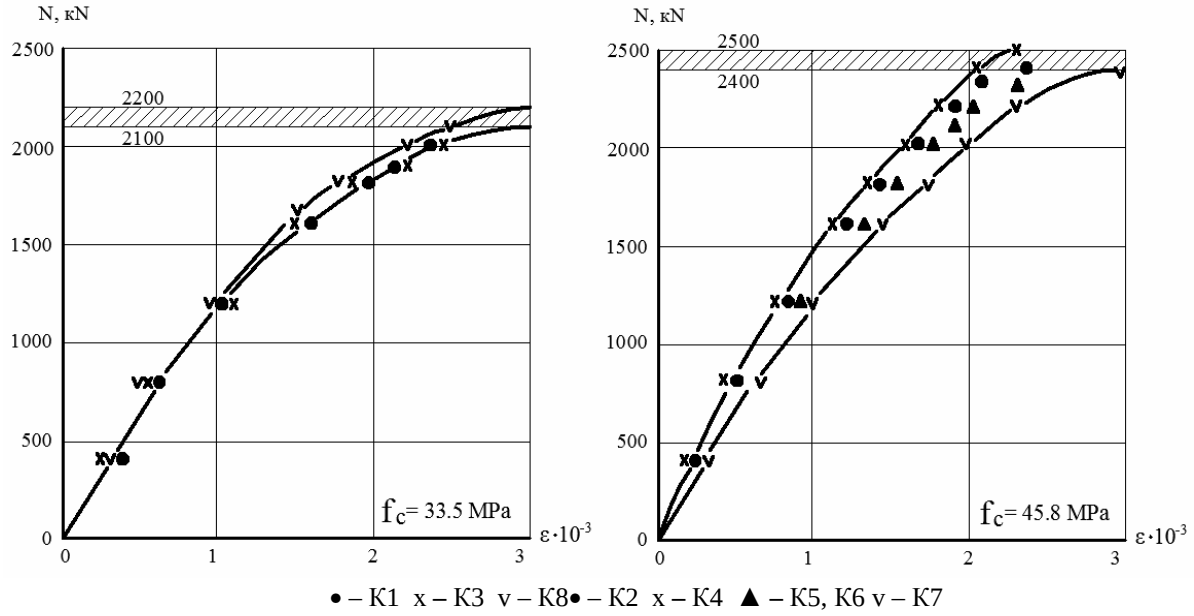

Fig. 4. Relative cross deformation of concrete of prototypes columns

– Character of the strain distribution was set along the length of prototypes couplings and its compliance as a linear displacement relative to the coupling rods abutting. The areas of strain concentration along the length of the connection were creating.

– Experimental tests of columns with coupling sleeve gave possibility to determine the strength of prototypes columns at the central compression.

– Placing a mechanical connection in the compressed zone did not lead to additional significant strains in concrete and did not affect the strength, and there were no influence on stiffnessof tested concrete columns.

– The obtained results allow us to recommend new construction mechanical connections for practical application.

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UDC 72 (Architecture); 502/504 (Environmental science)

ECOLOGICAL TRENDS IN THE BUILDING INDUSTRY

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The article discusses the criteria for environmental assessment of buildings and the various methods of environmental certification. Sustainable building is based on the use of environmental technologies, such as non-waste technologies, low emission technologies and renewable energy sources, reducing of energy consumption and use of ecological materials.

The building sector is a sector of the economy, which has a very strong impact on the environment, among other things; it is responsible for the consumption of 42% of energy and emission of approximately 35% of greenhouse gas emissions in the EU. At the same time construction in the EU market is buoyant (10% of GDP and 7% of the workforce), with a high potential for innovation. The implementation of the concept of sustainable development in the construction industry includes environmental aspects, social aspects and economical aspects. The chances of improvement in the housing sector, responsible for 26% of total energy consumption are substantially higher than in commercial construction. Comprehensively assessing the environmental impact of a building, usually shall be taken it impact on the enhancing of the greenhouse effect, the ozone layer depletion, consumption of primary energy, water consumption and water pollution (eutrophication and acidification), generation of waste and emissions of hazardous substances and the impact on the local microclimate.

The Assessment of the impact of the building on the environment is to determine the interaction of process and environmental and quantify of resources and energy flows charged from environment and emitted into the environment [5].

To assess the impact of the building on the environment throughout the life cycle analysis is used LCA (Life Cycle Assessment) (Fig. 1).

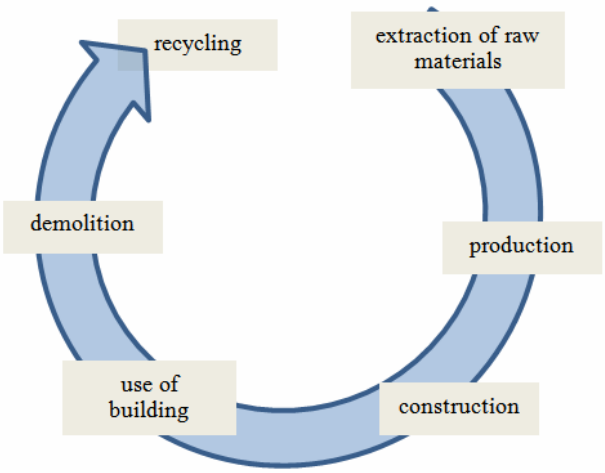

Fig. 1. Life Cycle Assessment of building

In the life cycle analysis of a building the environmental impact of all stages is considered : extraction and processing of raw materials, the manufacturing process, transportation, distribution, design, construction, operation and repair, end of life, change the way of use and re-use of waste. At each of these stages, a building strongly interferes on the environment, and interference may have either a negative or positive impact. The overall impact on the environment is determined by the balance of positive and negative impacts. LCA of buildings can be seen in the context of the analysis of the environmental impact of individual building materials.

The longest stage in the life cycle of the building is its use. The average person spends 80% of his life in building, therefore comfort and indoor environment are it is very important things. Analyzing the quality of life, most often is taken into account criteria such as health, safety of life, the environment and housing situation [niezabitowska]. The quality of the building, according to the POE (Post-Occupancy Evaluation) can be viewed in terms of technical quality, functional quality, behavioral quality and organizational and ecomonical effectiveness. By ABSIC (Advanced Building Systems Integration Consortium) the quality of the building can be assessed in terms of quality of space, thermal comfort, air quality nad acoustic and visual quality [5].

Among the tools used to assess the quality of the building include:

– REN (Real Estate Standards) – Dutch norm of real estate, constituting a systematic checklist, that allows to determine needs through discussions (helpful for architects when determining the requirements of the investor).

– PBAP & MM (Physical Building Audit Procedures and Maintenance Management) – it is the procedure for checking the physical condition of the building and its maintenance management – expert method for Facility Management in intelligent buildings.

– LCA & LCCA (Life Cycle Analisis & Life Cyclec Costs Analisis) – analysis of life-cycle costs of the building, allowing for the evaluation and calculation of economic justification of modernization [3, 5].

The implementation of objectives of sustainable development with regard to construction is reflected primarily on tightening requirements for thermal insulation of external walls and reduce the seasonal demand for energy for heating the building. So every building that meets the criteria for sustainable building must be, by definition, energy-efficient building. Criteria for assessment of buildings, in terms of its compliance with the criteria established for sustainable construction is shown in Fig. 2 [4].

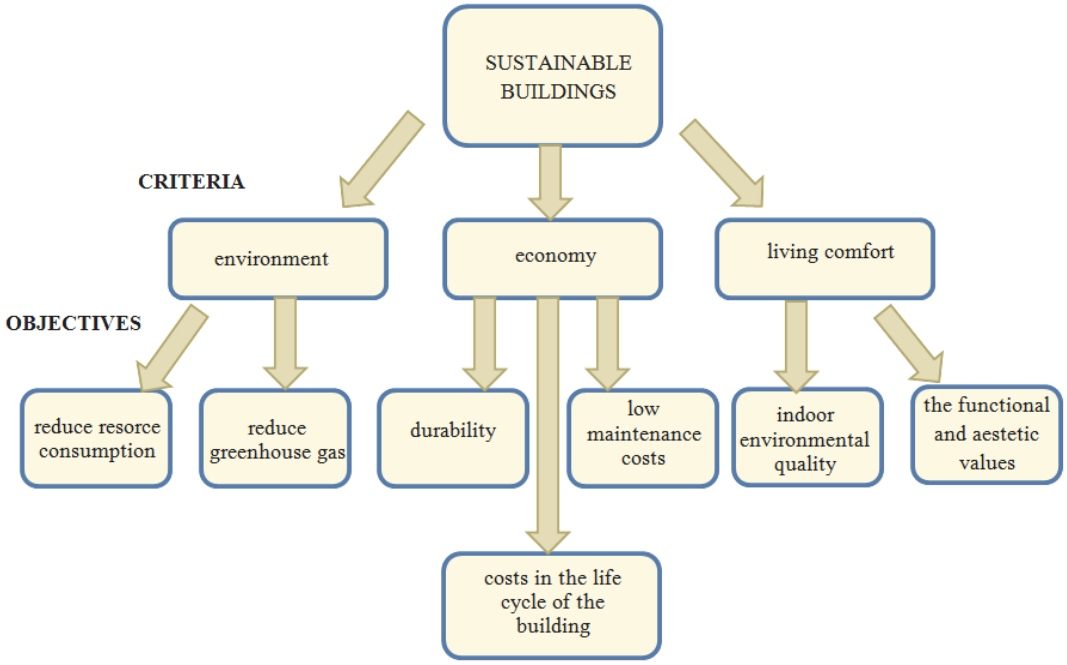

Fig. 2. Evaluation criteria for sustainable buildings [4]

For the assessment of buildings in terms of environmental requirements apply multi-criteria evaluation systems are used. They take into account the impact of buildings on the environment and quality of life of residents. The most commonly used systems are BREEAM and LEED.

The British system – BREEAM (BRE Environmental Assessment Method), which is also used in the international version, takes into account local conditions and law regulations in each country. BREEM takes into account many features of the building including indoor environment quality, energy efficiency, availability of transport, materials and design, exploitation and implementation, water and waste management [1, 2].

LEED (Leadership in Energy and Environmenral Design) is a certification system recognized internationally. It refers all the parameters, that are most important for buildings and society, as energy saving, rational water consumption, reduction of CO2 emissions, improved indoor environmental quality, resource management and well-being of inhabitants. The system is very highly flexible and can be used both in residential and commercial. LEED is recognized and used throughout the world, however, does not seem exam in tropical climates.

There are also local environmental building assessment systems that are used at national or regional level. The German Sustainable Building Certificate – DNGB – based on the concept of integral planning, that determines the character of the building at the planning stage. DNGB system considered issues such as ecology, economics and social quality, technical quality, process quality, and the quality of the location. Among the environmental certification systems should also include a system developed for the European Union – EU GreenBuilding, Geeen Star (Australia), HQE (France) and the system CASBEE (Japan) [2, 3].

Sustainable development in the building industry is carried out by balancing production and consumption patterns in relation to local conditions, the promotion of sustainable energy management system and sustainable transport system in residential areas. In the last years there are many initiatives to promote the locations of settlements in the industrial, devastated areas with a risk of biodiversity. Areas for building are beginning to be treated as a natural resource, which could be depleted. In the sustainable building industry, much attention is paid to the protection of the environment, mainly by the energy management (reduction of energy consumption, thermal modernization of buildings, installation of RES) at all stages of the LCA, the use of low- or non-waste technology, low carbon emission technology, promoting clean production systems and BAT technologies. In

order to maintain the quality of products there is used classification and labeling of chemical products specifying the risks of their use, the marking of construction products and equipment (in terms of energy consumption and eco-design of energy-related equipment, as Energy Label, Ecodesign) and their impact on the environment (Eco-label). Implementation of the concept of sustainable development in the building industry should be preceded by legislative procedure, adapting national legislation and national strategies related to construction (eg, energy, environmental protection, sustainable development strategy), as well as a comprehensive examination of the environmental problems in the legislation, planning and management. The implementation of the economic criteria should be based on the develop of economic and ecological account system , efficient use of available economic instruments and market conditions, such as the green procurement, green tax reform, green jobs [4, 5].

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MODELLING OF THE BASIS OF SOIL OF VARIOUS RIGIDITY

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The model of the basis of soil of various rigidity which provides rigid structure is offered and represents a monolith which doesn't give in to shrinkage. It is an important factor for design of highways as the problem of shrinkage of the basis is actual today. For a thorough assessment of soil, we have to go deep into structure of a monolith, into its packing, and also consider boundaries steam channels.

In one of his books the American scientist James D. Watson not without humor and a fair share of sarcasm tells about, how he together with British Frensis G. Shout and Maurice X. F.Uilkinsom opened structure of a gene spiral. These three scientists received the Nobel Prize in 1962 for this discovery. If to trust Watson, he carried out the most part of time in search of entertainments and only sometimes for own pleasure reflected on how to construct gene model of small balls. The task consisted in that, knowing approximate number and sequence of an arrangement of atoms in DNA molecule, to construct its model of balls and cores. The sizes of balls in model corresponded to the extent of atoms in DNA molecule. Their work which has become nowadays classical, – a striking example of how, playing balls, it is possible to get the Nobel Prize.

In a chain of reasoning about the most dense spherical pickings somebody was come, probably, to mind by thought that such pickings are capable to arise not only by careful laying of atoms one to one, but also is casual. For the sake of experience it would be possible to take a box with spheres, to shake it properly and then to investigate packing structure. Such experiment also was carried out. However, thus, the densest packing of spheres with volume filling in 74% never turned out, usually density of packing made about 60%. It is obvious, that crystals get the structure not in a random way, and there is some regularity. Not by gift a paper bag with peas or grain it is always used only for 50 – 60% of the volume.

Fritz Laves investigated the Dutch crystallographer a question of what most friable (least dense) packing of atoms, in general possible in crystals. It after all has to be constructed so that some atoms nevertheless adjoined among them, differently there won't be able to be a firm body. Laves came to a lattice with volume filling to 5,5%. However in the nature, apparently, such crystals don't exist.

After scientists understood a structure of crystals, they undertook determination of their theoretical durability. It in principle is very simple. Between atoms the communication forces which size with a sufficient accuracy is established by physics of a firm body work. From such private forces, naturally very small, there are general total forces. Wish to break off someone a metal crystal and it should overcome these total forces of communication.