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House design in the 21th century: ecological design: case study of a straw bale house in Slovenia

ArchTheo 12 – Theory of architecture conference

House & Home from a theoretical perspective

Istanbul 31. 10. 2012 - 3. 11. 2012

Prispevek je bil predstavljen na 12i mednarodni konferenci ARCHTHEO 12, ki je potekala v Istanbulu od 31.10.-3. 11. 2012. Koordinator konference Efe Duyan, glavni svetovalec pa Asst. Prof. Dr. Elvan Gökçe Erkmen. Prispevek je bil recenziran ter pregledan s strani znanstvenega odbora konference s člani: Vsi prispevki so objavljeni v zborniku z naslovom House and Home – from a theoretical perspective, in sicer v dveh delih, kamor je vključena tudi spodaj predstavljena študija.

Znanstveni odbor konference je bil sestavljen iz 7 profesorjev iz različnih fakultet:

- Prof. dr. Edward Casey
- Prof. dr. Aylâ Fatma Antel
- Prof. Bart Lootsma
- Assoc. prof. dr. Aydan Balamir
- Assoc. prof. dr. Bülent Tanju
- Assoc. prof. dr. Murat Cemal Yalçintan
- Asst. prof. dr. Elvan Gökçe Erkmen
- Aykut Köksal
- Erdal Özyurt

Use of conventional building materials and techniques still dominates despite of global effort for more environmental friendly design. A number of projects aim at overcoming the aesthetic or structural boundaries, in each case aspect of energy consumption is neglected.

To achieve a result of ecological design the primary task of a design is a selection of a main building material with low impact on the environment and people. The use of renewable resources like organic material such as straw is significant contribution to reducing greenhouse gas emissions. From ecological point of view there are many important values calculated within environmental impact and defined such as primary energy content, global warming potential and acidification potential. Building use and its maintenance is the longest part of the whole building life cycle. The life cycle can be divided into three phases, pre-construction, use and after use. Contemporary practice dictates guidelines for low energy consumption especially in the phase of use, although basic building material has the major influence on total energy balance. In the case of straw bale building there are many positive characteristics compared to conventional construction, such as availability of resources, sufficient isolation properties, negative embodied energy, local availability, etc.

The use of local materials was typical choice in the past, whereas nowadays residential buildings are built up with conventional materials such as brick and concrete. Designers nowadays do not give much of attention when it comes to choosing basic building material. Usually the material is chosen according

to the investor's financial capacity. Investors rarely demand unconventional materials, such as straw. This type of material often raises concerns about the performance, and there are also few investors who categorically reject it. The advantage of this material is held in the accumulation of CO₂ in the straw, therefore the final energy balance is characteristically lower.

Straw has a long history in architecture. For the longest period of time it was used as a layer of thatch or a binder in a clay building techniques. At the beginning of the 20th century, simultaneously with invention of steam machine for making straw bales, straw bale building technique was developed and mostly used in combination with timber and clay. Basic properties of straw are the isolation properties which are quite suitable, but the greatest advantage of straw is its organic structure which is completely recyclable and it is locally available practically worldwide.

Straw bale building is suitable not only for rural area. Many already built buildings prove that the straw and specific building techniques can be applied in urban area as well. The design of the presented single-family house is orientated environmental friendly. Currently built project in Radomlje (Slovenia) is based on the idea of low carbon footprint. Consequently the choice of natural materials was obvious. Structure of the house is timber frame filled with straw bales and rendered on both sides of the wall with clay. Exterior wall is additionally protected with a layer of lime wash. Another step in environmental design is orientation of the house with minimum glassed area on the north side and largest glassed area towards the south which present low heat losses.

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Borut Juvanec

Architectural theory : order in reality

Symmetry: Art and Science

International Society for the Indisciplinary Study of Symmetry ISIS

Folk Architecture – Vernacular Architecture

8. – 10. junij 2012, Budapest - Veszprém - Szentendre, Madžarska

Mednarodna znanstvena konferenca Symmetry of Forms and Structures se je odvijala na temo prostorskih struktur in harmonije. Symmetry konferenca združuje znanstvenike z različnih področij, kjer se pojavlja simetrija ali asimetrija. Na teh srečanjih se srečujemo matematiki, industrijski oblikovalci, arhitekti, fiziki, gradbeniki, urbanisti, arheologi, ki se praktično ukvarjamo na realnih primerih in razvijamo teoretične modele in metode dela. Namen konference je v povezovanju idej, vedenja in utrjevanju misli o ravnovesju.

Order is very interesting thing, even in architecture. Mostly in architecture, maybe.

From classical times to the present, harmony has meant a healthy mind in a healthy body: in philosophy as well as in architecture. The beauty itself cannot be defined. It is a matter of fashion and applicability, that vary over time.

Knowledge, schooling, heritage are elements that are not so different in their results. Schooling gives shape to scientific knowledge, heritage knows only order. Order does not mean recipes, for instant use, but can be applied to architecture with individual inspiration, without constraint or command.

‘Order and reality’ is an eternal question but the wise man used myth for the realization of wisdom. Wisdom in architecture, especially in vernacular architecture, means understanding materials, techniques and design. The elements of the house, and the house itself, mean the essential parts of materialism as well as in symbolism.

Simple man, as a builder, could not know everything or master all the skills. An architect has to coordinate wisdom, skills and the ability of workers and of users.

Harmonization is the most important part of an architect’s work, and the most visible.

Simplification of the work and avoiding mistakes are the elements of designing space, the result is aesthetics.

Geometry and mathematics are very important elements of sense in architecture. Simplification is of primary importance, because only simple things can be visible, understood, in the end real.

The use of simple mathematics and geometry is essential for architect’s work, from prehistory till today.

One of the first architectures, sacral complex Hagar Him in Malta, shows the simple mind and anthropomorphic understanding of the prime man: use of his own elements. In groundplan, the morulla and symmetry are in use, as well as the corbelling.

The next elements are square, cube, triangle, and the use of square root of two in plain, square root of three in space, and finally the golden section, the closest proportion system to the man himself.

The square

A square is one sixth of a cube, of its outer faces. It has four sides and all right angles. It is defined by its diagonal, the square root of two.

The cube

After a sphere, a cube is the simplest body. Its use can be described in terms of the whole cube, its half, its third, and several cubes in composition.

The triangle

A triangle can be of different types but the most usable is equilateral, with all three sides the same. Its height is equal to the square root of three divided by two. Stone objects in dry stone from the ancient monuments as well as from shepherds huts have construction in corbelling: the construction of stone shelters is always the same, composed with help of the square root of three divided by two, but the elevations are quite different - from Iceland to Yemen and from Lanzarote to Palestine.

Golden section

The golden section is the most usable system of proportion system, in which the shorter part has the same ratio to the longer one as the longer part to the whole, where this is the sum of the shorter and longer parts together.

Proportion systems in use: square roots

Square root of two: Slovene kozolec/hayrack is composed in a square, with help of its diagonal - in plain, in its main elevation. Square root of three is equal to the height of an equilateral triangle. It is in use for composing the corbelled dome.

Three thirds of a cube:

Where the cube is cut into three parts, three segments with dimensions 3 : 3 : 1 appear. The beehive hut in Slovenia is embraced in a cube.

Two thirds of a cube:

The ground plan of a house has a ratio of dimensions 2 : 3, including side elevations, while the main facades are embraced in a square 3 : 3. The granary near Vrhnika is composed in this order.

Three cubes:

A Slovene kozolec/hayrack in the space is a composition of three cubes, in which only one length is determined, the others are the result of diagonals: the diagonal of a square is the square root of two, and the diagonal of a rectangle with sides one and $\sqrt{2}$ is the square root of three.

A kozolec (hayrack) in Slovenia is the only ethnic architecture I know (May 2010:66).

Conclusions

Order in architecture is used for simplifying work, for avoiding mistakes - in technical mean of the construction. The use of such order results in beauty.

With the help of order, even unschooled, but not unskilled, man can achieve the effect: good, usable, achievable and harmonious objects, which are successful and beautiful and in which the users enjoy living. Quality of life means culture itself: the culture of mankind and of architecture, in time and in space.

And nobody is perfect. Except vernacular architecture.

JUVANEC, Borut. Architectural theory : order in reality. V: NAGY, Dénes (ur.). Folk architecture - vernacular architecture: traditions and rural development, Budapest - Veszprém - Szentendre, Hungary, June 8-10, 2012, (Symmetry, 1-2). Melbourne-Kew: International Society for the Interdisciplinary Study of Symmetry, 2012, str. 68-73, ilustr. [COBISS.SI-ID 2723716]

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Clay in Architecture: Slovenia and beyond

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RESTAPIA 2012 International congress on rammed earth

Universitat Politècnica de València

Valencia, 21. – 23. 6. 2012

Earthen architecture is more or less architecture in clay, but the boundaries between earth, clay, gypsum, lime and stone are not very clear. Earth, soil and turf can be used in construction