HOLISTIC SYSTEM OF SB EDUCATION IN BUILDING UNIVERSITY IN MOSCOW

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Summary

The system of education in field of ecological construction was begun in 1991 by creation of the textbook «Building ecology». Then the wide system included new textbooks "architectural ecology" and "ecological infrastructure". They contain features of sustainable building in condition of Russia, ecological decision of territorial, planning, geological, geographical, biological, hygienic, architectural, technical and aesthetic problems starting with general town planning scheme and ending with construction of biopositive buildings and engineering structures, sensory ecology and ecological beauty of buildings, and ecological ethics. All together, these sciences have formed the new educational course "ecological (sustainable) construction".

Keywords: Sustainable building education, architectural-building ecology, ecological infrastructure, sensory ecology, ecological beauty

1 Introduction

The system of ecological education for sustainable construction is created by help of new scientific complex inclusive urban ecology, architectural ecology, building ecology, ecological infrastructure, resilience of life in city, sensory ecology, religion and ecological philosophy (ecosophy), ecological ethics, socio-psychological and socio-economic decisions. Urban, architectural and building ecology is interconnected sciences about making of settlements and buildings, which are in balance with nature, and allow creating high-quality environment in region, cities and in buildings. Ecological infrastructure serves to support of high-quality environment in city. Sensory ecology is new science about favorable or unfavorable influences of outward appearance of buildings and engineering structures, urban noise (sounds) and smells in city on organs of sense of inhabitants. The beauty of city is one of basic conditions of complete satisfaction of needs of the inhabitants and support of sustainable building. Love to beautiful and healthy city is means of support of participation of all inhabitants in creation of this healthy city. There are noted scientists

in this field Rogers, 1997, Deelstra, 1998, Kibert, 2001, Register, 2002, Wang Rusong, 2002, 2006, Vladimirov, 1996, Tetior, 1992, 2003, etc. [1-12].

2 New educational course “ecological (sustainable) construction”

Educational course purposes two basic aims: theoretical aim (ecologization of thinking of experts - builders by study of complex of knowledge in the field of ecological mutual relation of builders and the natural environment) and practical aim (study of complex of ecological decisions of buildings and engineering constructions).

The basic purpose of this course is to teach students the theoretical base of architectural – building ecology and sustainable construction, to make ecological their thinking as the future experts – builders, and simultaneously to give a complex of practical knowledge in the field of ecologization of the construction, allowing not only to design and to build biopositive buildings and engineering constructions, which not prejudicial to the natural environment and even supporting it, but also to reach a condition of ecological equilibrium at reconstruction of existing buildings and constructions.

As a result of studying the course "ecological (sustainable) construction” every student should:

- know the methods and decisions of ecologization of buildings and constructions and creations of the high-quality environment in buildings at their designing, construction and the reconstruction, based on ecological laws, rules and principles.
- know the bases of ecology for builders, including the basic ecological postulates (laws, rules and principles) and their influence on building decisions, main principles of an ecologization in construction, ways of achievement of a condition of ecological equilibrium between built up territories and environment.
- know the methods of control and quality management of the city environment, preparation and completion of sanitary - ecological passports of building production, the responsibility of designers and the builder in nature protection.

Besides theoretical course, all students fulfill one of number of recommended practical works:

1 Ecological buildings. The general principles of ecological compatibility of buildings. Schematic designing of ecological house (multi-storey, individual).

2 Multifunctionality of buildings and constructions. Performance of the basic function with simultaneous performance nature protection, nature restoring and other biopositive functions. The schematic design of multifunctional building or engineering construction.

3 Designing the buildings with preservation of soil - vegetable layer (underground, overground buildings). The schematic design of an apartment house.

4 Designing the buildings in the territories inconvenient for usual building (abrupt slopes, hollows, landslips and so forth) with preservation of territories for creation of parks. The schematic design of a building on abrupt slope.

5 Energy active buildings and engineering constructions. The schematic design of energy active buildings and engineering constructions.

6 All directions of energy-saving in buildings. The schematic design of energy-saving individual and multi-storey apartment house.

7 The ecological house and ecological manor of the farmer. The schematic design of ecological wasteless manor of the farmer with recycling waste products, use of renewable energy (wind, solar, geothermal, etc.), energy-saving, use of underground space.

8 "Intelligent" biotic building with feedback and information systems. Possible systems in "intelligent" building: a building with automatic reaction to earthquakes, with maintenance of the healthy internal environment, and so forth. Schematic design.

9 System of reduction of waste products and waste recycling in a residential building. The schematic design of a building with systems of collection of rainwater, use of "grey" water, recycling of waste products.

10 Ecological engineering constructions. The schematic design of ecological retaining walls, noise protected screens, seashore protected constructions, fencings, lampposts, etc.

11 Ecological infrastructure and ecological framework. "Green corridors" inside quarters, in area, in city. Designing of the general plan of city quarter in view of creation of "green corridors". Engineering constructions for creation of "green corridors".

12 Ecological building materials. Selection of complex ecological building (constructional and finishing) materials for erection of a multi-storey apartment house, of cottage.

13 Architectural - building bionics. Use of bionic principles in construction. The schematic design of a building.

14 Ecological reconstruction. Development of the schematic design of ecological reconstruction inhabited houses in Moscow.

15 Ecological examination of civil-engineering designs. An example of drawing up of the conclusion by results of ecological examination.

16 Sanitary – ecological certification of materials, of building sites, of buildings. An example of performance of works and completion of the sanitary - ecological passport.

17 The program of sustainable construction of city. The schematic design of the program of sustainable development. The program of sustainable construction.

All students perform in process of training the graphic work "Ecological home" with wide ecological improvement, eco-reconstruction of building and eco-restoration of landscape (**Fig. 1**) and write the abstract on the theme "Ecological condition of area in which I live and means of its improving". However, there are difficulties in studying the sustainable construction, connected with features of development of Russia and World.

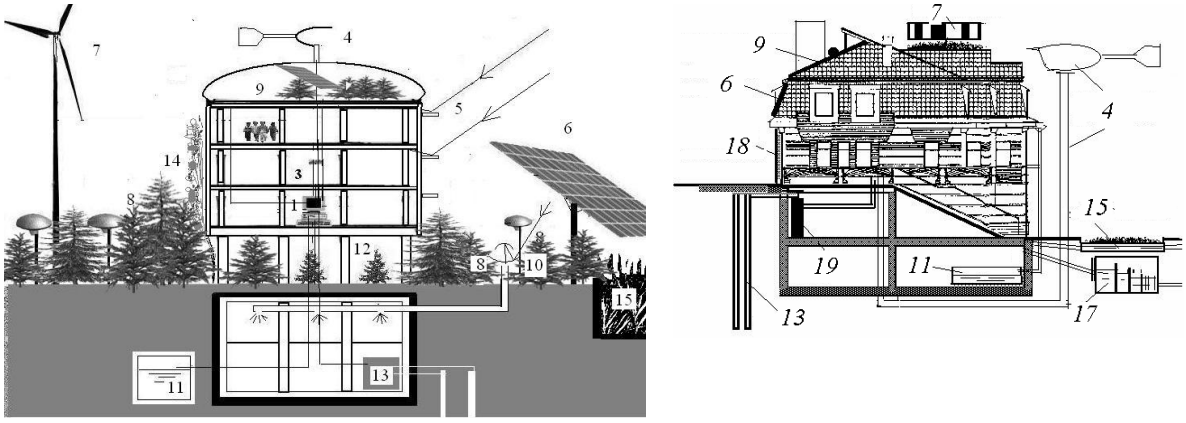

Fig. 1 Ecological sustainable buildings for students graphic work
1 – computers for receipt of the data from devices (gauges); **2** – gauge of the control of air in a rooms; **3** – the gauge of the control of internal light exposure; **4** – natural ventilation (such as a hood); **5** – receipt of light due to reflecting a venetian blind; **6** – electric power from the solar battery; **7** – electric power from wind farm; **8** – solar energy for night illumination; **9** – winter garden and hot water in heliostation; **10** – putting of daylight into basement; **11** – collection of "grey" water; **12** – trees under building; **13** – thermal pump of system of geothermal heating; **14** – vertical greenery; **15** – "living machine" for black water cleaning; **16** – heat pump; **17** – black water cleaning; **18** – passive heat wall; **19** – heat pump

New complex of interconnected sciences for ecological education in field of sustainable construction includes urban ecology, architectural ecology, building ecology, ecological infrastructure, sensory ecology, and ecological ethics. The system of ecological education for sustainable construction is based on inculcation of ecological thinking, ecological culture, and eco-philosophy. Urban ecology as most general ecological science includes the decisions of all ecological problems of big territories (**Tab. 1**).

Tab. 1 Structure of urban ecology

1. Ecological basis. Conditions of ecological equilibrium
2. Resource basis. Problems of ecological footprint and urban vulnerability
3. Biological basis. Problems of resilience of ecosystems
4. Territorial-planning basis. Ecological framework and corridors
5. Engineering - geological basis. Resilience of lithosphere
6. Geographical basis. Resilience of landscapes and all components
7. Engineering basis. Problems of ecological equilibrium restoration
8. Industrial and transport basis. Problems of industrial removals, pollution and transport
9. Hygienic basis. Problems of influence of environment on person
10. Aesthetic basis. Problems of increase of aesthetic value of natural environment

Architecturally – constructive ecology contains two complexes of ecology knowledge's: complex of general ecology knowledge that allows forming the ecological thinking of builders, and complex of special ecology thinking for ecologization of building (**Tab. 2**).

New concept of ecological infrastructure (it is complex of natural resources, constructions and systems, providing support of environment of human life) at all levels - from the whole country up to cities and to separate buildings and engineering constructions – can be basis of guaranteeing of high quality life environment in future healthy cities. (**Tab. 3**).

Tab. 2 Structure of architecturally – building ecology

Theoretical ecology		**Applied ecology**
Architectural ecology	Urban ecology	Landscape ecology
Ecological beauty	Construction ecology	Ecology of building site
Sensory ecology	Technological ecology	Phyto-melioration
Human ecology	Ecology of lithosphere	Ecological restoration
Love to city	Ecology of materials	Ecological reconstruction
Recourse saving building, buildings with closed loop of functioning		
Energy-saving buildings	Energy-active buildings	Natural technologies
Material-saving building	Water-saving building	Intellectual buildings

Tab. 3 Frame of ecological infrastructure

Artificial environment with ecologization	Completely natural environment	Quasi-natural environment
Technological systems with their ecologization	All natural territories with natural flora and fauna	Created by the person green areas
Traditional infrastructure with ecologization	Natural resources	Ecological built environment
Systems warning and liquidating adverse phenomena	Natural ecological framework with ecological corridors	Ecological cities and towns Ecological buildings
Socio-economic medium, socio-psychological medium		

Ecological beauty in urban architecture is beauty of ecological landscapes, buildings, engineering structures, complexes, districts, cities and countries, in which are used various elements of ecologization, sometimes changing their habitual appearance. All factors of sensory ecology (visual ecology, odor ecology and sound ecology) play very important part of life environment. Modern inhabitant perceives all sense factors on basis of previous conceptions about pleasant and useful sense influences, but modern sense mediums become more and more artificial. New ecological ethics is ethics of empathy. It assumes knowledge of ecology, evolution, and understanding of the important role of all animate nature in maintenance of life on the Earth.

3 Conclusion

Undoubtedly, the ecological (sustainable) building of ecocities is the future of mankind. New educational course “ecological (sustainable) construction” may help to form new ecological thought of future specialists – authors of ecocities, may help to preserve and to restore life environment and may help to create environmental technologies and healthy environment of life in future ecocities.

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