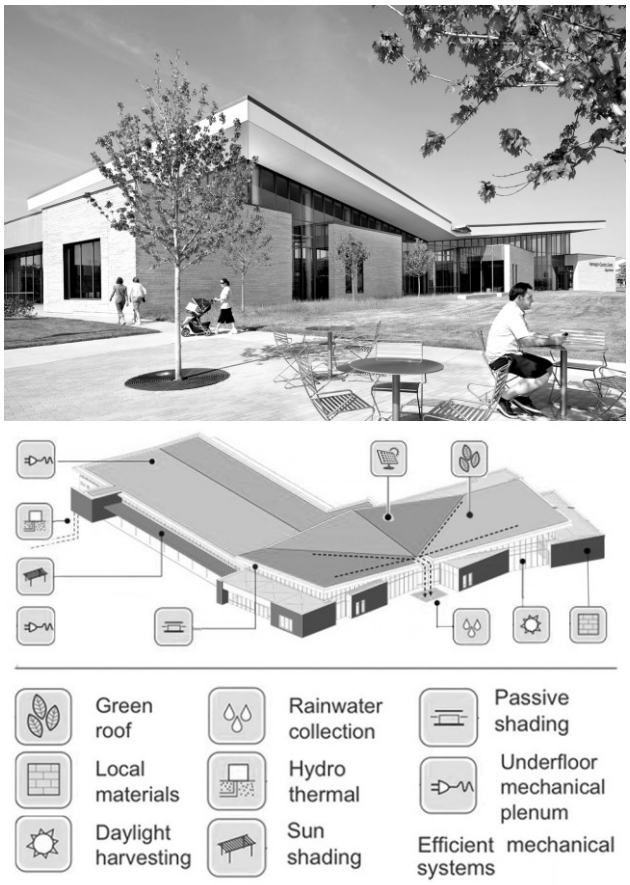

Fig. 1. Hennepin County Library Maple Grove

The new Maple Grove Library is designed as a pavilion in a park, connecting residents to information, the

outdoors, and the larger community. A seamless building and landscape design fully integrates the library and park, while a lake provides renewable, hydrothermal energy for the building. The design team's goal was to create a community living space, shaped by knowledge and technology. The design integrates outdoor views and spaces, such as a reading porch, which creates a strong inside-outside relationship and extends the experience beyond the walls of the library.

Energy conservation was a driving force in the design. The building was shaped to maximize daylight. An estimated 22.8% energy savings comes from daylight harvesting and another 24% from renewable energy sources. Designed to exceed the Minnesota energy code by more than 40%, the library provides an annual energy savings of more than 1,329,100 kWh.

The building was designed in accordance with the Buildings, Benchmarks, and Beyond: State of Minnesota Sustainable Building Guidelines. [2]

Another issue of nowadays is reconstruction and expanding of existing libraries. The following library could be drawn as a good and successful example of reconstructing a library following Sustainable Building. The most eco-friendly of the New York Public Library branches Fig.2, the project utilizes numerous sustainable design strategies and is on track to receive LEED Gold certification.

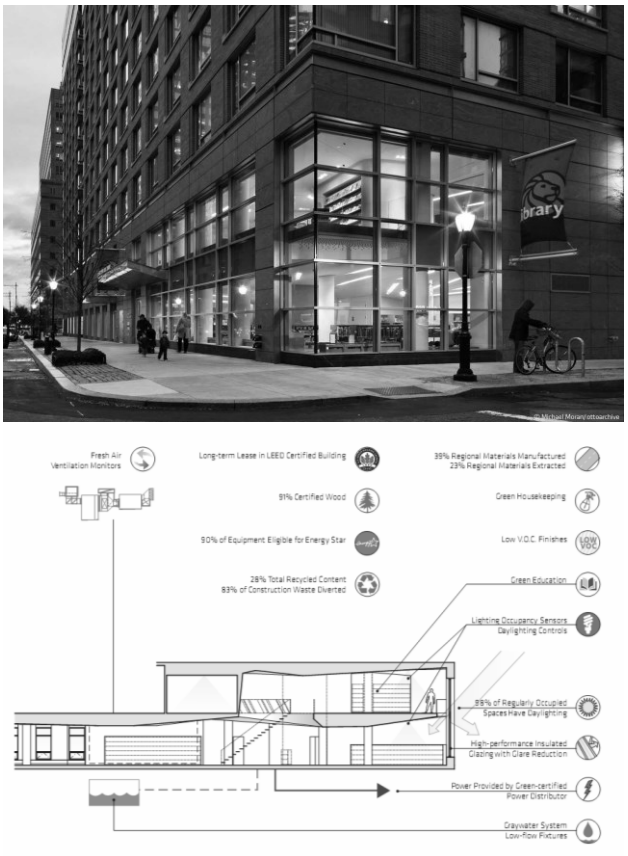

Fig. 2. The New York Public Library

The lighting system combines the need for a bright and f unctional library space and an energy efficient solution. The installation of a daylight-dimming device senses the amount of daylight coming in and dims the adjacent linear fixtures to compensate.

The energy efficiency of the lighting is further enhanced through the use of low energy fixtures and occupancy sensors in small, less frequently used spaces. Reclaimed wood from a wood manufacturer's cutoffs, carpet tiles fabricated out of repurposed truck tires, and recycled steel in the bookshelves, doors, doorframes, and structural members are part of the effort to take into careful consideration the life cycle of all materials used. The branch's power consumption is measured and offset by energy generated in remote locations using sustainable sources like wind, solar, and hydroelectricity. With abundant natural light, spatially dramatic sightlines, and inviting, efficient circulation paths, the branch was immediately successful at attracting visitors and encouraging community use. [3]

Conclusion

Based on the examples of the global experience in construction and reconstruction of media libraries, we have come to ecological principles of design and maintenance of media libraries, which include green roof, rainwater collection, hydro thermal sources of energy, passive shading, using local materials (and their recycling), maximum usage of daylight harvesting (also together with solar batteries), sun shading, introducing intellectual systems of automatic maintenance of buildings and energy saving technologies of artificial lighting.

A visitor working in a library has to be provided with comfort conditions from the ecological point of view. This gives an opportunity to work effectively with the materials. The operation of the library has to be independent of the weather conditions. Safety has to be another priority. This is important for protecting the book funds, for instance, by creating a stable temperature and humidity, building an underground library stack in order to protect paper funds from excessive sun light.

A major influence on people's safety is given by the planning structure which provides ecological comfort (insulation, noise protection, securing stable temperature and humidity, ventilation, etc.) and ways of evacuation.

References

[1] S.A. Yashin, "The ecological architecture and design. The concept, history and prospects of development" http://ekologhealth.ru/eko-dom/3960-ekologicheskaya-arhitektura-i-dizayn.-ponyatie-istoriya-i-perspektivy-razvitiya.html

[2] Archdaily, Hennepin County Library Maple Grove / MSR Design 3 Feb. 2011. http://www.archdaily.com/109062/hennepin-county-library-maple-grove-meyer-scherer-rockcastle

[3] Archdaily, "The New York Public Library / 1100 Architect", 7 Feb. 2012. http://www.archdaily.com/205410/the-new-york-public-library-1100-architect/

[4] Olga Dubin, "Library in the space of the city" publishing "Bibliomir" Moscow 2014.