

AESTHETICS IN VERNACULAR ARCHITECTURE

A COMPARATIVE ANALYSIS OF THE FORM OF VERNACULAR ARCHITECTURE IN THE BALKANS, AN AESTHETIC APPROACH

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ABSTRACT

The article reviews research into vernacular architecture of the Balkan region. There is a large building stock with an increasing potential in the contemporary context of preserving existing resources. The topic focuses on the form of the vernacular house and on the analysis of its aesthetic characteristics.

The subjects of study are single-family dwellings. The selection comprised two regional types of vernacular Balkan architecture, emerging in completely different historical contexts, natural and morphological characteristics of the terrain, and climatic conditions: the lowland house (in the northern Serbian province of Vojvodina) and the highland lake house (in the Ohrid region).

The first section of the research contains the analysis of the selected examples of vernacular architecture: the basic characteristics of architecture and urban design, the history of its development, the climate and the soil, etc. In addition, the studies of theoretical views in the field of aesthetics were used to define the principles upon which it was possible to examine the aesthetic characteristics of the house of vernacular architecture. The final step of the research contains the analysis of the elements of the form (surface and volumetric) for the particular examples of traditional buildings in Vojvodina and Ohrid, and the comparative analysis of their aesthetic characteristics.

The research showed that the form of the building of vernacular architecture is the result of a complex evolutionary process. The aesthetic characteristics of vernacular architecture created through the evolutionary process of adaptation to the particular natural and built environmental conditions make up an intricate set of various aesthetic categories, interconnected and intertwined. These aesthetics categories are integrated in order to create the general aesthetics of the architectural object as a compositional whole, and of the whole comprising the building and its environment.

The developed methodology can be applied to any structure of vernacular architecture whose aesthetic features need to be examined. Derived methodology is applicable to the investigation of aesthetic characteristics of any vernacular building. In conclusion, its applicability was verified on the chosen example of Bulgarian vernacular architecture.

Keywords: the form, aesthetics, vernacular architecture, bioclimatic architecture, the Balkans

ALTERNATIVE GEOMETRIES FOR A SUSTAINABLE DIGITAL DESIGN

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ABSTRACT

The study of alternative geometries in architectural space, through the standpoint of digital and technological evolutions, represents a worldwide current problem. Together with the progresses of exact science fields, the majority of traditional architectural concepts are redefined, the computer becoming the new center, the new reference point. In this context, in which information technology promotes a way of life increasingly dependent upon the digital component, most research directions focus towards identifying and classifying the generating models / patterns of the new virtual reality.

Contemporary design, and in particular its generative geometries, target efficiency and performance demands. In this context, digital technologies come to the aid of increasing the quality of the process and of the design result through new CAD (Computer-aided Design) programs, new CAM (Computer-aided Manufacturing) technologies, intelligent materials and, not least, through facilitating access to information. At the same time, the syncretism between architecture and connected fields – mathematics, engineering, computer science, biology, arts etc. – must be taken into account, an aspect that leads to defining new intelligent high performance models of interactive architecture. All these arguments promote a different perspective, one in which the geometric model must be able to represent the intangible, immaterial, dynamic, virtual, evolutionary spaces of experimental architecture.

Considering all the aforementioned aspects, this paper intends to establish specific guidelines for a sustainable digital design by means of a 3D modeling. The main goal is to provide answers to the contemporary challenges of material use optimization (through digital design and recycling). Thus, the final outcome would promote an evolutive and performative architectural space.

Keywords: sustainable structures, architectural pattern, geometry, digital design tools

ANALYSIS OF THE CRACKING PROCESS OF LEAN CONCRETE ROAD BASES

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ABSTRACT

Lean Concrete Bases (LCBs) are an interesting alternative with respect to sustainable infrastructure. In fact, because of the structural properties and resistance to erosion of LCBs, they provide long-term support to the overlaying pavement layers. Even more, these overlaying layers can be replaced while maintaining the LCB. Even when LCBs are used in flexible and rigid pavements because of their beneficial properties, the LCBs suffer from deformations, starting at the ‘green’ state, as a result of shrinkage and changes in temperature. As the LCBs cannot move freely, cracks are produced. These cracks have the potential to reflect through the overlaying pavement layers. The objective of the present paper is to analyse the longitudinal and transversal cracking process of LCBs. For that, a model previously published by the authors is used. The modelling was compared with field investigations on concrete pavements in Chile and Belgium. The model predicts the cracking process in LCBs (time of occurrence of the cracks, magnitude of the cracks, etc.) without and with saw-cutting. These modelling results are fundamental to the structural design and analysis of cracks reflective in the layers over the LCBs. It was possible to conclude, for instance, about the magnitude of the transverse crack width in LCBs, the reduction of more than 70% of the crack width through saw-cuts, the induction of earlier cracks (40 hours), or the negligible effect of the longitudinal cracks in LCBs on reflective cracking in the pavement surface.

Keywords: Lean Concrete, Roads, Shrinkage, Cracks.

ASPECTS REGARDING THE INDOOR MICROCLIMATE ANALYSIS OF SOCIAL DWELLINGS FROM THE PERSPECTIVE OF SUSTAINABLE ARCHITECTURE

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ABSTRACT

Sustainable development is a conceptual basis in almost all areas of the social and economic life, encompassing during the past decade an increasing number of aspects, the construction sector being among these. In the construction fields, the concept of sustainable development has been developed out of the definition provided by the Ch.Kilbert International Conference on Sustainable Constructions, held in Tampa Florida in 1994: "the creation and responsible management of an effectively-built environment based on the efficient use of resources and environmental principles." Nowadays, sustainable development in constructions can be defined as "developing buildings of ultimate quality with the lowest possible impact on the environment" (Ligny, 2009). At the EU level, it is estimated that the construction sector utilizes about 40% of the overall energy produced and generates around 40 % of total waste, buildings being considered responsible for more than 40 % of emissions of greenhouse gases. The notable Sick Building Syndrome has highlighted a number of factors that affect the health of habitants, related to: germs and allergens factors, improper temperature and humidity, molds, dust, improper lighting, ventilation and air currents, noise, the presence of building materials that contain harmful substances or generate toxic emissions, the operation of some equipment. Together with other factors, these may be found in the case of social housing buildings with high occupancy rates and relatively low living standards.

This paper analyzes the situation of such buildings thermally rehabilitated with the support of European funds, highlighting measures to improve their current setting. Comparing the results obtained in case of a building prior to its thermal rehabilitation with the results after its rehabilitation, we identify the probability of risk factors specific to human habitat. An important conclusion of the paper is that the thermal insulation and energy efficiency of a building cannot be limited to interventions in the building's surface and facilities, the natural room ventilation becoming an essential factor. This paper presents a study with the aim of providing the possibility of creating this in an apartment.

Keywords: sustainable development, social housing, energy efficiency, natural ventilation, hygiene and comfort

CLIMATE CHANGE GAP: AN OVERVIEW OF RECENT RESEARCH IN SERBIA

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ABSTRACT

Climate change and its effects are very complex and acute problems that we are facing today. Series of extreme weather conditions in the cities of Europe and the world shed a light on the vulnerability of cities to the effects of climate change. Serbia is one of the most vulnerable areas in Europe that will be affected by climate change. On the other hand, cities are the main causes of these changes, but, at the same time, the main field of action to minimize their impact. Accordingly, growing cities are strategic places to mitigate the harmful impacts of climate change on the environment. The phenomenon of global climate change inevitably affects the structure and functioning of the landscape, altering the topography of the landscape and its complex processes. The subject of this research is a multidisciplinary understanding of the effects of climate change on urban planning and architectural design and on creating a new academic curriculum in order to preserve the environment. Consequently, the focus of research is on urban morphology, urban and landscape fabric, housing, urban and landscape infrastructure, urban environment and nature resources. The paper discusses the phenomenon of growing cities in Serbia and current strategies and models for urban development based on modern principles and best practices in cities' adoption to climate change. The result of this study presents an overview of the latest theoretical and practical activities and research in Serbia aimed at adapting cities to climate change.

Keywords: climate change; urban planning; architectural design; urban and landscape fabric; urban development;

COLLECTIVE MEMORY AS A MANIFESTO FOR CULTURAL AND SOCIAL SUSTAINABLE ARCHITECTURE

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ABSTRACT

The aim of this paper is to discuss a few of very important contemporary issues regarding ideas establishing essential relationship between cultural and social sustainability and sustainable architecture and urban environment. It generates from the premises that sustainable architecture in a broader sense can be discussed not only as technologically efficient product for sustainable natural and build environment. It can be also observed as an aspect of cultural and social identity, without which a contemporary society cannot indicate and discuss problems regarding principles of sustainable environment.

In this context a particular issue will be explored. It is linked to the phenomenon of collective memory as a bearer of potentials for building up cultural and social identity through architecture and urban environment. Two examples will be used in the discussion. The first one is based on existing collective memory regarding architectural objects which become social monuments, particularly after their destruction. Architecture becomes an object of identification with important contemporary cultural integration processes, reflecting on its function before destruction. The second example will show how politics is using already destructed and devastated objects for establishing and extending collective memory as an aspect which should revitalize damaged national integrity and coherence in a society. Both examples are rooted in the ethical aspect of sustainable building environment, influencing further activities in this area and its development.

Keywords: Sustainable Architecture, Collective Memory, Social Sustainability, Cultural Sustainability, Ethics

COMPARATIVE STUDY REGARDING THE EFFICIENCY OF THERMAL REHABILITATION MEASURES AT EDUCATION BUILDINGS

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ABSTRACT

The assessment of energy performance of buildings gained an increasing importance over the last years. The effectiveness of thermal rehabilitation measures in terms of energy savings and maximizing the indoor environment comfort is different in various situations, depending on the building destination, geometry, area of building envelope and of the thermal resistance of these elements.

The aim of this paper is to present the results of a comparative study of four different education buildings of the Faculty of Civil Engineering and Building Services from Iași, Romania. The study is based on the results of the analysis carried on these buildings, having different thermal insulation degree of the envelope. In order to assess the weight of each factor that interfere in the global coefficient of thermal insulation, it was used the technique of factorial plan of experience with two levels.

Keywords: energy efficiency, thermal insulation, education buildings

CONTROLLING A VEHICLE AIR-CUSHION USING RADIO WAVES WITH APPLICATIONS IN WATER TRANSPORT

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ABSTRACT

To traverse various environments where conventional vehicles could not enter, the people was forced to focus on other methods of propulsion and transportation. This category ranges and air-cushion vehicles. With the discovery of radio waves, the researchers realized that this phenomenon has many practical uses, one of them being the control vehicles remotely.

Among the numerous advantages of using air-cushion vehicles include lower fuel consumption and therefore much less pollution than almost any means of transport. Also, since not cause any waves, air-cushion vehicles do not cause any erosion of river banks or changes to these.

Because most parts are placed on the platform above the cushion, these are not wet, do not transmit sound or vibration in the water which means that these types of vehicles do not have adverse effects on marine life [2].

In this paper, the main purpose was to present the performance of control and the construction of such a vehicle can cross the normal environments inaccessible to conventional cars. The vehicle presented in this paper was designed to prove the viability of radio controlled and construction of such a machine whose locomotion is done dragging on a pillow of air.

Keywords: vehicles, waves, control systems.

DISORDERS OF ROADS AND STRUCTURAL ELEMENTS IN A SERVICE OF HEAVY TRUCKS ON ROUNDABOUTS

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ABSTRACT

The article focuses on the issue of road defects, defects of components and materials used on roundabouts, which are located close to industrial zones. These defects are mostly caused by heavy freight vehicle crossing. Defects of the roundabouts may arise solely due to improper geometry of the crossroad itself, but also by selecting building materials inappropriately due to the nature of the transport. The article presents specific examples of roundabouts, described using this issue. In conclusion, there are recommended materials and possible solutions of this problem at the end of the article.

Keywords: Vehicles, industrial zones, components, material, roundabouts

ECOLOGICAL INFLUENCE OF ARTIFICIAL NIGHT LIGHT IN URBAN ENVIRONMENT AND LIGHT POLLUTION

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ABSTRACT

The article explores holistic approach of understanding the importance of qualitative lighted urban environment. A city at night is quite different from the city during the daytime. In the evening, attention is focused on the effect of the light. Sustainable lighting should be: suitable to everyone, environmental acceptable and cost-effective. For successful light use there are many limitations which should be considered, such as: natural circumstances, urban requirements, users' demands, technological possibilities and nature conservation demands. Successful lighting arrangements provide best living condition to all. Artificial night light increase visibility and personal security, decrease vandalism and make better orientation possible. But too much light or light pointed in wrong direction increase unpleasant feeling, lowers the residential potential, provide high energetic costs due to energy loss and raises emission of warm house effect. Consequently biodiversity is harmed; ecosystems and all living creatures are affected. This negative environmental burden, known as light pollution, can't be simply abolished by turn off the light. During the research work a methodology of city lighting evaluation was developed. The paper delivers an explanation of evaluation criteria which should be considered in order to achieve the balance between conservation of positive lighting aspects and improvement of negative pollution effects. The study is useful as an innovative approach in spatial design as well as in the electric power economy. Clever lighting design allows achieving a high level of quality at low energetic costs. Lower costs mean more effective contribution to economic growth that indirectly also stimulate sustainable urban development.

Keywords: Artificial night light, urban environment, light pollution, ecological influence

EDUCATIONAL AND CULTURAL DIMENSION OF GREEN SCHOOLS

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ABSTRACT

The aim of the paper is to show how properly designed green educational buildings may influence the attitudes towards nature. Especially the learning environment dedicated to the youngest generation has huge potential for societal progression and lifestyle improvement.

The authors of presented facilities search for solutions that allow high standard of architectural and environmental performance with the most limited budget. Sustainable, locally available materials as well as natural cooling and heating systems are low-cost ones and their application helps to minimize negative ecological impact. Thus created built environment promotes renewable and innovative architecture with the respect to the cultural heritage.

The paper analyzes the connections between the inspirations driven from local tradition and the building's adaptation to bioclimatic conditions. Furthermore the educational and cultural dimension of such buildings is investigated.

Keywords: sustainable education, green school design, bioclimatic architecture

**EFFECTIVE URBAN DENSITY AS ECOLOGICAL NECESSITY OF CITY
DEVELOPMENT IN SLOVAKIA**

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ABSTRACT

The study evaluates the current state of application of sustainable city development principles in Slovakia. It focuses to the analyses of master plans, key tools for controlling the urban development, of selected cities. This study emphasis evaluation of density regulation methods, rate of area usage of selected cities, its build up areas, as well as they proposed development areas. One of the goals of this study is an analysis of the ratio between expected exploitation of free or transformable areas inside the cities to expected usage of "new areas" outside the city. This paper also evaluates application of indicators of land use intensity, which define the future density of urban structures in the observed master plans, in the scope of international theory and praxes. Master plans of selected cities were used to evaluate the range of development areas and capacities of urban structures.

Keywords: sustainable development, compact city, urban density.

**EVALUATION AND POSSIBILITIES OF ENERGY SAVINGS IN THE
PROCESS OF REHABILITATION OF RESIDENTIAL BUILDINGS BUILT
BEFORE THE SECOND WORLD WAR**

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ABSTRACT

Improving the Serbian housing stock built before the beginning of World War II has the potential to achieve multiple benefits in terms of both saving energy and enhancing the quality of life in them. Considering the importance of preserving these buildings as testimonies of our architectural past, investing in their rehabilitation will also contribute to the preservation of a significant element of our national identity. Recent data from the 2011 Census show that 322,244 dwellings in Serbia were built prior to 1945, accounting for 10% of total dwellings. Nearly half of these (45%) are located in Vojvodina, and a fifth (20%) belongs to Belgrade area.

The methodology for rehabilitation was based on the typology of buildings from this period, as the starting point for calculating the potential energy savings and was developed for the purpose of the National Typology of Residential Buildings in Serbia. The Serbian housing stock built before World War II is characterized by high diversity as to the territorial distribution of construction types, while the remarkable differences between the old urban and rural architecture further add to the complexity of the typology.

Typological classification was made to: family and multi-family housing. While family houses were classified into freestanding and row houses, multi-family housing included multi-family houses and apartment blocks. Within this distribution, typical representatives of building types were recognized. Each of them was the subject of thermal calculations in three possible cases: a) the present state, b) the standard improvement and c) the advanced improvement of the building. Standard improvement measures implied application of common measures for energy refurbishment that are typical of the domestic market and that resulted with the improvement of building energy performance for at least one energy efficiency class. The advanced level of energy improvement included specific measures that contributed to the maximum possible improvement of the energy performance that was in accordance with the characteristics of the rehabilitated building. The present paper defines possible improvements to the selected building types as model representatives of real structures. The calculations of the energy performance and building type distributions were used to determine the potential energy savings in the process of rehabilitation.

Keywords: housing stock, energy rehabilitation, improvement measures, energy savings

EVALUATION OF INDOOR ENVIRONMENT AND ENERGY EFFICIENCY OF A PASSIVE HOUSE

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ABSTRACT

Thermal comfort of the indoor environment is the condition that expresses satisfaction with the thermal environment and can be assessed by objective and subjective evaluation. Light-weight timber-frame passive houses, which do not have adequate accumulation can have the problems with the optimum solution of the thermal load of the interior during the summer. The aim of this article is analysis of indoor environment and energy efficiency of the timber-frame passive house. The analysis is made on the base of numerical simulation, analytical calculation and experimental measurement. Numerical simulation is solved by the Design Builder software. Analytical calculation is solved by the software Simulation. Experimental measurements of the indoor and exterior parameters (external and indoor air temperature) are realized at the experimental passive timber-frame house in the area of the Faculty of Civil Engineering, VSB – Technical University of Ostrava. Results of theoretical analysis and experimental measurements are compared and evaluated.

Keywords: thermal comfort, indoor environment, energy efficiency, timber-frame passive house.

IMPACT OF STANDARDS AND REGULATIONS ON DESIGN OF SUSTAINABLE COMMUNITIES

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ABSTRACT

During the 40 years of communism, housing construction in the former Czechoslovakia was influenced by very precise planning. Into details developed system of standards and indicators was aimed to create independent and operationally self-sufficient housing estates, expressed by the phrase “complete housing construction”. Together with city development plans, defining the most suitable development areas (without a need to take the private property into account), the former regime possessed (and efficiently used) sufficient tools for planning residential construction in order to predict as well as regulate the growth of towns and villages.

After regime has changed in 1989, central planning, including use of standards and indicators, has been rejected as totalitarian limitation of free market. Return of private properties together with increasing social differences between inhabitants has caused massive residential suburbanization, especially around larger towns. During the last 20 years Slovakia repeated the very same mistakes that the western countries did and were fully aware of at the time when the process has started here. New suburban housing is typical by monofunctionality, increased transport demands and agricultural land take which is neither ecological nor economical and far away from worldwide trends promoting sustainability.

Current situation points out ineffective planning system that primarily fails to protect public interest. Absence of binding standards and indicators together with missing detailed development plans and appropriate regulations causes that new construction is based on individual interpretation of the land use plan by individual authorities. The result is disproportional growth and random placement of functions in the territory. It is the high time to start serious professional discussion how to change the system in order to ensure design of sustainable communities.

Keywords: residential suburbanization, public buildings, public interest, land use plan, planning system

**MATERIALS ROAD COVERS WHEN OPERATING PUBLIC TRANSPORT
(DURING THE DESIGN PERIOD)**

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ABSTRACT

The article focuses on disorders of pavement made of different materials, caused by increased load on the road at bus stops. In the beginning of this article, we introduce the types of vehicles operated bus and trolleybus routes in Ostrava. The article also deals with the possible effect of the public transport vehicles, as the effect of other vehicles which are moving close to the stop, so the load from them interferes into the cover of the road surface of the stop. Increased weight loads from vehicles has resulted in faster damage to all layers of the road at stops. Finally, the paper recommends materials and possible solutions to this problem.

Keywords: road covers, public transport, bus stops, load, damage, layers of the road

MODERNISATION OF OBJECT OF RAILWAY STATION IN ŽILINA

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ABSTRACT

The building of railway station in Žilina is built in the style of Modernism. Its historical value is not very important. Building was built between 1937 and 1942. Its artistic and cultural qualities significantly exceed its historical value. The railway station is a typical example of Modernism artistic style, including characteristic details and aesthetics of Modernism epoch. Here we present the description of historical-artistic-cultural characteristics of the building, as well as its incorporation into the urban environment of Žilina town.

Our focus is on the possible ways of modernisation. The principle is to preserve architectural features and artistic value of the building while improving its thermal performance. Environmental assessment of the building modernisation is calculated in comparative studies. They compare existing building envelope structures insulated with different types of insulating materials: starting with commercially used insulators ending up with environmentally friendly materials.

Keywords: railway station, eco indicator OI3, thermal performance, heat transfer coefficient, natural materials

PARTICIPATORY PUBLIC ART – A SUSTAINABLE PLACE-MAKING PRACTICE

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ABSTRACT

In contemporary urban development, public art is recognized as an important part of place-making and is nowadays established as research and professional practice. Nevertheless, concept and practice of public art is not fixed and is recently passing substantial changes. This change is related to the recognition of the importance of interdisciplinary work and broad public participation in production of urban space - in order to achieve more sustainable public places. In this context, participatory public art is developed as an art form that connects various stakeholders and design disciplines on different stages of public art project realization. But we argue that although participatory public art can contribute to sustainable place-making, restrictions for public participation in public art process exist and depend on social, political and economic context.

Analysis of context and possibilities for participatory public art in Serbia confirmed that this form of public art can make important contribution to sustainability of urban places on various bases. At the same time analysis pointed out that, if it is not institutionalized through public art programs and policies, contribution of public art to place-making remains limited, sporadic and temporary.

Keywords: sustainability, participation, public art, public space, urban design

POSSIBILITIES OF THE ECO-TOWN CONCEPT APPLICATION: THE PRINCIPLES AND GUIDELINES FOR THE CASE STUDY OF JELEZOVAC–SUNČANI BREG INFORMAL SETTLEMENT, BELGRADE

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ABSTRACT

This paper is aiming to contribute to the application of goals, concepts and criteria and related to the sustainable urban development and transformation defined and implemented internationally, in the complex setting of Serbia and its capital. Serbia as a country in transition is facing many urban development and growth issues for over two decades intensively. While main principles of sustainable urban development, derived from worldwide and EU legislation, practice and theoretical framework have been rooted in almost any plan or research study related to urban planning issues in Serbia, the implementation and substantial link to the situation-in situ have not been fully achieved. This situation is most noticeable in areas under greatest pressure of urban growth - the areas of informal settlements on the outskirts of major cities, and especially in Belgrade which is the Serbian capital and the largest city. The “ring” around Belgrade is currently consisted of numerous illegal settlements, which basically rely on individual housing development. Some of them are older ones, with more compact structure and with some elements of communal and social infrastructure. Other, newer units have been growing since 1990s, even after 2000, and mainly lack clear urban structure and many attributes of urbanity. On the other hand, such areas are not yet fully built so the urban renewal/redefinition is still possible. Therefore, newer illegal settlements, such as Jelezovac- Sunčani Breg area, are adequate research area for the possible application of new concepts which could greatly improve their livability. Since the phenomenon of illegal housing in Serbia is related to the suburban areas, while keeping in mind that location is a crucial factor in the selection of a research concept, this paper will discuss the concept of eco sustainable development tailored for developing countries on one hand, and the concept of UK eco-town on the other, as well as the possibilities of its implementation. Further, this paper will present the case study of newer illegal settlement at the southern fringe of Belgrade, confronting the goals, criteria and standards of the chosen concepts with the possibilities of its implementation in Belgrade context.¹

Keywords: eco sustainable urban development, eco town concept, informal urban growth, renewal.

PRINCIPLES OF SUSTAINABILITY IN ROMANIPEN-BASED INFORMAL ROMA SETTLEMENTS

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ABSTRACT

The intent of this paper is to present how several basic interdependent characteristics of the functional organization of *Romanipen* (Roma cultural identity) based Roma communities represent the ethos of the formation of spatial structures and construction methods in informal Roma settlements which correspond with the principles of sustainable architecture.

Given this context, the paper starts with the broader interpretation of territorialization which suggests the existence of a relation between the spatial and the social level of Roma settlements; a relation that makes possible the understanding of what this cultural group produces in space. The physical spatial patterns of informal Roma settlements were created without professionals' influence and represent a quality induced by the need to functionally organize a community where everyday activities take place. Therefore, the characteristics of spatial organization and construction methods in unplanned Roma settlements are the actual object of research when examining a collective lifestyle as the dominant pattern in everyday behavior determined by concrete Romanipen principles.

Further on, the paper compares research results – a systematic overview of characters of physical structures and construction principles – with the principles of sustainable architecture, thus formulating several conceptions of physical structure which can be considered as culturally adjusted environment that at the same time integrates both the realized principles of sustainable architecture and the potential for further acceptable development in the same domain.

Methodologically, the paper will also include case studies of representative types of spatial organization in slum-type informal Roma settlements in Belgrade, Serbia. The Case Study analysis was included week-long observation of the lifestyle and habitation of the members of certain community and informal conversation with them.

The purpose of the paper is firstly to emphasize the fact that the Roma microenvironments already offer their own ways to participate in the creation of cities of future. Acknowledging the character of the physical structure of a culturally adjusted environment with integrated sustainability principles has a dual effect: it pushes architecture towards a smarter, more sustainable future; and, it achieves the fulfillment of certain spatial needs which enable the development of a cultural identity, meaning the enabling of adequate conditions for a lifestyle acceptable to the Roma population. It is known that, in terms of social upgrade, the ability of affirming the attributes of cultural identity and the appreciation of differences represent an inevitable condition for

interculturalization which ought to be included into the architectural practice to successfully accomplish the social cohesion of the Roma people.

Keywords: informal Roma settlements, culturally adjusted environment, sustainable housing, social cohesion.

REMOTE TEMPERATURE CONTROL SYSTEM FOR GREENHOUSE ENVIRONMENT

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ABSTRACT

This study proposes a monitoring and control system of ventilation and temperature for greenhouse environment with both local and remote interface. For process control a Simatic S7-300 PLC is used. The control algorithms are based on conventional PID controller, positional control algorithm, and fuzzy logic controller. The final part of the paper highlights the obtained performances of each of the three control algorithms. The remote monitoring and control of the process are delivered through a web server implemented on Arduino Duemilanove microcontroller board with Ethernet capabilities that is connected to S7-300 PLC via analogical inputs and outputs of the specific modules SM331 and SM332. This is a solution that combines the advantages of both PLCs and microcontrollers.

Keywords: data acquisition, remote monitoring, PLCs control, greenhouse environment

ROMANIAN MULTISTOREY APARTMENT BUILDINGS – BETWEEN RETROFITTING AND RENOVATION

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ABSTRACT

During the urban development of the communist era in the 1970s, entire neighborhoods of collective dwellings were erected in order to accommodate the wave of people working in the new factories. Standardized and repeated blocks of flats were massively spread throughout the country, offering identical living conditions for all their inhabitants. After the fall of the totalitarian regime, 96% of the inhabitants living in the blocks of flats became owners of their apartments, one of the highest rates of ownership in Europe. Nowadays, almost 60% of the Romanian urban population lives in these so-called grey neighborhoods.

The renovation of these buildings started in the middle of the 90's, as a response to their technical degrading. Most common interventions resulted in the addition of pitched-roofs over the deteriorated flat roofs in order to prevent infiltrations. The real estate development from the 2000s treated the so-called thermal rehabilitation program into a business opportunity by using the slope roof as a livable attic connected to the existing block. As a result, new apartments were added, increasing the urban density levels, but without offering a significant improvement for the existing inhabitants.

The existing Thermal rehabilitation program consists in cladding the façade with a polystyrene base thermal envelope system, and, in some cases, the replacement of the openings with efficient doors and windows. In this case the reduction in energy demands is of 30-40%. The plumbing and heating systems are not included therefore energy management systems are not present.

By contrast, sustainable retrofitting embodies an integrated approach concerning social, economic and environmental aspects. The present article describes the detailed aspects of the two directions of intervening on this specific Romanian building stock. Multiplication represents an advantage for the implementing of both measures (almost 40.000 blocks of flats exist in Romania). The market viability of the two types of intervention is translated in two different industrialization processes detailed in this paper.

Keywords: retrofitting, green design, sustainability, green energy, energy efficiency

SHEAR STRESSES TRANSFER AT THE STEEL-CONCRETE INTERFACE IN CIRCULAR CONCRETE FILLED STEEL TUBES

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ABSTRACT

The concrete filled steel tubes, also known as CFT, have, as a main advantage over the reinforced concrete system, the fact that the interaction between the steel tube and the concrete improves the buckling behaviour of the steel tube and increases the strength of the concrete. This paper presents the research done by the authors in understanding the mechanism of the shear transfer over the interface between the circular steel tube and the concrete core.

Shear stresses appear due to the action of the shear forces over the element cross-section. According to the shear stresses duality, longitudinal shear arises along the length of the element (column), that tend to produce the relative slipping between the concrete and the steel tube. While the tangential tensile stresses do not exceed a certain size, the adhesion, the friction and the surface irregularities are sufficient. If the tensile stresses grow, it becomes necessary to use mechanical connectors.

The paper presents a methodology for finding the bond-slip at the interface of the steel-concrete for CFT, followed by a proposed design methodology. Using the proposed methodology the authors investigated the longitudinal shear stress over the interface between a circular steel tube and the concrete core for different values of the cross-section of the circular steel tube.

Keywords: Concrete filled steel tubes (CFT), steel-concrete composite structures, bond-slip behaviour.

**SOLAR ACCESS AND URBAN FABRIC: SOLAR ENVELOPE METHOD AS
DECISION-SUPPORT TOOL**

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ABSTRACT

Climatic forces are important in architecture because a building's response to climate is directly related to its energy consumption, and because climate is a powerful local context giving designers a means of regional expression and place making. [3] The contribution deals with a method which can be a tool how to fulfil an effort declared in European Directive 2010/31/EU on the energy performance of buildings to build after 2020 only passive houses, zero-energy buildings or active houses. Such buildings for their performance need quite significant portion of solar energy, so access to direct solar radiation is inevitable. The requirement of solar access could significantly influence existing way of urban design. Using the solar envelope method can be an answer how to insure adequate portion of solar energy. The paper contains some display of using this method – students' projects - from a scale of a building to organizing a space in a small settlement.

Keywords: solar energy, solar envelope, solar access, urban structure

**SOLUTIONS FOR ECOLOGICAL HOMES ADAPTED TO THE SEVERE
MOUNTAIN CLIMATE IN ROMANIA, USING SUSTAINABLE MATERIALS.
CASE STUDIES**

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ABSTRACT

This paper presents the results of studies that analyzed eco-efficient solutions for homes adapted energy-wise to the specific demands of the mountain climate (climatic areas III and IV of Romania), which ensure meeting the standard parameters and the conservation of the building traditions in these areas.

This paper presents the results of the analytic assessment of the global loss of heat for an actual house built in a mountainous area at an approximate altitude of 850m (M1), monitored for its thermo-physical properties by on site measurements in comparison with a building having an identical spatial structure with energetically efficient closing elements, studied experimentally in the laboratory.

The paper presents comparative results of these studies for the examined buildings as follows:

- the thermal transfer resistance of the exterior walls;
- the total heat loss of the entire building;
- the global heat loss for a built cubic meter;
- the global heat loss through the entire surface of the opaque exterior walls;
- the global heat loss for a square meter of opaque exterior wall.

The final result of this study has been a Catalog of solutions for ecological and energy-efficient homes adapted to the mountain climate, which is useful in ensuring a durable development of human settlements.

Keywords: energy efficiency, sustainability, ecology

SUSTAINABILITY ASPECTS AND ENERGY OPTIMIZATION POTENTIAL OF MULTIFAMILY SOCIALIST-PERIOD HOUSING IN SERBIA

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ABSTRACT

Almost 70% of the existing multifamily housing stock in Serbia was constructed during the four decades of extensive building activity after the World War Two. The architectural design and building technologies evolved greatly during this period, resulting in variety of building types. The paper presents a relevant portion of national housing typology developed within European TABULA project, with an overview of typical housing types and explores various sustainability aspects paying special attention to the questions of energy optimisation potential, cross-referencing results of multiple national and international research and scientific projects conducted during last 12 years. The significant share of these buildings in housing stock defines them as an issue of national strategic importance regarding the possible functional and energy-efficiency upgrades, so the long-term impacts on national scale are explored as well.

Keywords: housing stock upgrades, sustainable architecture, multifamily housing, energy efficiency, socialist housing doctrine

SUSTAINABLE ARCHITECTURE OF THE HOLY PLACE

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ABSTRACT

The architectural form of the holy places differs in its essence from the architecture of secular facilities and structures, thus playing a special role in space (rural setting or urban matrix) and time (through historic continuity and in the present). As the venue for researching holy places, the Republic of Serbia confirms the picture of spiritual inseparability of the Balkan Peninsula in the principals of church creations, as well as the belonging of each shrine to the overall church architecture of the Christian Orthodox world. Among the holy places, monasteries are prime representatives of technical and artistic creations in the sphere of architecture and urban planning. In construction terms, a monastery has a significant form consisting of a central building with perimeter facilities and empty space of the churchyard, and the essence of that template has been repeated for centuries in the ground plan of the holy place. The space of a monastery is made special not only by the inseparability of the form and function, but also by that of the built structure and the living community that inhabits it. The rules of the life in a monastery were established more than a millennium ago, which has, through the use of the spaces, also been reflected on the stability of the architectural patterns. Ever since the first centuries of the Christianity the patterns of sanctuary buildings have gotten authentic style forms in relation to the geographic regions and the historic periods of their creation. Sustainability of the form of the holy place has special foundation in comparison to the secular architecture of residential, public and community buildings. Sustainability of a monastery (church, paraclises, dormitories, churchyard and their mutual relation) is based on uniting the values of the spiritual and the material, of what has been and what will be. Each holy place unites space, time and architecture in an authentic manner, while at the same time and inseparably belonging to the unique body of the Christian architecture. In the case of secular architecture, the primary importance lies with the most modern construction technologies, economic cost efficiency of the facility, striving towards prestige in the presentation and aesthetics of the building, strict requirements related to the provision of real energy consumption, etc. Integrative approach to the protection of holy places is preservation of the essential sustainability of the space and of the architectural identity in continuity.

Keywords: monastery, sustainable architecture, space, time, form, function, continuity, integrative protection.

TACTILE AND VISUAL PERCEPTION OF NATURAL WOOD FINISHES

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ABSTRACT

Eco wood finishing products are in full process of replacing traditional methods. Although marketing campaigns present these products as being "green", the ecological aspect is reduced to meeting specific regulations. Human perception is omitted. This study focuses on identifying the physical characteristics that make a finish preferred to others by presenting different samples to a number of testers. The subjects are presented with a selection of samples finished with different materials, ranging from the new ecological products to conventional finishes and traditional solutions. The analysis is carried out in two stages, tactile and visual. The study takes into account the influence of the subjects' cultural background. The main parameter that determines a surface as being preferred is associated to the roughness of the material. Perfecting wood finishes and their use in different applications must relate to human awareness, to the perception of the surface and not to focus entirely on reaching higher protection levels.

Keywords: wood finishes, haptic, perception, furniture

**THE ARCHITECTURAL REHABILITATION OF COLLECTIVE HOUSING.
FUNCTIONAL, SOCIO-PHYSIOLOGICAL AND RESIDENTIAL SECURITY
ASPECTS**

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ABSTRACT

Besides the benefits brought to the energy balance and to the interior comfort through the direct interventions on the envelope elements, a complex and multidimensional process of architectural rehabilitation, which operates on a spatial and morpho-functional level, could become an instrument for improving the overall quality of housing, the optimal and coherent functionality, the potentiation of good neighborly policy, an its ability of facilitating the social contact and stimulation of communication.

The paper explores from this perspective the most important types of interventions: from those which consist only in the reevaluation and reshaping of the living space to those focused on the entire ensemble, including the reorganization of internal and external spaces. For the operations to have the target-effect, it is needed that the proposals of rehabilitation to be realized on different levels, depending on the context and situation, and to follow an economy of usage in conformity with the collective life wished by its inhabitants.

The re(arrangement) of common areas, internal or external, presumes their investment as thresholds between public spaces, semiprivate spaces and familial spaces, their organization for an easy and adequate accessibility to the collective needs without assuming a perturbing role in the functionality of the residential units. Their functional role must be accompanied by the one that is environment-generator.

Furthermore, between the qualitative aspects of a social collective residential building, which a rehabilitation process cannot ignore, it is also one of security - linked to the level of protection and safety, which a dwelling building, residential ensemble and its neighborhood offer, these being an essential condition in the evaluation of a district or an urban area. This paper proposes, applied on a certain situation -an ensemble of existing social collective housing – and in a realistic scenario, a set of architectural and urban rehabilitation interventions, focused on the imperative direction of a sustainable urban development, on the revalorization of urban territories and increase of residential satisfaction.

Keywords: architectural rehabilitation, collective housing, communitary sociability, sustainable urban development

THE ARCHITECTURAL STUDY BY DESIGN: ARCHITECTURAL EXPERIMENTS

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ABSTRACT

Contemporary architectural practice is expanding its horizon of work and research on city and landscape with all their complexities, from social to ecological. Active presence of theory in the process of design, necessarily led to development of design methodology known as architectural design research. Contemporary architects, searching for the truth as the pre-condition for architectural creation, are experimenting with presented architectural and non-architectural attributes. Their goal is to create something new, something unrecognized as architectural form so far, but now is. The paper discusses two methodological design platform - design by research and study by design. The research aims to review the possible directions for addressing the problems of design, through something that is determined by something that already exists, and the study involves an empirical verification of design results, which subject is determined by current context with addition of something new, and this new is variable because it needs to be designed. The paper considers the results of design research related to environmental sustainability and energy efficiency, applied through the bidding practice of the group Architectural Alchemy (AA). The result of this consideration is reflected in the conclusion that Study by Design, is mostly exploring new opportunities with a generic variable, and new knowledge and understanding of the design, which is of undoubted importance to meet the complex requirements such as adaptation to climate change.

Keywords: architectural study by design; architectural creation; process of design; design by research; experiment; architectural design.

**THE CHANCES FOR ACHIEVING URBAN SOCIAL COHESION: CASE
STUDY OF BELGRADE INFORMAL SETTLEMENT AS A PILOT PROJECT
FOR NEW SOCIAL HOUSING**

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ABSTRACT

This paper will enlighten the problem of illegal housing in unconventional way – by trying to understand the illegal settlements as areas of social/affordable housing and social integration. It will also discuss the possibilities of urban upgrading and regeneration of illegal settlements making them liveable places and areas which can be integrated into the Belgrade development. On one hand, Serbia is, like some other developing countries, facing the problems of socially and spatially incoherent urban development and of integration of special socio-economic groups, while on the other - there is an issue of tackling the untamed urban growth in the form of illegal settlements in suburb areas. These problems are closely related to the lack of adequate affordable housing and its capacity. Having this in mind, it is understandable that Serbia is coping with even bigger problem of affordable and social housing than it is the case with developed EU countries. The pressure of these problems is more visible in Belgrade, Serbian capital since it deals with the demographic pressure and immigrants more than any other Serbian city over past four decades. As a consequence of this pressure many previously agriculture areas at the fringes of the city have become illegal urban sprawls. As the time has proven, the country did not manage to limit the informal growth in the acceptable manner, neither through restrictive policy and plans, nor through the legalization process. At the same time, being a severely hit by economic crisis in past few years, Serbia will not easily reform its housing policy and enable growth of the typical affordable housing which will meet demands. Having all in mind, this paper will try to present a different prospective which relies upon the integrative approach to these problems and which is based on the idea of new form of social housing and transformed and upgraded informal settlements. Furthermore, it will offer the directions and measures for the planning actions that would meet the objectives of social integration and cohesion and would contribute to the solving of social housing problem within the social sustainability development framework.¹

Keywords: informal growth, illegal settlements, urban social cohesion, social housing, sustainable urban planning.

¹ This paper is done as a part of research project “Research and systematization of housing development in Serbia, in the context of globalization and European integrations, with the aim of housing quality and standard improvement” (TR 36034), financed by Ministry of education and science of Serbia.

THE CRISIS OF ARCHITECTURAL CREATIVITY: AN ESSAY ON UNDERSTANDING OF NON-GOOD IN THE ARCHITECTURE

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ABSTRACT

In front of the post-industrial society is a challenge that can be seen through the question: Is it possible to overcome the current concept of the crisis decision which takes the form of an external challenge to the individual, and a necessary internal response? This paper examines the crisis of architectural creativity from the position of ethics. The concepts of virtue ethics or deontology in the context of redefined position and role of architectural creativity in postmodernity are explored accordingly. A particular focus of the paper is on understanding of Alain Badiou's ethical theory and an understanding of ethics focusing on the Good. Consequently, the concepts such as Truth, Event, Subject and Fidelity are studied, for the purpose of detecting and understanding the current crisis of architectural creativity. Of special importance for this study was a review of the concept of fidelity of Event in architecture, in order to make a distinction between Good and Non-Good, as something that is not true to Event and, as such, denies the Truth. Hence, the paper discusses the ethical issues related to the cities of the XXI Century, based on the trends of global changes in society, politics, democracy, economy and their relations to the natural environment. The result of this research is reflected in the conclusion that the crisis of the architectural creativity is autonomous and does not come as a consequence of the crisis of something that is 'outside' (political, economic, etc.), but its causes are within the subjective paradigm of enjoyment, ergo experiments with death within life.

Keywords: Alain Badiou, architectural creativity; Event; postmodernity; ethics; Truth; Non-Good; Evil

THE ENERGY DIAGNOSTIC OF THE CURRENT TRENDS IN THE CONSTRUCTION OF SINGLE-FAMILY RESIDENTIAL BUILDINGS

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ABSTRACT

The paper deals with the diagnostic of the current trend in the construction of single-family residential buildings with respect to the energy performance. Current trends in civil engineering are mainly focused on the energy efficiency of the buildings and saving non-renewable resources in accordance with the principles of sustainable development. The primary legal instrument for the energy-efficient construction is a revised Directive on the Energy Performance of Buildings (EPBD II). The basic factors of the evaluation of the building's energy performance are heat transfer coefficient of structures, mean heat transfer coefficient, air change rate, specific heating demand and specific primary energy demand. The aim of the diagnostic is to describe the impact of users standards on the energy balance of the building compared with the proposed calculation values.

Keywords: energy performance, sustainable development, energy efficient buildings, green buildings, single-family residential buildings

TOWARD BUILDING KNOWLEDGE FOR SUPPORTING SUSTAINABLE TRANSITION OF THE BUILDING STOCK

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ABSTRACT

The paper discusses the possibility of developing an easy and shareable framework with the aim of building basic knowledge for supporting the energy retrofitting process of the heritage building stock, with spatial detail at the neighborhood or district scale and, in a more general sense, for supporting the urban regeneration process.

One of the main strategies to achieve the 20-20-20 Communitarian objectives is the building stock renovation process via energy efficiency improvement. Thanks to the great economical and political interest in the development of technologies and practices for reducing energy consumption and for Renewable Energy Sources (RES) micro-generation, there are favorable conditions to reach the resources to promote a rethinking of the physical components and intangible assets of the cities. The integration of new technologies into the urban building stock could pave the way for urban regeneration with small scale intervention programs that combine the identity of the places with energy efficiency and urban facilities improvement.

In order to support this extraordinarily complex process, the Public Administrations (PA) and decision makers need methodologies and tools capable of defining and representing urban transformation scenarios and future views in order to encourage the broad participation of strategies drawing and promote the sharing and transfer of good practices. Tools and models adopt methodologies and approaches of various complexities, purposes and effectiveness. Generally speaking, the specificity of the models often focused only on certain aspects of the process (CO₂ emissions, RES potential, Microclimate, Policy assessment...), and the various local baseline data availability on the utilization and physical characteristics of the real estate and on energy consumption require use of methods that are unlikely could be exported to different contexts.

The wide implementation of INSPIRE standards for the management and production of spatial data, the spread of new technologies for topographic high detail surveying and for the production of environmental data outline an approach that could be exported in a different context, such as a way to create a Spatial Data Infrastructure (SDI) to describe the state of the urban environment. At the same time, the promising SMART metering technologies and the development of methodologies for voluntary feedback acquisition from energy users, or more widely from city users, could overcome the chronic lack of data about energy consumption profiles.

However, some barriers still remain, preventing the development of a widely shared approach which are the further research focus.

Keywords: Energy Retrofitting, Building Stock, SDI

**URBAN AGRICULTURE: A WAY TO A SUSTAINABLE COMPLEMENTARITY
BETWEEN THE CITY AND THE COUNTRYSIDE**

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ABSTRACT

For centuries, town and country maintained a relation of dichotomy and complementarity, but, because of industrial and technological progress, this dichotomy had faded way and the complementary links were broken. The country, with less population and fewer labour, affected in its economic and social structure, lost the ability to produce enough and high-quality food for town that, besides its social and environmental problems, has been seeking for solutions inside itself to improve the quality of urban life, but never stopped to extend its limits and to consume agricultural soil. We evolved from the traditional approach of urban / rural into a global landscape: urban and rural get mixed, creating discontinuities needing to be overcome. We believe urban agriculture, in its different implementation forms, is a way to overcome them by allowing a landscape construction that will retrieve the elementary processes of production, recreation and protection and, therefore, the lost complementarity.

Keywords: City. Countryside. Complementarity. Urban agriculture.

VULNERABILITY TO CONDENSE OF THERMAL REHABILITATION BUILDINGS

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ABSTRACT

The thermal rehabilitation of existing buildings, an essential component of Sustainable Architecture, aims at reducing energy consumption for building operation and ensuring a healthy and comfortable indoor environment. This involves the reduction of risk of condensation on both the surface and inside the closing elements. However, there are reported situations of vulnerabilities to surface and interstitial condense of certain areas of rehabilitated building envelope, when a combination of favorable conditions for producing the phenomenon is determined. These conditions may be caused by deficiencies in the design or in application of additional insulation measures and / or improper operation, consisting mainly in the mismatch between the production of vapor and the ventilation rate. Exterior climate conditions, specific for the continental temperate area, could have an important contribution.

This paper aims to identify the generating situations of condense vulnerability of rehabilitated buildings, taking into account different scenarios for using. Measures for vulnerability reduction are proposed and analyzed, aiming the optimization of constructive solutions and also of the operating system.

Keywords: condensation vulnerability, rehabilitation buildings, indoor air humidity, thermal bridges, temperature factor.

AESTHETICS IN VERNACULAR ARCHITECTURE

A COMPARATIVE ANALYSIS OF THE FORM OF VERNACULAR ARCHITECTURE IN THE BALKANS, AN AESTHETIC APPROACH

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ABSTRACT

The article reviews research into vernacular architecture of the Balkan region. There is a large building stock with an increasing potential in the contemporary context of preserving existing resources. The topic focuses on the form of the vernacular house and on the analysis of its aesthetic characteristics.

The subjects of study are single-family dwellings. The selection comprised two regional types of vernacular Balkan architecture, emerging in completely different historical contexts, natural and morphological characteristics of the terrain, and climatic conditions: the lowland house (in the northern Serbian province of Vojvodina) and the highland lake house (in the Ohrid region).

The first section of the research contains the analysis of the selected examples of vernacular architecture: the basic characteristics of architecture and urban design, the history of its development, the climate and the soil, etc. In addition, the studies of theoretical views in the field of aesthetics were used to define the principles upon which it was possible to examine the aesthetic characteristics of the house of vernacular architecture. The final step of the research contains the analysis of the elements of the form (surface and volumetric) for the particular examples of traditional buildings in Vojvodina and Ohrid, and the comparative analysis of their aesthetic characteristics.

The research showed that the form of the building of vernacular architecture is the result of a complex evolutionary process. The aesthetic characteristics of vernacular architecture created through the evolutionary process of adaptation to the particular natural and built environmental conditions make up an intricate set of various aesthetic categories, interconnected and intertwined. These aesthetics categories are integrated in order to create the general aesthetics of the architectural object as a compositional whole, and of the whole comprising the building and its environment.

The developed methodology can be applied to any structure of vernacular architecture whose aesthetic features need to be examined. Derived methodology is applicable to the investigation of aesthetic characteristics of any vernacular building. In conclusion, its applicability was verified on the chosen example of Bulgarian vernacular architecture.

Keywords: the form, aesthetics, vernacular architecture, bioclimatic architecture, the Balkans

ALTERNATIVE GEOMETRIES FOR A SUSTAINABLE DIGITAL DESIGN

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ABSTRACT

The study of alternative geometries in architectural space, through the standpoint of digital and technological evolutions, represents a worldwide current problem. Together with the progresses of exact science fields, the majority of traditional architectural concepts are redefined, the computer becoming the new center, the new reference point. In this context, in which information technology promotes a way of life increasingly dependent upon the digital component, most research directions focus towards identifying and classifying the generating models / patterns of the new virtual reality.

Contemporary design, and in particular its generative geometries, target efficiency and performance demands. In this context, digital technologies come to the aid of increasing the quality of the process and of the design result through new CAD (Computer-aided Design) programs, new CAM (Computer-aided Manufacturing) technologies, intelligent materials and, not least, through facilitating access to information. At the same time, the syncretism between architecture and connected fields – mathematics, engineering, computer science, biology, arts etc. – must be taken into account, an aspect that leads to defining new intelligent high performance models of interactive architecture. All these arguments promote a different perspective, one in which the geometric model must be able to represent the intangible, immaterial, dynamic, virtual, evolutionary spaces of experimental architecture.

Considering all the aforementioned aspects, this paper intends to establish specific guidelines for a sustainable digital design by means of a 3D modeling. The main goal is to provide answers to the contemporary challenges of material use optimization (through digital design and recycling). Thus, the final outcome would promote an evolutive and performative architectural space.

Keywords: sustainable structures, architectural pattern, geometry, digital design tools

ANALYSIS OF THE CRACKING PROCESS OF LEAN CONCRETE ROAD BASES

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ABSTRACT

Lean Concrete Bases (LCBs) are an interesting alternative with respect to sustainable infrastructure. In fact, because of the structural properties and resistance to erosion of LCBs, they provide long-term support to the overlaying pavement layers. Even more, these overlaying layers can be replaced while maintaining the LCB. Even when LCBs are used in flexible and rigid pavements because of their beneficial properties, the LCBs suffer from deformations, starting at the ‘green’ state, as a result of shrinkage and changes in temperature. As the LCBs cannot move freely, cracks are produced. These cracks have the potential to reflect through the overlaying pavement layers. The objective of the present paper is to analyse the longitudinal and transversal cracking process of LCBs. For that, a model previously published by the authors is used. The modelling was compared with field investigations on concrete pavements in Chile and Belgium. The model predicts the cracking process in LCBs (time of occurrence of the cracks, magnitude of the cracks, etc.) without and with saw-cutting. These modelling results are fundamental to the structural design and analysis of cracks reflective in the layers over the LCBs. It was possible to conclude, for instance, about the magnitude of the transverse crack width in LCBs, the reduction of more than 70% of the crack width through saw-cuts, the induction of earlier cracks (40 hours), or the negligible effect of the longitudinal cracks in LCBs on reflective cracking in the pavement surface.

Keywords: Lean Concrete, Roads, Shrinkage, Cracks.

ASPECTS REGARDING THE INDOOR MICROCLIMATE ANALYSIS OF SOCIAL DWELLINGS FROM THE PERSPECTIVE OF SUSTAINABLE ARCHITECTURE

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ABSTRACT

Sustainable development is a conceptual basis in almost all areas of the social and economic life, encompassing during the past decade an increasing number of aspects, the construction sector being among these. In the construction fields, the concept of sustainable development has been developed out of the definition provided by the Ch.Kilbert International Conference on Sustainable Constructions, held in Tampa Florida in 1994: "the creation and responsible management of an effectively-built environment based on the efficient use of resources and environmental principles." Nowadays, sustainable development in constructions can be defined as "developing buildings of ultimate quality with the lowest possible impact on the environment" (Ligny, 2009). At the EU level, it is estimated that the construction sector utilizes about 40% of the overall energy produced and generates around 40 % of total waste, buildings being considered responsible for more than 40 % of emissions of greenhouse gases. The notable Sick Building Syndrome has highlighted a number of factors that affect the health of habitants, related to: germs and allergens factors, improper temperature and humidity, molds, dust, improper lighting, ventilation and air currents, noise, the presence of building materials that contain harmful substances or generate toxic emissions, the operation of some equipment. Together with other factors, these may be found in the case of social housing buildings with high occupancy rates and relatively low living standards.

This paper analyzes the situation of such buildings thermally rehabilitated with the support of European funds, highlighting measures to improve their current setting. Comparing the results obtained in case of a building prior to its thermal rehabilitation with the results after its rehabilitation, we identify the probability of risk factors specific to human habitat. An important conclusion of the paper is that the thermal insulation and energy efficiency of a building cannot be limited to interventions in the building's surface and facilities, the natural room ventilation becoming an essential factor. This paper presents a study with the aim of providing the possibility of creating this in an apartment.

Keywords: sustainable development, social housing, energy efficiency, natural ventilation, hygiene and comfort

CLIMATE CHANGE GAP: AN OVERVIEW OF RECENT RESEARCH IN SERBIA

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ABSTRACT

Climate change and its effects are very complex and acute problems that we are facing today. Series of extreme weather conditions in the cities of Europe and the world shed a light on the vulnerability of cities to the effects of climate change. Serbia is one of the most vulnerable areas in Europe that will be affected by climate change. On the other hand, cities are the main causes of these changes, but, at the same time, the main field of action to minimize their impact. Accordingly, growing cities are strategic places to mitigate the harmful impacts of climate change on the environment. The phenomenon of global climate change inevitably affects the structure and functioning of the landscape, altering the topography of the landscape and its complex processes. The subject of this research is a multidisciplinary understanding of the effects of climate change on urban planning and architectural design and on creating a new academic curriculum in order to preserve the environment. Consequently, the focus of research is on urban morphology, urban and landscape fabric, housing, urban and landscape infrastructure, urban environment and nature resources. The paper discusses the phenomenon of growing cities in Serbia and current strategies and models for urban development based on modern principles and best practices in cities' adoption to climate change. The result of this study presents an overview of the latest theoretical and practical activities and research in Serbia aimed at adapting cities to climate change.

Keywords: climate change; urban planning; architectural design; urban and landscape fabric; urban development;

COLLECTIVE MEMORY AS A MANIFESTO FOR CULTURAL AND SOCIAL SUSTAINABLE ARCHITECTURE

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ABSTRACT

The aim of this paper is to discuss a few of very important contemporary issues regarding ideas establishing essential relationship between cultural and social sustainability and sustainable architecture and urban environment. It generates from the premises that sustainable architecture in a broader sense can be discussed not only as technologically efficient product for sustainable natural and build environment. It can be also observed as an aspect of cultural and social identity, without which a contemporary society cannot indicate and discuss problems regarding principles of sustainable environment.

In this context a particular issue will be explored. It is linked to the phenomenon of collective memory as a bearer of potentials for building up cultural and social identity through architecture and urban environment. Two examples will be used in the discussion. The first one is based on existing collective memory regarding architectural objects which become social monuments, particularly after their destruction. Architecture becomes an object of identification with important contemporary cultural integration processes, reflecting on its function before destruction. The second example will show how politics is using already destructed and devastated objects for establishing and extending collective memory as an aspect which should revitalize damaged national integrity and coherence in a society. Both examples are rooted in the ethical aspect of sustainable building environment, influencing further activities in this area and its development.

Keywords: Sustainable Architecture, Collective Memory, Social Sustainability, Cultural Sustainability, Ethics

COMPARATIVE STUDY REGARDING THE EFFICIENCY OF THERMAL REHABILITATION MEASURES AT EDUCATION BUILDINGS

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ABSTRACT

The assessment of energy performance of buildings gained an increasing importance over the last years. The effectiveness of thermal rehabilitation measures in terms of energy savings and maximizing the indoor environment comfort is different in various situations, depending on the building destination, geometry, area of building envelope and of the thermal resistance of these elements.

The aim of this paper is to present the results of a comparative study of four different education buildings of the Faculty of Civil Engineering and Building Services from Iași, Romania. The study is based on the results of the analysis carried on these buildings, having different thermal insulation degree of the envelope. In order to assess the weight of each factor that interfere in the global coefficient of thermal insulation, it was used the technique of factorial plan of experience with two levels.

Keywords: energy efficiency, thermal insulation, education buildings

CONTROLLING A VEHICLE AIR-CUSHION USING RADIO WAVES WITH APPLICATIONS IN WATER TRANSPORT

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ABSTRACT

To traverse various environments where conventional vehicles could not enter, the people was forced to focus on other methods of propulsion and transportation. This category ranges and air-cushion vehicles. With the discovery of radio waves, the researchers realized that this phenomenon has many practical uses, one of them being the control vehicles remotely.

Among the numerous advantages of using air-cushion vehicles include lower fuel consumption and therefore much less pollution than almost any means of transport. Also, since not cause any waves, air-cushion vehicles do not cause any erosion of river banks or changes to these.

Because most parts are placed on the platform above the cushion, these are not wet, do not transmit sound or vibration in the water which means that these types of vehicles do not have adverse effects on marine life [2].

In this paper, the main purpose was to present the performance of control and the construction of such a vehicle can cross the normal environments inaccessible to conventional cars. The vehicle presented in this paper was designed to prove the viability of radio controlled and construction of such a machine whose locomotion is done dragging on a pillow of air.

Keywords: vehicles, waves, control systems.

DISORDERS OF ROADS AND STRUCTURAL ELEMENTS IN A SERVICE OF HEAVY TRUCKS ON ROUNDABOUTS

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ABSTRACT

The article focuses on the issue of road defects, defects of components and materials used on roundabouts, which are located close to industrial zones. These defects are mostly caused by heavy freight vehicle crossing. Defects of the roundabouts may arise solely due to improper geometry of the crossroad itself, but also by selecting building materials inappropriately due to the nature of the transport. The article presents specific examples of roundabouts, described using this issue. In conclusion, there are recommended materials and possible solutions of this problem at the end of the article.

Keywords: Vehicles, industrial zones, components, material, roundabouts

ECOLOGICAL INFLUENCE OF ARTIFICIAL NIGHT LIGHT IN URBAN ENVIRONMENT AND LIGHT POLLUTION

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ABSTRACT

The article explores holistic approach of understanding the importance of qualitative lighted urban environment. A city at night is quite different from the city during the daytime. In the evening, attention is focused on the effect of the light. Sustainable lighting should be: suitable to everyone, environmental acceptable and cost-effective. For successful light use there are many limitations which should be considered, such as: natural circumstances, urban requirements, users' demands, technological possibilities and nature conservation demands. Successful lighting arrangements provide best living condition to all. Artificial night light increase visibility and personal security, decrease vandalism and make better orientation possible. But too much light or light pointed in wrong direction increase unpleasant feeling, lowers the residential potential, provide high energetic costs due to energy loss and raises emission of warm house effect. Consequently biodiversity is harmed; ecosystems and all living creatures are affected. This negative environmental burden, known as light pollution, can't be simply abolished by turn off the light. During the research work a methodology of city lighting evaluation was developed. The paper delivers an explanation of evaluation criteria which should be considered in order to achieve the balance between conservation of positive lighting aspects and improvement of negative pollution effects. The study is useful as an innovative approach in spatial design as well as in the electric power economy. Clever lighting design allows achieving a high level of quality at low energetic costs. Lower costs mean more effective contribution to economic growth that indirectly also stimulate sustainable urban development.

Keywords: Artificial night light, urban environment, light pollution, ecological influence

EDUCATIONAL AND CULTURAL DIMENSION OF GREEN SCHOOLS

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ABSTRACT

The aim of the paper is to show how properly designed green educational buildings may influence the attitudes towards nature. Especially the learning environment dedicated to the youngest generation has huge potential for societal progression and lifestyle improvement.

The authors of presented facilities search for solutions that allow high standard of architectural and environmental performance with the most limited budget. Sustainable, locally available materials as well as natural cooling and heating systems are low-cost ones and their application helps to minimize negative ecological impact. Thus created built environment promotes renewable and innovative architecture with the respect to the cultural heritage.

The paper analyzes the connections between the inspirations driven from local tradition and the building's adaptation to bioclimatic conditions. Furthermore the educational and cultural dimension of such buildings is investigated.

Keywords: sustainable education, green school design, bioclimatic architecture

**EFFECTIVE URBAN DENSITY AS ECOLOGICAL NECESSITY OF CITY
DEVELOPMENT IN SLOVAKIA**

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ABSTRACT

The study evaluates the current state of application of sustainable city development principles in Slovakia. It focuses to the analyses of master plans, key tools for controlling the urban development, of selected cities. This study emphasis evaluation of density regulation methods, rate of area usage of selected cities, its build up areas, as well as they proposed development areas. One of the goals of this study is an analysis of the ratio between expected exploitation of free or transformable areas inside the cities to expected usage of "new areas" outside the city. This paper also evaluates application of indicators of land use intensity, which define the future density of urban structures in the observed master plans, in the scope of international theory and praxes. Master plans of selected cities were used to evaluate the range of development areas and capacities of urban structures.

Keywords: sustainable development, compact city, urban density.

EVALUATION AND POSSIBILITIES OF ENERGY SAVINGS IN THE PROCESS OF REHABILITATION OF RESIDENTIAL BUILDINGS BUILT BEFORE THE SECOND WORLD WAR

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ABSTRACT

Improving the Serbian housing stock built before the beginning of World War II has the potential to achieve multiple benefits in terms of both saving energy and enhancing the quality of life in them. Considering the importance of preserving these buildings as testimonies of our architectural past, investing in their rehabilitation will also contribute to the preservation of a significant element of our national identity. Recent data from the 2011 Census show that 322,244 dwellings in Serbia were built prior to 1945, accounting for 10% of total dwellings. Nearly half of these (45%) are located in Vojvodina, and a fifth (20%) belongs to Belgrade area.

The methodology for rehabilitation was based on the typology of buildings from this period, as the starting point for calculating the potential energy savings and was developed for the purpose of the National Typology of Residential Buildings in Serbia. The Serbian housing stock built before World War II is characterized by high diversity as to the territorial distribution of construction types, while the remarkable differences between the old urban and rural architecture further add to the complexity of the typology.

Typological classification was made to: family and multi-family housing. While family houses were classified into freestanding and row houses, multi-family housing included multi-family houses and apartment blocks. Within this distribution, typical representatives of building types were recognized. Each of them was the subject of thermal calculations in three possible cases: a) the present state, b) the standard improvement and c) the advanced improvement of the building. Standard improvement measures implied application of common measures for energy refurbishment that are typical of the domestic market and that resulted with the improvement of building energy performance for at least one energy efficiency class. The advanced level of energy improvement included specific measures that contributed to the maximum possible improvement of the energy performance that was in accordance with the characteristics of the rehabilitated building. The present paper defines possible improvements to the selected building types as model representatives of real structures. The calculations of the energy performance and building type distributions were used to determine the potential energy savings in the process of rehabilitation.

Keywords: housing stock, energy rehabilitation, improvement measures, energy savings

EVALUATION OF INDOOR ENVIRONMENT AND ENERGY EFFICIENCY OF A PASSIVE HOUSE

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ABSTRACT

Thermal comfort of the indoor environment is the condition that expresses satisfaction with the thermal environment and can be assessed by objective and subjective evaluation. Light-weight timber-frame passive houses, which do not have adequate accumulation can have the problems with the optimum solution of the thermal load of the interior during the summer. The aim of this article is analysis of indoor environment and energy efficiency of the timber-frame passive house. The analysis is made on the base of numerical simulation, analytical calculation and experimental measurement. Numerical simulation is solved by the Design Builder software. Analytical calculation is solved by the software Simulation. Experimental measurements of the indoor and exterior parameters (external and indoor air temperature) are realized at the experimental passive timber-frame house in the area of the Faculty of Civil Engineering, VSB – Technical University of Ostrava. Results of theoretical analysis and experimental measurements are compared and evaluated.

Keywords: thermal comfort, indoor environment, energy efficiency, timber-frame passive house.

IMPACT OF STANDARDS AND REGULATIONS ON DESIGN OF SUSTAINABLE COMMUNITIES

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ABSTRACT

During the 40 years of communism, housing construction in the former Czechoslovakia was influenced by very precise planning. Into details developed system of standards and indicators was aimed to create independent and operationally self-sufficient housing estates, expressed by the phrase “complete housing construction”. Together with city development plans, defining the most suitable development areas (without a need to take the private property into account), the former regime possessed (and efficiently used) sufficient tools for planning residential construction in order to predict as well as regulate the growth of towns and villages.

After regime has changed in 1989, central planning, including use of standards and indicators, has been rejected as totalitarian limitation of free market. Return of private properties together with increasing social differences between inhabitants has caused massive residential suburbanization, especially around larger towns. During the last 20 years Slovakia repeated the very same mistakes that the western countries did and were fully aware of at the time when the process has started here. New suburban housing is typical by monofunctionality, increased transport demands and agricultural land take which is neither ecological nor economical and far away from worldwide trends promoting sustainability.

Current situation points out ineffective planning system that primarily fails to protect public interest. Absence of binding standards and indicators together with missing detailed development plans and appropriate regulations causes that new construction is based on individual interpretation of the land use plan by individual authorities. The result is disproportional growth and random placement of functions in the territory. It is the high time to start serious professional discussion how to change the system in order to ensure design of sustainable communities.

Keywords: residential suburbanization, public buildings, public interest, land use plan, planning system

**MATERIALS ROAD COVERS WHEN OPERATING PUBLIC TRANSPORT
(DURING THE DESIGN PERIOD)**

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ABSTRACT

The article focuses on disorders of pavement made of different materials, caused by increased load on the road at bus stops. In the beginning of this article, we introduce the types of vehicles operated bus and trolleybus routes in Ostrava. The article also deals with the possible effect of the public transport vehicles, as the effect of other vehicles which are moving close to the stop, so the load from them interferes into the cover of the road surface of the stop. Increased weight loads from vehicles has resulted in faster damage to all layers of the road at stops. Finally, the paper recommends materials and possible solutions to this problem.

Keywords: road covers, public transport, bus stops, load, damage, layers of the road

MODERNISATION OF OBJECT OF RAILWAY STATION IN ŽILINA

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ABSTRACT

The building of railway station in Žilina is built in the style of Modernism. Its historical value is not very important. Building was built between 1937 and 1942. Its artistic and cultural qualities significantly exceed its historical value. The railway station is a typical example of Modernism artistic style, including characteristic details and aesthetics of Modernism epoch. Here we present the description of historical-artistic-cultural characteristics of the building, as well as its incorporation into the urban environment of Žilina town.

Our focus is on the possible ways of modernisation. The principle is to preserve architectural features and artistic value of the building while improving its thermal performance. Environmental assessment of the building modernisation is calculated in comparative studies. They compare existing building envelope structures insulated with different types of insulating materials: starting with commercially used insulators ending up with environmentally friendly materials.

Keywords: railway station, eco indicator OI3, thermal performance, heat transfer coefficient, natural materials

PARTICIPATORY PUBLIC ART – A SUSTAINABLE PLACE-MAKING PRACTICE

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ABSTRACT

In contemporary urban development, public art is recognized as an important part of place-making and is nowadays established as research and professional practice. Nevertheless, concept and practice of public art is not fixed and is recently passing substantial changes. This change is related to the recognition of the importance of interdisciplinary work and broad public participation in production of urban space - in order to achieve more sustainable public places. In this context, participatory public art is developed as an art form that connects various stakeholders and design disciplines on different stages of public art project realization. But we argue that although participatory public art can contribute to sustainable place-making, restrictions for public participation in public art process exist and depend on social, political and economic context.

Analysis of context and possibilities for participatory public art in Serbia confirmed that this form of public art can make important contribution to sustainability of urban places on various bases. At the same time analysis pointed out that, if it is not institutionalized through public art programs and policies, contribution of public art to place-making remains limited, sporadic and temporary.

Keywords: sustainability, participation, public art, public space, urban design

POSSIBILITIES OF THE ECO-TOWN CONCEPT APPLICATION: THE PRINCIPLES AND GUIDELINES FOR THE CASE STUDY OF JELEZOVAC–SUNČANI BREG INFORMAL SETTLEMENT, BELGRADE

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ABSTRACT

This paper is aiming to contribute to the application of goals, concepts and criteria and related to the sustainable urban development and transformation defined and implemented internationally, in the complex setting of Serbia and its capital. Serbia as a country in transition is facing many urban development and growth issues for over two decades intensively. While main principles of sustainable urban development, derived from worldwide and EU legislation, practice and theoretical framework have been rooted in almost any plan or research study related to urban planning issues in Serbia, the implementation and substantial link to the situation-in situ have not been fully achieved. This situation is most noticeable in areas under greatest pressure of urban growth - the areas of informal settlements on the outskirts of major cities, and especially in Belgrade which is the Serbian capital and the largest city. The “ring” around Belgrade is currently consisted of numerous illegal settlements, which basically rely on individual housing development. Some of them are older ones, with more compact structure and with some elements of communal and social infrastructure. Other, newer units have been growing since 1990s, even after 2000, and mainly lack clear urban structure and many attributes of urbanity. On the other hand, such areas are not yet fully built so the urban renewal/redefinition is still possible. Therefore, newer illegal settlements, such as Jelezovac- Sunčani Breg area, are adequate research area for the possible application of new concepts which could greatly improve their livability. Since the phenomenon of illegal housing in Serbia is related to the suburban areas, while keeping in mind that location is a crucial factor in the selection of a research concept, this paper will discuss the concept of eco sustainable development tailored for developing countries on one hand, and the concept of UK eco-town on the other, as well as the possibilities of its implementation. Further, this paper will present the case study of newer illegal settlement at the southern fringe of Belgrade, confronting the goals, criteria and standards of the chosen concepts with the possibilities of its implementation in Belgrade context.¹

Keywords: eco sustainable urban development, eco town concept, informal urban growth, renewal.

PRINCIPLES OF SUSTAINABILITY IN ROMANIPEN-BASED INFORMAL ROMA SETTLEMENTS

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ABSTRACT

The intent of this paper is to present how several basic interdependent characteristics of the functional organization of *Romanipen* (Roma cultural identity) based Roma communities represent the ethos of the formation of spatial structures and construction methods in informal Roma settlements which correspond with the principles of sustainable architecture.

Given this context, the paper starts with the broader interpretation of territorialization which suggests the existence of a relation between the spatial and the social level of Roma settlements; a relation that makes possible the understanding of what this cultural group produces in space. The physical spatial patterns of informal Roma settlements were created without professionals' influence and represent a quality induced by the need to functionally organize a community where everyday activities take place. Therefore, the characteristics of spatial organization and construction methods in unplanned Roma settlements are the actual object of research when examining a collective lifestyle as the dominant pattern in everyday behavior determined by concrete Romanipen principles.

Further on, the paper compares research results – a systematic overview of characters of physical structures and construction principles – with the principles of sustainable architecture, thus formulating several conceptions of physical structure which can be considered as culturally adjusted environment that at the same time integrates both the realized principles of sustainable architecture and the potential for further acceptable development in the same domain.

Methodologically, the paper will also include case studies of representative types of spatial organization in slum-type informal Roma settlements in Belgrade, Serbia. The Case Study analysis was included week-long observation of the lifestyle and habitation of the members of certain community and informal conversation with them.

The purpose of the paper is firstly to emphasize the fact that the Roma microenvironments already offer their own ways to participate in the creation of cities of future. Acknowledging the character of the physical structure of a culturally adjusted environment with integrated sustainability principles has a dual effect: it pushes architecture towards a smarter, more sustainable future; and, it achieves the fulfillment of certain spatial needs which enable the development of a cultural identity, meaning the enabling of adequate conditions for a lifestyle acceptable to the Roma population. It is known that, in terms of social upgrade, the ability of affirming the attributes of cultural identity and the appreciation of differences represent an inevitable condition for

interculturalization which ought to be included into the architectural practice to successfully accomplish the social cohesion of the Roma people.

Keywords: informal Roma settlements, culturally adjusted environment, sustainable housing, social cohesion.

REMOTE TEMPERATURE CONTROL SYSTEM FOR GREENHOUSE ENVIRONMENT

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ABSTRACT

This study proposes a monitoring and control system of ventilation and temperature for greenhouse environment with both local and remote interface. For process control a Simatic S7-300 PLC is used. The control algorithms are based on conventional PID controller, positional control algorithm, and fuzzy logic controller. The final part of the paper highlights the obtained performances of each of the three control algorithms. The remote monitoring and control of the process are delivered through a web server implemented on Arduino Duemilanove microcontroller board with Ethernet capabilities that is connected to S7-300 PLC via analogical inputs and outputs of the specific modules SM331 and SM332. This is a solution that combines the advantages of both PLCs and microcontrollers.

Keywords: data acquisition, remote monitoring, PLCs control, greenhouse environment

ROMANIAN MULTISTOREY APARTMENT BUILDINGS – BETWEEN RETROFITTING AND RENOVATION

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ABSTRACT

During the urban development of the communist era in the 1970s, entire neighborhoods of collective dwellings were erected in order to accommodate the wave of people working in the new factories. Standardized and repeated blocks of flats were massively spread throughout the country, offering identical living conditions for all their inhabitants. After the fall of the totalitarian regime, 96% of the inhabitants living in the blocks of flats became owners of their apartments, one of the highest rates of ownership in Europe. Nowadays, almost 60% of the Romanian urban population lives in these so-called grey neighborhoods.

The renovation of these buildings started in the middle of the 90's, as a response to their technical degrading. Most common interventions resulted in the addition of pitched-roofs over the deteriorated flat roofs in order to prevent infiltrations. The real estate development from the 2000s treated the so-called thermal rehabilitation program into a business opportunity by using the slope roof as a livable attic connected to the existing block. As a result, new apartments were added, increasing the urban density levels, but without offering a significant improvement for the existing inhabitants.

The existing Thermal rehabilitation program consists in cladding the façade with a polystyrene base thermal envelope system, and, in some cases, the replacement of the openings with efficient doors and windows. In this case the reduction in energy demands is of 30-40%. The plumbing and heating systems are not included therefore energy management systems are not present.

By contrast, sustainable retrofitting embodies an integrated approach concerning social, economic and environmental aspects. The present article describes the detailed aspects of the two directions of intervening on this specific Romanian building stock. Multiplication represents an advantage for the implementing of both measures (almost 40.000 blocks of flats exist in Romania). The market viability of the two types of intervention is translated in two different industrialization processes detailed in this paper.

Keywords: retrofitting, green design, sustainability, green energy, energy efficiency

SHEAR STRESSES TRANSFER AT THE STEEL-CONCRETE INTERFACE IN CIRCULAR CONCRETE FILLED STEEL TUBES

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ABSTRACT

The concrete filled steel tubes, also known as CFT, have, as a main advantage over the reinforced concrete system, the fact that the interaction between the steel tube and the concrete improves the buckling behaviour of the steel tube and increases the strength of the concrete. This paper presents the research done by the authors in understanding the mechanism of the shear transfer over the interface between the circular steel tube and the concrete core.

Shear stresses appear due to the action of the shear forces over the element cross-section. According to the shear stresses duality, longitudinal shear arises along the length of the element (column), that tend to produce the relative slipping between the concrete and the steel tube. While the tangential tensile stresses do not exceed a certain size, the adhesion, the friction and the surface irregularities are sufficient. If the tensile stresses grow, it becomes necessary to use mechanical connectors.

The paper presents a methodology for finding the bond-slip at the interface of the steel-concrete for CFT, followed by a proposed design methodology. Using the proposed methodology the authors investigated the longitudinal shear stress over the interface between a circular steel tube and the concrete core for different values of the cross-section of the circular steel tube.

Keywords: Concrete filled steel tubes (CFT), steel-concrete composite structures, bond-slip behaviour.

**SOLAR ACCESS AND URBAN FABRIC: SOLAR ENVELOPE METHOD AS
DECISION-SUPPORT TOOL**

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ABSTRACT

Climatic forces are important in architecture because a building's response to climate is directly related to its energy consumption, and because climate is a powerful local context giving designers a means of regional expression and place making. [3] The contribution deals with a method which can be a tool how to fulfil an effort declared in European Directive 2010/31/EU on the energy performance of buildings to build after 2020 only passive houses, zero-energy buildings or active houses. Such buildings for their performance need quite significant portion of solar energy, so access to direct solar radiation is inevitable. The requirement of solar access could significantly influence existing way of urban design. Using the solar envelope method can be an answer how to insure adequate portion of solar energy. The paper contains some display of using this method – students' projects - from a scale of a building to organizing a space in a small settlement.

Keywords: solar energy, solar envelope, solar access, urban structure

**SOLUTIONS FOR ECOLOGICAL HOMES ADAPTED TO THE SEVERE
MOUNTAIN CLIMATE IN ROMANIA, USING SUSTAINABLE MATERIALS.
CASE STUDIES**

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ABSTRACT

This paper presents the results of studies that analyzed eco-efficient solutions for homes adapted energy-wise to the specific demands of the mountain climate (climatic areas III and IV of Romania), which ensure meeting the standard parameters and the conservation of the building traditions in these areas.

This paper presents the results of the analytic assessment of the global loss of heat for an actual house built in a mountainous area at an approximate altitude of 850m (M1), monitored for its thermo-physical properties by on site measurements in comparison with a building having an identical spatial structure with energetically efficient closing elements, studied experimentally in the laboratory.

The paper presents comparative results of these studies for the examined buildings as follows:

- the thermal transfer resistance of the exterior walls;
- the total heat loss of the entire building;
- the global heat loss for a built cubic meter;
- the global heat loss through the entire surface of the opaque exterior walls;
- the global heat loss for a square meter of opaque exterior wall.

The final result of this study has been a Catalog of solutions for ecological and energy-efficient homes adapted to the mountain climate, which is useful in ensuring a durable development of human settlements.

Keywords: energy efficiency, sustainability, ecology

SUSTAINABILITY ASPECTS AND ENERGY OPTIMIZATION POTENTIAL OF MULTIFAMILY SOCIALIST-PERIOD HOUSING IN SERBIA

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ABSTRACT

Almost 70% of the existing multifamily housing stock in Serbia was constructed during the four decades of extensive building activity after the World War Two. The architectural design and building technologies evolved greatly during this period, resulting in variety of building types. The paper presents a relevant portion of national housing typology developed within European TABULA project, with an overview of typical housing types and explores various sustainability aspects paying special attention to the questions of energy optimisation potential, cross-referencing results of multiple national and international research and scientific projects conducted during last 12 years. The significant share of these buildings in housing stock defines them as an issue of national strategic importance regarding the possible functional and energy-efficiency upgrades, so the long-term impacts on national scale are explored as well.

Keywords: housing stock upgrades, sustainable architecture, multifamily housing, energy efficiency, socialist housing doctrine

SUSTAINABLE ARCHITECTURE OF THE HOLY PLACE

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ABSTRACT

The architectural form of the holy places differs in its essence from the architecture of secular facilities and structures, thus playing a special role in space (rural setting or urban matrix) and time (through historic continuity and in the present). As the venue for researching holy places, the Republic of Serbia confirms the picture of spiritual inseparability of the Balkan Peninsula in the principals of church creations, as well as the belonging of each shrine to the overall church architecture of the Christian Orthodox world. Among the holy places, monasteries are prime representatives of technical and artistic creations in the sphere of architecture and urban planning. In construction terms, a monastery has a significant form consisting of a central building with perimeter facilities and empty space of the churchyard, and the essence of that template has been repeated for centuries in the ground plan of the holy place. The space of a monastery is made special not only by the inseparability of the form and function, but also by that of the built structure and the living community that inhabits it. The rules of the life in a monastery were established more than a millennium ago, which has, through the use of the spaces, also been reflected on the stability of the architectural patterns. Ever since the first centuries of the Christianity the patterns of sanctuary buildings have gotten authentic style forms in relation to the geographic regions and the historic periods of their creation. Sustainability of the form of the holy place has special foundation in comparison to the secular architecture of residential, public and community buildings. Sustainability of a monastery (church, paraclises, dormitories, churchyard and their mutual relation) is based on uniting the values of the spiritual and the material, of what has been and what will be. Each holy place unites space, time and architecture in an authentic manner, while at the same time and inseparably belonging to the unique body of the Christian architecture. In the case of secular architecture, the primary importance lies with the most modern construction technologies, economic cost efficiency of the facility, striving towards prestige in the presentation and aesthetics of the building, strict requirements related to the provision of real energy consumption, etc. Integrative approach to the protection of holy places is preservation of the essential sustainability of the space and of the architectural identity in continuity.

Keywords: monastery, sustainable architecture, space, time, form, function, continuity, integrative protection.

TACTILE AND VISUAL PERCEPTION OF NATURAL WOOD FINISHES

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ABSTRACT

Eco wood finishing products are in full process of replacing traditional methods. Although marketing campaigns present these products as being "green", the ecological aspect is reduced to meeting specific regulations. Human perception is omitted. This study focuses on identifying the physical characteristics that make a finish preferred to others by presenting different samples to a number of testers. The subjects are presented with a selection of samples finished with different materials, ranging from the new ecological products to conventional finishes and traditional solutions. The analysis is carried out in two stages, tactile and visual. The study takes into account the influence of the subjects' cultural background. The main parameter that determines a surface as being preferred is associated to the roughness of the material. Perfecting wood finishes and their use in different applications must relate to human awareness, to the perception of the surface and not to focus entirely on reaching higher protection levels.

Keywords: wood finishes, haptic, perception, furniture

**THE ARCHITECTURAL REHABILITATION OF COLLECTIVE HOUSING.
FUNCTIONAL, SOCIO-PHYSIOLOGICAL AND RESIDENTIAL SECURITY
ASPECTS**

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ABSTRACT

Besides the benefits brought to the energy balance and to the interior comfort through the direct interventions on the envelope elements, a complex and multidimensional process of architectural rehabilitation, which operates on a spatial and morpho-functional level, could become an instrument for improving the overall quality of housing, the optimal and coherent functionality, the potentiation of good neighborly policy, an its ability of facilitating the social contact and stimulation of communication.

The paper explores from this perspective the most important types of interventions: from those which consist only in the reevaluation and reshaping of the living space to those focused on the entire ensemble, including the reorganization of internal and external spaces. For the operations to have the target-effect, it is needed that the proposals of rehabilitation to be realized on different levels, depending on the context and situation, and to follow an economy of usage in conformity with the collective life wished by its inhabitants.

The re(arrangement) of common areas, internal or external, presumes their investment as thresholds between public spaces, semiprivate spaces and familial spaces, their organization for an easy and adequate accessibility to the collective needs without assuming a perturbing role in the functionality of the residential units. Their functional role must be accompanied by the one that is environment-generator.

Furthermore, between the qualitative aspects of a social collective residential building, which a rehabilitation process cannot ignore, it is also one of security - linked to the level of protection and safety, which a dwelling building, residential ensemble and its neighborhood offer, these being an essential condition in the evaluation of a district or an urban area. This paper proposes, applied on a certain situation -an ensemble of existing social collective housing – and in a realistic scenario, a set of architectural and urban rehabilitation interventions, focused on the imperative direction of a sustainable urban development, on the revalorization of urban territories and increase of residential satisfaction.

Keywords: architectural rehabilitation, collective housing, communitary sociability, sustainable urban development

THE ARCHITECTURAL STUDY BY DESIGN: ARCHITECTURAL EXPERIMENTS

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ABSTRACT

Contemporary architectural practice is expanding its horizon of work and research on city and landscape with all their complexities, from social to ecological. Active presence of theory in the process of design, necessarily led to development of design methodology known as architectural design research. Contemporary architects, searching for the truth as the pre-condition for architectural creation, are experimenting with presented architectural and non-architectural attributes. Their goal is to create something new, something unrecognized as architectural form so far, but now is. The paper discusses two methodological design platform - design by research and study by design. The research aims to review the possible directions for addressing the problems of design, through something that is determined by something that already exists, and the study involves an empirical verification of design results, which subject is determined by current context with addition of something new, and this new is variable because it needs to be designed. The paper considers the results of design research related to environmental sustainability and energy efficiency, applied through the bidding practice of the group Architectural Alchemy (AA). The result of this consideration is reflected in the conclusion that Study by Design, is mostly exploring new opportunities with a generic variable, and new knowledge and understanding of the design, which is of undoubted importance to meet the complex requirements such as adaptation to climate change.

Keywords: architectural study by design; architectural creation; process of design; design by research; experiment; architectural design.

**THE CHANCES FOR ACHIEVING URBAN SOCIAL COHESION: CASE
STUDY OF BELGRADE INFORMAL SETTLEMENT AS A PILOT PROJECT
FOR NEW SOCIAL HOUSING**

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ABSTRACT

This paper will enlighten the problem of illegal housing in unconventional way – by trying to understand the illegal settlements as areas of social/affordable housing and social integration. It will also discuss the possibilities of urban upgrading and regeneration of illegal settlements making them liveable places and areas which can be integrated into the Belgrade development. On one hand, Serbia is, like some other developing countries, facing the problems of socially and spatially incoherent urban development and of integration of special socio-economic groups, while on the other - there is an issue of tackling the untamed urban growth in the form of illegal settlements in suburb areas. These problems are closely related to the lack of adequate affordable housing and its capacity. Having this in mind, it is understandable that Serbia is coping with even bigger problem of affordable and social housing than it is the case with developed EU countries. The pressure of these problems is more visible in Belgrade, Serbian capital since it deals with the demographic pressure and immigrants more than any other Serbian city over past four decades. As a consequence of this pressure many previously agriculture areas at the fringes of the city have become illegal urban sprawls. As the time has proven, the country did not manage to limit the informal growth in the acceptable manner, neither through restrictive policy and plans, nor through the legalization process. At the same time, being a severely hit by economic crisis in past few years, Serbia will not easily reform its housing policy and enable growth of the typical affordable housing which will meet demands. Having all in mind, this paper will try to present a different prospective which relies upon the integrative approach to these problems and which is based on the idea of new form of social housing and transformed and upgraded informal settlements. Furthermore, it will offer the directions and measures for the planning actions that would meet the objectives of social integration and cohesion and would contribute to the solving of social housing problem within the social sustainability development framework.¹

Keywords: informal growth, illegal settlements, urban social cohesion, social housing, sustainable urban planning.

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THE CRISIS OF ARCHITECTURAL CREATIVITY: AN ESSAY ON UNDERSTANDING OF NON-GOOD IN THE ARCHITECTURE

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ABSTRACT

In front of the post-industrial society is a challenge that can be seen through the question: Is it possible to overcome the current concept of the crisis decision which takes the form of an external challenge to the individual, and a necessary internal response? This paper examines the crisis of architectural creativity from the position of ethics. The concepts of virtue ethics or deontology in the context of redefined position and role of architectural creativity in postmodernity are explored accordingly. A particular focus of the paper is on understanding of Alain Badiou's ethical theory and an understanding of ethics focusing on the Good. Consequently, the concepts such as Truth, Event, Subject and Fidelity are studied, for the purpose of detecting and understanding the current crisis of architectural creativity. Of special importance for this study was a review of the concept of fidelity of Event in architecture, in order to make a distinction between Good and Non-Good, as something that is not true to Event and, as such, denies the Truth. Hence, the paper discusses the ethical issues related to the cities of the XXI Century, based on the trends of global changes in society, politics, democracy, economy and their relations to the natural environment. The result of this research is reflected in the conclusion that the crisis of the architectural creativity is autonomous and does not come as a consequence of the crisis of something that is 'outside' (political, economic, etc.), but its causes are within the subjective paradigm of enjoyment, ergo experiments with death within life.

Keywords: Alain Badiou, architectural creativity; Event; postmodernity; ethics; Truth; Non-Good; Evil

THE ENERGY DIAGNOSTIC OF THE CURRENT TRENDS IN THE CONSTRUCTION OF SINGLE-FAMILY RESIDENTIAL BUILDINGS

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ABSTRACT

The paper deals with the diagnostic of the current trend in the construction of single-family residential buildings with respect to the energy performance. Current trends in civil engineering are mainly focused on the energy efficiency of the buildings and saving non-renewable resources in accordance with the principles of sustainable development. The primary legal instrument for the energy-efficient construction is a revised Directive on the Energy Performance of Buildings (EPBD II). The basic factors of the evaluation of the building's energy performance are heat transfer coefficient of structures, mean heat transfer coefficient, air change rate, specific heating demand and specific primary energy demand. The aim of the diagnostic is to describe the impact of users standards on the energy balance of the building compared with the proposed calculation values.

Keywords: energy performance, sustainable development, energy efficient buildings, green buildings, single-family residential buildings

TOWARD BUILDING KNOWLEDGE FOR SUPPORTING SUSTAINABLE TRANSITION OF THE BUILDING STOCK

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ABSTRACT

The paper discusses the possibility of developing an easy and shareable framework with the aim of building basic knowledge for supporting the energy retrofitting process of the heritage building stock, with spatial detail at the neighborhood or district scale and, in a more general sense, for supporting the urban regeneration process.

One of the main strategies to achieve the 20-20-20 Communitarian objectives is the building stock renovation process via energy efficiency improvement. Thanks to the great economical and political interest in the development of technologies and practices for reducing energy consumption and for Renewable Energy Sources (RES) micro-generation, there are favorable conditions to reach the resources to promote a rethinking of the physical components and intangible assets of the cities. The integration of new technologies into the urban building stock could pave the way for urban regeneration with small scale intervention programs that combine the identity of the places with energy efficiency and urban facilities improvement.

In order to support this extraordinarily complex process, the Public Administrations (PA) and decision makers need methodologies and tools capable of defining and representing urban transformation scenarios and future views in order to encourage the broad participation of strategies drawing and promote the sharing and transfer of good practices. Tools and models adopt methodologies and approaches of various complexities, purposes and effectiveness. Generally speaking, the specificity of the models often focused only on certain aspects of the process (CO₂ emissions, RES potential, Microclimate, Policy assessment...), and the various local baseline data availability on the utilization and physical characteristics of the real estate and on energy consumption require use of methods that are unlikely could be exported to different contexts.

The wide implementation of INSPIRE standards for the management and production of spatial data, the spread of new technologies for topographic high detail surveying and for the production of environmental data outline an approach that could be exported in a different context, such as a way to create a Spatial Data Infrastructure (SDI) to describe the state of the urban environment. At the same time, the promising SMART metering technologies and the development of methodologies for voluntary feedback acquisition from energy users, or more widely from city users, could overcome the chronic lack of data about energy consumption profiles.

However, some barriers still remain, preventing the development of a widely shared approach which are the further research focus.

Keywords: Energy Retrofitting, Building Stock, SDI

URBAN AGRICULTURE: A WAY TO A SUSTAINABLE COMPLEMENTARITY BETWEEN THE CITY AND THE COUNTRYSIDE

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ABSTRACT

For centuries, town and country maintained a relation of dichotomy and complementarity, but, because of industrial and technological progress, this dichotomy had faded way and the complementary links were broken. The country, with less population and fewer labour, affected in its economic and social structure, lost the ability to produce enough and high-quality food for town that, besides its social and environmental problems, has been seeking for solutions inside itself to improve the quality of urban life, but never stopped to extend its limits and to consume agricultural soil. We evolved from the traditional approach of urban / rural into a global landscape: urban and rural get mixed, creating discontinuities needing to be overcome. We believe urban agriculture, in its different implementation forms, is a way to overcome them by allowing a landscape construction that will retrieve the elementary processes of production, recreation and protection and, therefore, the lost complementarity.

Keywords: City. Countryside. Complementarity. Urban agriculture.

VULNERABILITY TO CONDENSE OF THERMAL REHABILITATION BUILDINGS

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ABSTRACT

The thermal rehabilitation of existing buildings, an essential component of Sustainable Architecture, aims at reducing energy consumption for building operation and ensuring a healthy and comfortable indoor environment. This involves the reduction of risk of condensation on both the surface and inside the closing elements. However, there are reported situations of vulnerabilities to surface and interstitial condense of certain areas of rehabilitated building envelope, when a combination of favorable conditions for producing the phenomenon is determined. These conditions may be caused by deficiencies in the design or in application of additional insulation measures and / or improper operation, consisting mainly in the mismatch between the production of vapor and the ventilation rate. Exterior climate conditions, specific for the continental temperate area, could have an important contribution.

This paper aims to identify the generating situations of condense vulnerability of rehabilitated buildings, taking into account different scenarios for using. Measures for vulnerability reduction are proposed and analyzed, aiming the optimization of constructive solutions and also of the operating system.

Keywords: condensation vulnerability, rehabilitation buildings, indoor air humidity, thermal bridges, temperature factor.