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WMCAUS 2020

5th Anniversary

5th WORLD MULTIDISCIPLINARY CIVIL ENGINEERING - ARCHITECTURE - URBAN PLANNING SYMPOSIUM

ABSTRACT BOOK

WMCAUS 2020

1-5 September, 2020 - Prague (Czech Republic)

Eco-friendly Symposium - WMCAUS

the more you save the Earth, the more you get wealth

SAVE THE DATE & NEXT YEAR JOIN US AGAIN for the WMCAUS 2021 - 14-18 June 2021 in Prague

Preface

This is the Abstract Collection of 5th Anniversary of the WMCAUS 2020 and consists of the abstracts of oral and poster presentations in the “World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium” in the city of romance Prague (Czech Republic) during 1-5 September 2020. The World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium (WMCAUS) aims to provide a forum for discussion of the latest findings and technologies in different fields of Civil Engineering, Architecture and Urban Planning, to give opportunities for future collaborations, to be a platform for sharing knowledge and experiences in the fields of Civil Engineering, Architecture and Urban Planning, to lead for providing a forum for early career researchers for presentation of their work and discussion of their ideas with experts in different fields of Civil Engineering, Architecture and City and Urban Planning such as; Construction Management and Engineering, Construction Materials, Geotechnics, Hydromechanics, Structural Engineering, Building Performance Simulations, Transportation, Architectural Space, Social Sciences and Architecture, Architectural Culture, Theories of Vision and Visuality, Architectural Design and Methods, Architectural Historiography, Architectural Heritage and Conservation of Historical structures, Sustainability in the Built Environment, Urban Planning, Public Space, Urban Design, Theories and Methods, Regional Planning, Archaeological Method and Theories, Sustainable Urban Development, Urban Sociology, Economics and Politics, Risk Management and Mitigation Planning, GIS-Based Modelling for Mitigation Planning, Computer Aided Design, Mathematical and Statistical Methods, Integrated Coastal Zone Planning and, Management, Accreditation of Civil Engineering, City and Regional Planning Education.

The main mission of the "World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS" is to lead to contribute in multidisciplinary studies related with Civil Engineering, Architecture, City and Urban Planning and to improve interactions between people within these fields. As another mission it will provide a forum for this diverse range of studies which report very latest results and document emerging understanding of the related systems and our place in it.

We would like to express our sincere gratitude to all ~500 submissions to WMCAUS 2020 from 50+ different countries all over the world for their interests and contributions in WMCAUS 2020. We wish you enjoy the World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium – WMCAUS 2020 and have a pleasant stay in the city of romance Prague.

We hope to see you again during next event 6th World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS 2021 which will be held in Prague (Czech Republic) during the period of 14-18 June 2021.

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NEW RAILWAY ROUTES, CROSS SECTION AND WATER EVACUATION SYSTEM PROBLEMS AT TUNNELS IN ROMANIA

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ABSTRACT

Adoption of the maximum circulation speed of passenger trains of 160 km/h and 120 km/h for freight trains conducted to rectification of 300 Railway Magistral. In the railway rehabilitation project between Brasov and Simeria, component part of IVth Pan European Railway Corridor along Romania were provided a series of art works like tunnels and bridges. The paper presents the new constructive routes adopted in the railway rehabilitation project for three zones, corresponding to the new three tunnels: Sighisoara, Danes and Turdas and the new rail curves adopted in order to ensure the designed speed. In the second part of the paper it is made a research regarding the technical solution of tunnels cross section and the implication of the works connected. A brief comparison between the Sighisoara, Danes and Turdas tunnels cross section and the problems encountered during construction is made. In the third part of the paper are presented the deficiencies of the water evacuation canal, central canal, drainage pipes and deficiencies in conception of water drainage system of tunnels.

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DEVELOPING RAILWAY LINK IN CENTRAL REGION OF ROMANIA

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ABSTRACT

An intersection of European Railway Corridors are present in our country by geographical meanings, conducting to a need of developing infrastructure and connecting it to the European Corridors. The railway link between the Romanian Regions is developing and has just a few sections that need to be made in order to have the entire IVth Pan European Railway Corridor from Romania rehabilitated. The Central Developing Region from Romania contains the railway section between Brasov and Sighisoara cities that is rehabilitated for the maxim design speed for passenger trains of 160 km/h and 120km/h for freight trains. The maximum design speed impose new curves with bigger radius resulting new routes along the section. The actual and proposed route of double track railway section between Brasov and Sighisoara is analysed and the rehabilitation works along it. Are presented and analysed the tunnels cross section and possible difficulties in realising and execution of them. Conclusions regarding the proposed art works and future problems that can be solved in this stage – preparation stage that can assure better and safe construction and exploitation of railway are made in final.

EFFECTS OF INDOOR LANDSCAPE DESIGN ON ELDERLY' HEALTH

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ABSTRACT

Interior design is the result of covering part of the physical space with limiting elements (walls, ceilings, etc.). People spend a considerable amount of time in indoor spaces created with artificial environments, separated from outdoor and nature. Indoor air quality is as important as outdoor air quality. Developments in construction technology and the use of synthetic materials as building materials make buildings more insulated and comfortable. However, the synthetic materials used are known to cause various diseases by disrupting the indoor air quality. Due to the materials used in this type of building, people experience various health problems such as eye and skin itching, drowsiness, respiratory and sinus congestion. The biggest reason for this is benzene, ethylene and similar chemical organic gases contained in materials such as oil paints, laminate flooring, degreaser and glass cleaner. Especially in the winter months, since thermal insulation is at the forefront, the buildings cannot be adequately ventilated and the pollutant concentrations in the indoor environment are at levels that may pose a threat to health. All of these factors cause the phenomenon of "Sick Building Syndrome". Also plant material used in the interior design creates the feeling of living in harmony with nature and reveals the effect of peace and rest. In this research, health and psychological effects of the use of indoor plant materials were investigated. In line with the data obtained, the plants that should be used in indoor landscape design and their effects on human health have been revealed.

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SLOPE STABILITY UNDER THE INFLUENCE OF GEOLOGICAL CONDITION AND BLASTING ACTIVITIES: CASE STUDY FROM THE PHOSPHATE MINE IN ALGERIA

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ABSTRACT

In the phosphate mine, the Kef-Essnoun deposit extended to (N75° E), soft and brittle tectonics resulted in an abrupt change in the dip of the phosphate layer flush or the dip angle is subvertical or steeply inclined towards the Southeast and sometimes the Northwest. The overall edge angle of the pit evaluated at 55° for a depth of 75 m. Several incidents of slope failure occurred in the mine, and a considerable disruption to production and monetary losses occured. It is expected that slope failures may be triggered due to blasting in a steeply sloped laminate. In order to study the causes of slope failures, on the one hand, a back analysis was applied in order to assess the most probable physical and mechanical characteristics of the facies generating the movement, and on the other hand, the slope was analysed by the limit equilibrium methods. The calculation of the safety factor (SF) value was carried out under static loads and dynamic loads were taken into account, which led to the conclusion that the dynamic load affects the safety coefficient.

Corresponding Author: Mohamed Fredj

SUSTAINABLE CITY PROJECT FOR RESIDENTIAL SUBURBS

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ABSTRACT

Sustainability is on the top of the agenda of cities research, not only locally but also globally. This article refers to a city project proposal for a low density suburb in Portugal. It is focused on a residential neighbourhood, Covelo in Covilhã, which is based on the single-house typology. The urban design solution aimed to rethink the referred area, in order to promote the functional diversity, the architectonic variety, the public spaces qualification and the urban sustainability. The later aspect was achieved creating democratic spaces for meeting and leisure, based on the concepts of improving permeability, accessibility, readability, flexibility, and identity of the local community, including residents and visitors. The methodological approach comprised the following main fourth steps: 1. an analytical research of the area, supported by field visits, mental maps and municipal documents that regulate the processes of edification, urbanization and urban requalification; 2. the preparation of visual maps that allowed the construction of a set of conditions, weaknesses and potentialities of the case study neighbourhood, considering its characteristics and morphological elements; 3. a diagnosis was elaborated showing the failures of integration between this suburban residential area and the urban network of the city, revealing the massive presence of urban voids, the low quality of public areas, the undersized road structures, or the lack of commercial attractiveness. Therefore, this city project proposes the creation of an urban environment where everyone can experience the individual and the collective, within the same neighbourhood. The proposal was designed in an academic environment, on behalf of an international mobility programme for higher education students in between Portuguese and Brazilian universities. Among other conclusions, the result shows an attractive proposal for the region and that, through the urban design project, is possible to invite citizens to take ownership of the new public areas, while creating a sense of collective responsibility for their maintenance.

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TRADITIONAL BUILDINGS ASSESSMENT USING MICROSOFT EXCEL®

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ABSTRACT

This article presents a traditional buildings assessment methodology, using the Microsoft excel®, based on qualitative architectural features. The developed software was called AVAL-Nisa, give than it was designed for the case study of Nisa, a Portuguese historical village. With the growing of the interest on the subject of rehabilitation and conservation of traditional buildings, there is the need of acquire new means to evaluate their status of conservation. This methodology was developed using a spreadsheet of Microsoft excel®, able to make calculations and to store the traditional buildings data, provided without the usage of any paper and the capability of being updated later on. The referred spreadsheet is based on a form that has a Main Menu, in order to facilitate the navigation between all sheets of the software, with buttons done on Visual Basic for Applications. Beyond the capability of assess one building it was also designed to analyse a set of several buildings and compare them in terms of their conservation performances. The assess software was organised in four main categories and 17 sub- categories, related to architectural features. The user begins filling the form from the chimney (the feature relates to the top of the building) and goes down till the coating finishes. On the one hand, the main categories only work as an output for a simpler analysis and the subcategories have different weights for different elements of the facade. On the other hand, the spreadsheet can adjust the weights between main categories and sub-categories, according to the different elements of buildings. Consequently, the evaluation is done between 1 corresponding to the worst status of the building element conservation, and 5 for the best. After the calculations ready as a result of the background formulas, the software output shows the provisory score of each building according also its conditions for living. Finally, it provides also a part that analyses the scores of all buildings and organizes them with a condition/cost state of the three more expensive building elements to repair, and the three less expensive. This facility, provides to the user, the chance of get a quick idea on which building elements are needing attention, regarding the conservation and maintenance purposes. For a better analysis the spreadsheet also calculates various graphs and tables automatically. By the application of AVAL-Nisa in the case study area, is possible to conclude that 25% of the analysed traditional buildings are in a medium status of conservation and 10% of them are in bad condition. Only 5% of them are in very good status in conservation terms. This software can be used in other case studies having similar architectural features.

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REQUALIFICATION OF SOCIAL HOUSING AT SUBURBAN NEIGHBOURHOODS

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ABSTRACT

Social housing neighbourhoods are issues for several approaches and studies, in both domains, the architectural scope and the urban scale. There are several examples of academic researches focused on this topic. However, there is still much ink to spill regarding the scientific interest of these urban areas, such as in the case of the Ingote plateau, a suburban neighbourhood at the Portuguese city of Coimbra. It is the result of the following three housing developments from different periods of time, according to the national policy to provide social houses: The Ingote neighbourhood from the 1970s, the António Sérgio neighbourhood from the 1980s, and the Rosa neighbourhood from the 1990s. These residential areas are associated with all problems related to suburban neighbourhoods, such as the scarcity of social and economic means, or the shortage of urban conditions. Suburban neighbourhoods of social housing are complex social entities, and their rapid urban growth has contributed to change spatial identity of cities, leaving room for new questions about the concept of neighbourhood and its role in the urban scale. As this article aims to show, the geographical location of Ingote plateau on the outskirts of the city makes it a target of urban exclusion, territorially and socially. Therefore, an urban design solution was proposed in order to rethink this area, developing strategies for its integration the urban fabric. As a main conclusion, the urban design solution aims to maintaining the same number of dwellings, improving the quality of public spaces, facilities, greenery and leisure, projected to serve not only its inhabitants but also the city as a whole. The main goal is to reinforce the identity of the place and to promote the safety of local community, inhabitants and visitors, making them to be proud of their neighbourhood.

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THE STRENGTH AND DRYING SHRINKAGE PROPERTIES OF AMORPHOUS METALLIC FIBER REINFORCED CEMENT COMPOSITES WITH MIXED SLAG SAND

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ABSTRACT

As the production of concrete has increased worldwide, the lack of natural aggregate is becoming increasingly severe, and the need for alternative aggregate development is increasing. In South Korea, steel slag, which is by-product of the steel industry, is produced over 15 million tons a year. In addition, environmental pollution problems are increasing due to the steel by-product, and various researches for recycling steel slag are being conducted. In this study, the strength and drying shrinkage properties of cement composites with mixed slag sand (MSS) including blast furnace slag sand and ferronickel slag sand, and the amorphous metallic fiber (AMF), which has excellent corrosion resistance and mechanical properties, were investigated. MSS mixed with blast furnace slag sand and ferronickel slag sand at 5:5 was used to replace the natural sand in AMF reinforced cement composites. As the results, the compressive strength of AMF reinforced cement composites with MSS was higher than that of the control mix. In addition, the flexural strength of the sample containing ASF was higher than that of the sample without ASF. Therefore, MSS can be effectively used as a substitute for natural sand in the cement concrete industry.

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PUBLIC PARKS: SPACES OR PLACES, THE LOST IDENTITY OF THE FAMILY PARK, NEW CAIRO, EGYPT

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ABSTRACT

Public parks discourse and related definitions, aims, concepts, disciplines and design processes have passed through three main shifts throughout history. The industrial revolution, the WWII and the Globalization movement have tended to guide such shifts. Not until the 2010s did the concept of place-making have a major impact on the public parks discourse. However, the concept of place-making does not appear to be a new concept but rather a revived one. It has the very same perception on public parks as those of the period between the WWII and the start of Globalisation in the early 1990s, where social interaction, diversity formulated the core design and usage principles of public parks challenging the conservation of their cultural identities. In practice, public parks all over the Globe, especially in developing countries, have faced major economic, social and political changes since the early 1990s. The Egyptian context was no difference; it evidently shows vivid consequences of embedding global urban trends while risking the loss of its local identity. Furthermore, Public Parks as many public spaces moved into the mode of privatization targeting mainly upper-middle and high income socio-economic classes while destroying the notion of "public" to the core. This paper aims to explore, discuss and document the case of The Family Park in New Cairo, Egypt with specific reference to the dichotomy of space and place-making.

SIMULATING FUTURE LAND USES TO ANALYZE THE INFLUENCE OF THE LANDSCAPE IN URBAN CHANGE: THE CASE OF INDUSTRIAL HERITAGE NEIGHBORHOODS IN CHILE

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ABSTRACT

Since the end of the nineties, various researchers have studied the applicability of computer models (cellular automats, multi agent or hybrid) to predict land-use change. Most of this research focuses in large areas at a regional scale and in predicting urban growth (i.e. the expansion of the city form). Within this field of research, our investigation innovates by studying the applicability of these tools to predict shifts of different types of urban land uses at the scale of the city plot. Using GIS we built previous and current land use maps of three neighborhoods located in the historic city of Tome in Chile (years 1992, 2009 and 2019). Then, using the *Dinamica-EGO* land-use simulation and modelling software, we analyzed future scenarios of land use from 2019 to 2029. The methodology involved two phases. Firstly, building static maps of land uses that do not change during model iteration; secondly, identifying key cells linked to specific characteristics of the landscape; and thirdly to analyze how they affected land use change. We compared a baseline scenario with other two scenarios taking into account the influence of these morphological characteristics in increasing or reducing the probability for the preservation or regeneration of the historical land uses. The main results prove that the method is a powerful tool not only to simulate future land uses within historical areas, but also to analyze the impact of different morphological variables in these processes.

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DESIGNING BRAND EXPERIENCE IN INTERIOR SPACE

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ABSTRACT

With fast globalization, comes competitive marketing and brands have begun to use experiential design as a marketing strategy. Experiencing spaces creates a signification in people's lives, and spaces can have a particular role in originating specialized experiences. Therefore, there is a key role for interior designers, because they design experience through space. Understanding how to design a perceived space for the purpose of brand strategy becomes significant at this point. The research aspires to analyze the role of interior space in experiencing corporate identity. Moreover, it explores how interior space is being shaped by firms who are designing the corporate identity with all design elements together, from graphic design for the logo, to the software design for the website, to interior design for the design of the corporate space. Integrating interior space within the development of corporate identity is a new and effective approach in understanding the experience of the corporate identity. Schmitt's [1] Experiential Marketing model is used to analyze the works of the design company, I-am Associates, that uses this approach. The model is adapted to the field of interior design to provide a link with marketing and to eliminate deficiencies between professional life and the existing literature.

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MECHANICAL DESIGN IN ADVANCED STRUCTURES: FROM 3D TO 4D

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ABSTRACT

With progressive advancements in various cutting-edge technologies, smart structures with both robust stability and manipulatable functions are highly pursued to meet the critical requirements in the various complicated environments. On the other hand, development of addictive manufacturing technology has fundamentally exhibited great advantages, which provides an exclusive platform for manufacturing smart structures. Based on 3D printing added with additional dimension, either time or space, for manipulating shape, property or functions, in the present talk, I would initially analyse the key scientific issues in 4D printing technology from Beijing Institute of Technology, including design, materials, apparatus, software, manipulation and applications. Based on an advanced multi-material structure strategy for achieving smartness, I would give several examples based on our current studies for better understanding how 4D printing plays a significant role in designing and manufacturing smart structures and smart devices, with potential applications in manipulating electromagnetic waves or light. The 4D printing technology is expected to open a novel strategy for substantially endowing the advanced structures with smartness and exceptionality.

BUILDING ENERGY SIMULATION: CASE STUDIES WITH WATER FLOW GLAZING

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ABSTRACT

Buildings represent complex systems with high levels of inter-dependence on many external sources. Building envelope expertise is part of the building process, from pre-design through post-occupancy. Large glazed surfaces increase the building's luminosity. However, the glass is a poor thermal insulator, and allows a great part of the solar radiation to pass through it. The use of a glazed façade has the disadvantage of introducing an excess of energy in the building by means of solar radiation during the summer months. New glass technologies solve the energy problems raised by the use of glass in buildings: double and triple glazing, surface treatments, solar control glazing, low-emissivity glazing, etc. One of these is the water flow glazing. Due to the spectral properties of water, it captures most of the infrared solar radiation, allowing the visible component to pass through. This provides the water flow glazing with the same luminosity than conventional glazing, only lessening the heat transfer towards the interior space. Furthermore, the water circulation allows us to use, store or dissipate the captured energy as deemed appropriate. The first goal of this paper is to study the integration of the water flow glazing to evaluate its behavior in different weather conditions. Active and passive strategies will be tested in real case studies to achieve the goal of a Zero Energy Building.

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A METHODOLOGY FOR OPTIMAL DESIGN AND SIMULATION OF DEPLOYABLE STRUCTURES

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ABSTRACT

Deployable structures with bars have been used in different technological fields since the beginning of the 20th century. It was as of 1930 when their use in construction became widespread, especially in roofs with large spans. The research group at San Pablo University in Madrid, along with Keene State College has developed a new type of deployable structure that minimizes the weight and maximizes the span. The structural efficiency is based on the fact that the tensioned elements of the modules are made of cables. In addition to contributing to the overall stiffness and strength of the structure, these cables are designed to guide the folding and unfolding process of the structure. In each module the tension cable is extended until it is connected to the midpoint of the compression bar, thus regulating its position and avoiding the possibility of unforeseen folding while the structure is fully deployed. This article shows a method to optimize the geometry and to test the static and dynamic behavior of the structure.

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MANUFACTURE AND ASSEMBLY MECHANISM OF DOUGONG

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ABSTRACT

Dougong[斗栱] is a bracket between column, beam, and rafter in traditional timber structure building in China. It has several bearing blocks, which named dou [斗], and some bracket arms, which named gong [栱]. All components are connected by sunmao[榫卯]. It was born from the capital and later developed into a bracket that does not have to be related to the column. During the last 3000 years, its status in traditional architecture has been rising. In the Qing Dynasty, the architectural design work started it as the core. The chief aim of this research is to explore the possibility and key issues of using dougong for prefabricated building. This research documents a folk building project in China from three aspects: the construction organization, the dougong component manufacture and assembly. After that, we study the mechanism and analyse the traditional technology. Finally, the study provides some suggestions for the prefabricated building. The first aspect is the construction organization. The component manufacture team needs more specialized skills than the assembly team. The two teams exchange information through the code on components and simple language. The proportion of dougong manufacture workload on the standard floor is 40%. The second aspect is the dougong component manufacture. A master carpenter, a chief engineer, is in charge of three tasks: architectural design, material requirements planning, and templates making. After that, he directed 4 carpenters to make components accorded with the templates. The dougong components are universal. Besides, carpenters assemble and code the completed gong components in layers in the carpentry yard. Each layer of gong uses 1 English capital letter to code. The other components are unassembled and uncoded. The third aspect is the dougong component assembly. The assembly team's workers need only simple skills to complete their work. Limited by the low precision of the hand-made method, they need to fine-tune the size of the gong at the joint between the gong and the column. This is the only step in this stage that requires tools. In this project, the lowest component of dougong is gong, so, the workers assemble 5 layers of gongs into the columns from bottom to top first, and then assemble several dous between the gongs. The completed sunmaos at this stage are not tightly fitted, which leaves room for adjustment of the upper components of the dougong. The research we have done indicates that compared with the assembly stage, the manufacture stage is a concentrated section of the technology and workload. So, the key to modernizing traditional building is the modernization of this stage, especially the dougong manufacture. If it is realized, we can save at least 40% hand-made workload of the standard floor. At the same time, the components will achieve higher accuracy, which is beneficial to improve the assembly speed and the quality. Also, in the future, BIM can be utilized based on the traditional design method, which is significant to the inheritance and improvement of dougong technology.

Corresponding Author: Dai Haiyan

STUDY ON FUNCTION TRANSFORMATION AND SPATIAL RECONSTRUCTURING OF SMALL TOWNS IN CHINA'S SOUTH OF THE YANGTZE RIVER FROM 1840 TO 1949: CASE ON CHANGZHOU

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ABSTRACT

Taking Changzhou as a case, this paper studies on the functional transformation and spatial reconstructuring of small towns in the south of the Yangtze River in China from 1840 to 1949. Then, the article analyzes its adaptability and mechanism. During this period, there were three significant transformations of urban functions in Changzhou. The political status of Changzhou declined from the Changzhou Prefecture of the Qing Dynasty to the county of the Republic of China; the transportation function reduced from the regional transportation hub city to the local transportation hub city; and the economic function was transformed from the traditional agricultural city to the light industrial city. Functional transformations have driven the spatial reconstructuring. Urban construction has transformed from urban internal transformation to a composite expansion mode, a ring-layer and axial-type composite model. Finally, a lute-shaped urban form was formed, and the internal facilities of the city were more modern.Although there are some regrets, Changzhou's urban spatial reconstructuring has changed the original material framework of the city. This adapted and promoted the transformation of urban functions during this period. In terms of mechanism, first, this is a passive transformation model. Changzhou mainly promotes urban functions through local private forces and relies on the role of the market. Second, industrialization is the fundamental driving force.In the political and economic context of this period, these changes in function and space manifested self-organizing and progressive characteristics.

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ENERGY SAVINGS IN RESIDENTIAL BUILDINGS: EXPLORING INFLUENTIAL FACTORS AFFECTING OCCUPANTS' MOTIVATION IN THE UNITED ARAB EMIRATES

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ABSTRACT

Similar to other fast-growing countries, the built environment in the United Arab Emirates (UAE) accounts for 70% of energy consumption compared to the global average of 40%. Cooling dominates the consumption. Within the built environment assets, the residential sector represents the second-largest share (30%) and is proved to be primarily influenced by the building characteristics and occupants' behaviour. The energy usage is expected to keep increasing, urgently calling for strategies to address this trend. Strategies to curb the ever-increasing energy demand are a worldwide agenda. Energy efficient housing under hot climatic conditions, have been extensively studied in relation to design, construction materials and building systems. However, the energy performance gap has been widely recognized as a result of occupants' behaviour, catalysing further research. Occupants' behaviour change is a difficult target to achieve. The emerging literature indicates that exploring the motivational drivers which entice occupants to save energy is of high relevance. Based on an extensive body of literature, occupants' motivation may be influenced by policies and regulations, occupants' level of education, socio-cultural factors in addition to house spaces and systems quality. Studying this topic in the context of UAE is a challenging task because of the harsh climatic conditions, the rapid population growth, economic growth, and the presence of numerous nationalities with their own cultural background. Hence, this paper reports on an exploratory qualitative pilot study that investigates the potential drivers affecting housing occupants' motivation to save energy in their houses in the UAE. Through semi-structured interviews, in-depth data about occupants' behaviour is collected. The results of this field exploration are then validated against the themes of existing specialized literature with an emphasis in setting up a group of drivers specific to the UAE context. The selected participants for this pilot study are housing occupants living in the city of Al Ain in the UAE, from different age groups, and have different educational backgrounds and income levels. The main results indicate that the drivers enticing housing occupants to save energy differ among local and expat occupants mainly because of the status of house ownership, house size and income level. Findings were discernible and validated the influence of factors extracted from literature with significantly potential impacts in the local context. Understanding building occupants' behaviour, awareness, and motivation is expected to be a critical factor that feeds into the development of efficient energy-saving strategies, policies, financial scenarios, and incentives as well as effective marketing strategies.

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CONSTRUCTION SUSTAINABILITY IMPROVEMENT THROUGH USING RECYCLED AGGREGATES IN CONCRETE PRODUCTION

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ABSTRACT

Due to the energy consumption caused by the construction industry, the public is paying more and more attention to the sustainability of the buildings. With the advancement of research on recycled aggregates, it has become possible to replace natural aggregates with recycled aggregates, and to achieve a reduction in energy consumption of materials during construction. The purpose of this paper is to quantitatively compare the emergy consumption of natural aggregate concrete (NAC) and recycled aggregate concrete (RAC). To do so, the emergy analysis method is adopted. Using this technique, it can effectively analyze different forms of energy and substance. The main analysis object is the direct and indirect emergy consumption of the stages in concrete production. Therefore, for indirect energy, consumption of production machinery and transportation vehicle also need to be considered. Finally, the emergy values required to produce the two concrete types are compared to analyze whether the RAC can reduce emergy consumption.

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SYSTEMS APPROACH TO ANALYSIS OF DESTRUCTION OF CEMENT COMPOSITES

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ABSTRACT

A new approach to the creation of composite materials using system analysis methods is proposed. A composite is considered as a set of elements connected by relations generating an integrative quality. When studying the properties of materials, synergetic, informational and homeostatic approaches are implemented. It is noted that when the integrative parameters of the system approach the maximum permissible, a systemic crisis occurs: the system enters the bifurcation zone. The system attributes and methods for selecting elements and subsystems are determined taking into account the paradoxes of integrity and hierarchy; their implementation is indicated in the development of radiation-protective composite materials. Issues of paradigm shift in the development of composite materials are touched upon. The new paradigm does not include the old one. It is stressed that in a paradigm shift there is no continuity of theories; Involves the formation of another system of views based on fundamentally new basic models and the change of the principle of management of initial structure formation. On identification, the principle of simulating a complex system is used (it was represented by a finite set of models that reflect a certain facet of its essence) and purposefulness (matching a complex system with many private criteria and specially developed global criteria that describe its existence as a whole). An example of the synthesis of composites based on the identification of kinetic processes of formation of their physical and mechanical characteristics is indicated. Some aspects of evaluating the durability of materials are considered; the destruction of the system is interpreted as a catastrophe associated with a violation of homeostasis. It is assumed that structural elements are formed from elementary particles, which, under the influence of external factors, are combined into molecules, clusters, globules and fibrils; associative clusters and more complex ordered packing of structural elements appear. The approaches of Benoit Mandelbrot are used, a quantum-mechanical description of the process of destruction of a solid body: a solid body is represented as a set of elementary oscillators; energy is released and absorbed by elementary portions - quanta; destruction of one structural element does not lead to destruction of the entire system; destruction is considered as a process proceeding at scale levels. An illustration is given of a systematic approach to modeling a cement composite as a complex scale-invariant system with the indication of particular models.

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FROM THE EXPERIENCE OF DESIGNING BUILDING MATERIALS

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ABSTRACT

The evolution of views on the development of composite materials is analysed from the point of view of paradigm shift based on basic models of a continuous self-developing environment towards paradigms based on models of a structured self-developing environment based on ideas and methods of a systematic approach and synergetics. A system approach can reduce or even eliminate the uncertainty inherent in the problem being solved; to reconstruct it in models that meet the objectives of the study; identify objects, properties and relationships of the investigated system, taking into account the mutual influence of the external environment. It is shown that the structural organization of the material determines the structural design of the product or structure and largely determines the functional properties of the entire system. Composite materials are considered as large complex systems formed on a modular principle: integrative properties are approximately determined on the basis of autonomous studies of separate subsystems. Separate subsystems are supposed to have a certain degree of autonomy; the introduction of custom reference models with the simultaneous decentralization of modules by inputs is possible. It is shown that the conditions for transferring the results of autonomous studies to the system as a whole are determined by the completeness of understanding the processes of formation of the structure and properties of the system. When developing composites, the PATTERN method and the SATURN technology are used to determine the criteria for assessing the relative importance, mutual utility, state and timing of research and development, maintaining a reasonable balance between the internal logic of science and its practical significance. Partial criteria and formalization of the generalized quality criterion of building material are analyzed. As an illustration, the definition of flocculation conditions in a disperse system is given on the basis of its representation as a system of particles moving under the action of gravitational and pair interaction forces, interaction with boundaries and a dispersion medium. It is shown that the uniformity of the steady-state configuration and the sedimentation stability of the polydisperse system are mainly determined by the volumetric degree of filling. Given the complexity of the composite as an object of study (multidimensionality, multiconnectedness, incompleteness of diagnostic information), diagnostic interpretation of the analyzed factors, the probabilistic nature of diagnostic information the necessity of using methods of both specific and abstract logical cognition is shown (each new logical stage continues the previous one and serves as the initial prerequisite for the previous one).

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THE INFLUENCE OF GREEN SPACES ON OUTDOOR THERMAL COMFORT IN A HOT ARID ENVIERONMENT: THE CASE OF AL SHARQ CITY

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ABSTRACT

With the new approach toward urban growth and creating new Settlements toward east arid region in Jordan. Al-Sharq city known to be one of the first urban growth as a new expansion for Zarqa city to accommodate the rising population. However, under such challenging climate, the potential degradation of the outdoor thermal environment can be one of the main problems affecting inhabitants. This research interested in studying the effects of green spaces on microclimate parameters and human thermal comfort by focusing on one of the new designed neighbourhoods in Al-Sharq city as a hot semi-arid study area. The study is approached in a quantitative method through experiment by using (ENVI-met) simulation software. for thermal analysis, three main scenarios of different green coverage ratio, quantity and structure of vegetation (trees grass, shrub and tree) in the study area were examined in order to investigate green coverage contribution in reducing the temperature parameters and PMV (predict mean vote). The analysis focus on understanding how creating green spaces in Al-Sharq city can reduce the urban heat of the neighbourhood. The research illustrates the importance of implementing a bioclimatic design in public open spaces, which can lead to more sustainable cities, the results indicated the great impact of green spaces on improving the outdoor quality and thermal comfort by enhancing the microclimatic situations. This could be generalized to Zarqa city and most of the east-southern areas where the climatic conditions characteristics are very similar to Al-Sharq City

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THE ROLE OF URBAN INFORMATICS IN MONITORING THE PHYSICAL DETERIORATION OF THE URBAN ENVIRONMENT

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ABSTRACT

The twenty-first century is witnessing rapid growth population in urban areas; this growth needs intelligent urban planning and management. The field of urban informatics is one of the new and important specialties to organize and analyze the urban system at all levels and fields. ICT works with interactive community participation to guide and manage the urban environment to serve, provide the residents with safety and security. The paper presents a new vision in terms of employing the field of urban informatics in mapping and monitoring the urban deterioration of the built environment in general and buildings in particular. The urban informatics system is still taking its first steps to manage and serve the city's facilities (transportation, communication, air pollution, etc.). The built environment and the deterioration through time and other factors are still far from this area. The aim of this paper is to identify the urban information field, the situations and types of urban deterioration and move to capturing urban deterioration indicators (main and secondary), which can be measured in urban informatics. This paper recommends the adoption of such a mechanism in managing and controlling the deterioration that contributes to reduction of material and human losses, saving time and money away from traditional methods, and the possibility of employing them in times of crisis and disasters in the urban environment.

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TECTONIC PLATE PARAMETERS ESTIMATED IN THE INTERNATIONAL TERRESTRIAL REFERENCE FRAME ITRF2008 BASED ON VLBI STATIONS

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ABSTRACT

Modern space measurement techniques like SLR, DORIS, VLBI and GNSS are used to study of the tectonic plates. The determination of plate motion parameters (Φ, Λ, ω) from various geodetic measurements is outlined. The paper regards an accuracy analysis of the of determined the Φ, Λ, ω parameters which describe motions of the tectonic plates using Very Long Base Interferometry (VLBI) technique. The study's basis is the station positions' velocities of in the International Earth Rotation and Reference Systems Service (IERS), which has published a realization of the International Terrestrial Reference System - ITRF2008 for VLBI technique. This model is made subject to an analysis in juxtaposition with the APKIM2005 model. The six big plates, namely: EURASIAN, AFRICAN, AUSTRALIAN, NORTH AMERICAN, PACIFIC and ANTARCTIC were analyzed. In the calculations the sequential method was used. In the first stage, the motion parameters of the plate were determined on the basis of two stations located on each of the plates, then next stations were added one by one and the motion parameters of the plate were determined anew until stability and compatibility of the solution was obtained. The estimates were compared with the APKIM2005 model. From the comparison, compatibility within 2° was determined. The calculations were performed with the use of our own software.

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ACTVITY OF PURCHASE OF FLATS IN THE AREA OF PUBLIC URBAN PLANNING AND ARCHITECTURAL INTERVETION

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ABSTRACT

Urban space serves a variety of purposes, especially public purposes. The study of the literature suggests that the improvement of road infrastructure, the location of a new public transport network or the emergence of green areas in the city should increase the value of neighbouring properties. The municipal authorities' intervention in public space has a formal and legal dimension in the form of local spatial development plans. Since the planning arrangements are open, participants of the real estate market make their decisions rationally. Unfortunately, in practice, the implementation of public tasks in space affects neighbouring properties: their attractiveness and, as a result, market value. The article will analyze market effects on residential properties located close of new investments - public urban-architectural intervention. The research was conducted on the local market in Szczecin. In 2006-2019 changes in prices and activity of apartment buyers in the vicinity of new public investments were analyzed. For this purpose, both statistical tools and methods of visualization of the studied phenomena were used.

HISTORICAL CENTERS OF SMALL CITIES IN SLOVAKIA – PROBLEMS AND POTENTIALS OF CREATING LIVABLE PUBLIC SPACES

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ABSTRACT

Public spaces in the historic cores of cities need to adapt to changing requirements for their use, reflecting the current needs of their users. High-quality public spaces provide a safe, accessible, suitable and pleasant environment for various types of activities and meet the needs of residents - users. Based on their good functioning, cities are generally evaluated by their inhabitants as more or less attractive for life. Within the project "LIVA - The concept of livability in the context of small towns" we have examined public spaces in the historic city cores of selected small cities in Slovakia, to identify the problems and potentials of forming environmentally and people-friendly public spaces. The research shows, that today's architectural-urban forms of public spaces in the historical centers of small towns in Slovakia are burdened with many problems, the most serious of which are usually their unsatisfactory functional content, unsatisfactory organization of transit transport, the poor state of public greenery, or unsatisfactory conditions of the physical environment – pavements or equipment with urban furnishings. The public spaces reflect the overall problems of small towns, remoteness, lack of investments, departure of young people and aging of the population, resulting in a lack of basic infrastructure and underdeveloped amenities for providing public services. In many cases, the historical centers of small towns do not provide sufficient attractiveness for businesses and cultural and social facilities in the parterre of buildings, nor variability of functional use of the public space. On the other hand, public spaces in the centers of small cities show the potential to offer a better quality of the environment. The central zones, the amenities, and public services, green infrastructure or recreation and sports areas in small cities are usually accessible within walking distances, which supports pedestrian movement and reduces the use of cars. The historical cores of small towns in many cases successfully preserved their cultural heritage values, their historical identity, and their character.

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LOCATION PATTERNS OF SMALL SACRAL ARCHITECTURE IN RURAL LANDSCAPES – CASE STUDIES FROM EASTERN SLOVAKIA

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ABSTRACT

Specific locations of small objects of sacral architecture in the landscape represent both tangible and intangible values, which are the result of long-lasting ties between man – society and the landscape. The objects of small sacral architecture, small chapels, statues of saints, crucifixes, small belfries or other typological forms of small sacral objects, are located at specific places, important sites linked to the life of local inhabitants, on places with good visibility and accessibility, for example along roads, at crossroads, at borders of settlements, field boundaries, or elevated locations, determining compositional linkages in space. We have examined the location patterns of objects of small sacral architecture in rural landscapes of Eastern Slovakia, in selected cadastral areas of village settlements in the district Vranov nad Topľou, in the Prešov region. The results of the research show that most of the locations in the open landscape outside of the built-up area of settlements are the road-side locations along currently used roads or along the field roads and abandoned former roads which in the past connected the villages. Only a few are found on sites near springs of mineral water, or on elevated top-hill position. Within the built-up areas of settlements, the most of objects of small sacral architecture are located in the private fenced spaces of front gardens; only a few are located in public space. Many objects of small sacral architecture are abandoned, vanish from the rural landscape, deteriorate and fall into decay. The reinvention of their values and their valorization will help to preserve the character and traditional local identity of rural cultural landscapes.

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NEW "REVOLUTION" – GREEN SOLUTIONS IN URBAN DESIGN

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ABSTRACT

The urban environment is constantly changing, which results in the depreciation of its natural elements. Progressing urbanization means that a person ceases to perceive larger cities as an attractive place to live or relax, while the city becomes first and foremost a place of work or an economic center. The thing that may change the attitude of the inhabitants to the attractiveness of the environment is green infrastructure. Greenery in the city space plays biological, recreational and aesthetic functions. What is more, it is a habitat for animal life, increases biodiversity, improves air quality and reduces the effects of climate change. Certainly, the preservation of open spaces and greenery is justified, because of the numerous advantages. That is why innovative solutions are applied for the identification, assessment, and planning as well as management of greenery in cities. A relatively new concept, used by the authors during the research, which relates the design and management of green areas to the needs of a better life of inhabitants, is "green livability". Thus, ecological solutions appear in space based on balancing the expected economic effects in relation to the growing social and environmental needs. The revolution in planning is also increasingly associated with climate change and the migration of the population to a previously unknown scale. This paper presents selected design trends in Poland, Slovakia, and Lithuania, covering green solutions in small scale – including roof gardens, vertical vegetation, rain gardens, community and pocket gardens in cities. In the countries analyzed, there is increasing recognition of the need to change the way of thinking about planning, which results solely from economic or aesthetic needs, towards ecological planning with the participation of society.

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THE ROLE OF PERMEABLE PAVEMENTS AS A COMPONENT OF SUSTAINABLE URBAN PLANNING

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ABSTRACT

Managing stormwater runoff is one of the biggest challenges for urban planners and designers at present, which is caused due to rapid urbanisation. Stormwater management strategies have shifted in past decades, from simple flood control practices to onsite detention systems to collection, storage, treatment and reuse. Recent research work have revealed that Permeable Pavement Systems (PPS) provide multiple advantages such as reduced impervious factor that mitigates numerous negative impacts arising from urbanisation including increased flood risk, change in water balance, reduced evaporation, heat island effect, soil erosion, and standing water issues like odour and mosquito breeding. In addition, PPS can have positive impacts such as pollutant reduction and sediment control. However, the uptake of PPS as a stormwater best management practice is limited and relatively slow, due to lack of in-depth scientific understanding and limitations in its usefulness to some hydrogeological conditions. The focus of this paper is to reveal the environmental, hydraulic and structural benefits of permeable pavements as a component of sustainable urban planning and to illustrate the ability of modifying its structure for its application in the wider urban environment. This paper presents results and recommendations from laboratory experiments that were carried out to understand the influences of different conditions and materials used, on performances of permeable pavement systems, together with other published data.

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IMPLEMENTING INCLUSIVE DESIGN IN ARCHITECTURAL EDUCATION AND DESIGN PRACTICE

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ABSTRACT

The objective of the article is to present working methods in didactics and in design practice in the field involving the implementation of the concept of inclusive design. It obliges the students or participants to be involved in the design process in order to recognize the needs and preferences of different user groups. Additionally, since the development of ICT technology allows to increase the availability of space, the expansion of the range of tools in the design process requires the expansion of the knowledge of future designers. Therefore, the authors pose questions: how to educate future architects in this context? what tools and technologies to offer to local communities so that they can actively participate in such design processes? The subject of the analyses involves the implemented didactic projects regarding the solutions for the elderly and the disabled, both in facilities having the caring function and in public spaces. The effects of the completed didactic projects and project activities had a diverse character: from conceptual designs to the prototypes of small architecture elements. The basic assumption in the implemented projects is to adopt the formula of education through experience and the use of pre-project research. According to the state of the knowledge in this respect, the effectiveness of a design process for people with disabilities requires direct contact with users, research on the functioning of space and how it is experienced. The article presents the tools and techniques of work applied in the method ‘education trough experience’: focus meetings, individual interviews, observational studies, role playing, experimenting, testing the solutions.

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INVESTIGATING THE PRESENCE OF NATIONAL CAPITALS AS RANKED GLOBAL CITIES

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ABSTRACT

Urban competitiveness has become an undeniable reality of our world. Cities around the world create strategies and development plans to enhance their competitiveness and reach worldwide fame and attraction for different segments. This competition has widened to reach different aspects of social, economic, physical and environmental aspects of cities. Along the years different methodologies and criteria were proposed to create a systematic assessment of cities worldwide and rank their competitiveness. The results of such assessments are published in indices; e.g. Global Power City Index, Global Power City Index, etc. Each index has its own set of indicators that cover different aspects of cities; e.g. economy, environment, accessibility. Sample cities from all over the world are graded and ranked accordingly. The cities that achieve top ranking in those global assessment lists are called global cities. This paper aims to investigate if being a national capital can be related to becoming a global city. This is through the study of two global city rankings; Global Power City Index (GPCI) and Global Cities Index (GCI), for three successive years; 2016, 2017, 2018. It is shown that around 50% of ranked cities are national capitals across both ranking system and over the three years covered in this research. European national capitals reach 66% of those featured, followed by Asian capitals with around 33%. The presence of capital cities is also evident in within each indicator of the Global Power City Index (GPCI). In general, evident presence can be linked to national capitals especially those of Europe and Asia.

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NEW CAPITAL CITIES: A TIMELESS MEGA-PROJECT OF INTERCONTINENTAL PRESENCE

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ABSTRACT

Mega-projects are projects that require immense resources to create. This includes all different aspects; funding, labour, etc. These projects are meant to create a massive effect on the city or national level through providing job opportunities during construction as well as after completion. Moreover, these projects usually have an intercontinental effect that echoes worldwide and may affect other projects, cities or even countries either positively or negatively. Mega-projects are not restricted to certain project typologies; in fact, they range from Olympic cities to water dams and channels. We can even claim that the first mega-project was the great pyramid. Mega-projects can also be linked to mega-events thus achieving more international acknowledgement. This paper discusses the creation of new capital cities as a mega-project typology. It analyzes different examples worldwide where a new capital city was created to act as a mega-project that would create ripples of economic and urban development through a country. The capitals of Brazil, Kazakhstan and Egypt are studied to display the authors view of them as mega-projects that have the same function but span across time, space and cultures.

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ECOSYSTEM SERVICES ASSESSMENT IN LANDSCAPE URBAN PLANNING: A CASE STUDY OF AN URBAN DEVELOPMENT PLAN

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ABSTRACT

The growth of urban populations leads cities, and their suburbs, to spread, expand, and replace agricultural and natural lands. Indeed, urbanization brings to land-use change, altering the relationship between human societies and environmental resources with loss of important natural and rural ecosystem goods and services. In urban areas, the elements that provide ecosystem services are defined as 'green infrastructure'. The Strategic Environmental Assessment (SEA) is an appraisal process introduced in the EU regulation with Directive 2001/42/CE used to assess the effect of the plans and strategies of the land-use change on human well-being. An important part of SEA processes is represented by the analysis of different scenarios of the urban development with mitigation measures: actions must be implemented in order to avoid and reduce the expected adverse environmental impacts. Currently, among these measures, few or none takes into consideration the ecosystem services assessing and therefore, the concept of ecosystem services in urban planning is purely conceptual than practical. As above discussed, starting from a case study in the Gallipoli municipality, South Italy, we propose a methodological analysis to evaluate ecosystem services in a SEA process. We have analysed different urban scenarios in synergy with the mitigation measures proposed. The results show the variation of ecosystem services passing from the current agricultural land use to urban development forecast and the increase of ecosystem services if we apply specific mitigation actions to the original urban plan. Authors believe that a correct and profitable assessment of ecosystem services in SEA strategy allows passing from an approach mainly oriented towards a conservation purpose, to an approach concerned also to the improvement of ecosystem services within the territory transformation processes. In accordance with the spontaneous vegetation and the typical crops of the area, the mitigation measures developed are mainly focalized on green infrastructures which can be useful to increase the ecological functions reducing ecological footprint and increasing carry capacity of an urban system.

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A NEW PERSPECTIVE OF SOLAR RENEWABLE ENERGY FOR SOUTH ITALY USING THE FLOATING PHOTOVOLTAIC SYSTEM

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ABSTRACT

In recent years, renewable energy sources use has been growing rapidly worldwide. in this context, solar energy is considered one of the most valid alternative energies thanks to its applicability worldwide. Furthermore, solar energy is a continuous resource always available compared to other energy alternatives. The main technologies currently applied for the use of solar energy are photovoltaic systems. Recently, the installation of the photovoltaic systems was carried out on agricultural land creating a paradox because it caused a conversion of land use and transformations in the agricultural landscape with negative impacts on human well-being. Currently, a valid alternative for the exploitation of solar energy using photovoltaic systems is represented by floating photovoltaic systems. This type of system involves the positioning of photovoltaic systems on the free surface of the water of natural lakes or artificial water basins reducing the exploitation of the agricultural land resource. In particular, the photovoltaic floating system consists of a floating system, mooring system, photovoltaic system and cables that run in the water. Floating system open-up new opportunities and scenarios to increase the production of solar energy, especially in countries with a high population density and where the natural and anthropic components are strongly interconnected and mutually conditioned. The purpose of this report is to describe briefly the design hypothesis of a floating photovoltaic system of power between 90-100 MW, to be positioned on the free water surface of the Esaro Lake in the Municipality of Roggiano Gravina (CS). The socio-economic and environmental benefits of these types of plants will be examined on the basis of other plants already developed in the world. In addition, project indications will be provided with estimates of expected production and economic benefits. From the analysis, it emerges that this type of Floating PV can allow to avoid soil consumption and increase energy productivity considering the construction of photovoltaic systems on the ground with the same power. Therefore, the floating photovoltaic systems better meet the main objectives of sustainable development in the economic, social and ecological sphere compared to traditional ground PV plants.

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CONVECTIVE HEAT TRANSFER INSIDE PLANAR SOLAR COLLECTORS

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ABSTRACT

A solar collector is a device that collects solar radiation from the Sun and transfers it to a heat carrying medium. There are more types of solar collectors. One of them is the so-called flat plate solar collector that consists of a thermally isolated solid frame whose one large planar side is glazed to enable the solar radiation to enter the inner space (cavity) of the collector. On the bottom of the collector, a highly absorptive layer along with metallic pipes is placed. The layer (absorber) and the pipes absorb the energy from the Sun. The fluid medium moving inside the pipes carries the absorbed energy for further utilization. There is a permanent interest in improving the construction and thermal properties of the planar solar collectors. Minimizing the heat losses of the collectors and improving their energy gains are some of the relevant research goals. Convective heat transfer inside the cavity of planar collectors has been determined theoretically and numerically in this conference contribution. The convective heat transfers represent essential part of heat losses that lower the effectiveness of planar solar collectors. In this conference contribution the convective heat losses have been compared with the standard density of heat flow coming from the Sun and the corresponding energy ratio has been determined. It is shown that this ratio amounts almost 10 %. A typical summer environment has been supposed with a standard sunshine reaching 1000 Wm^{-2}.

HEAT LOSSES OF WINDOW COMPACT SHUTTERS

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ABSTRACT

Window shutters are usually made of wood. They protect glazed windows at their external sides from mechanical damages and inconvenient weather conditions. In winter season, they also partially serve as simple thermal insulators. However, a simple plate-like shutter may provide the window with only insufficient thermal protection. Better thermal protection may be expected when the compact box shutters are used. If closed and attached to windows, these compact box shutters form closed cavities filled with air. The air inside a closed cavity is known to be a good thermal insulation. Yet, the compact shutters represent imperfect insulation systems since some portion of heat may be transferred by convection and radiation from the warm glazed side to the cold external side and through the external side into outdoor space. These transfers are unwanted heat losses. A question may be posed what values of thermal resistance may be attributed to the window compact shutters. This conference contribution attempts to answer such a question. A typical window compact shutter is described; its dimensions and basic thermal parameters are defined. The convection and radiation heat transfers are computed on the basis of physical relations and, finally, the resulted thermal resistance is derived. A discussion concerning the mutual competition of convective and radiative heat transfers inside closed cavities of window shutters is presented. Although the derived formula of thermal resistance is related to the specific kind of window shutters, yet, it may provide an instructive insight into the thermal properties of these systems.

STUDY ON THE CONSTRUCTION OF INFORMAL LEARNING SPACES (ILSS) ON UNIVERSITY CCAMPUSES IN CHINA

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ABSTRACT

The main research object of this paper is informal learning spaces (ILSs) on Chinese university campuses. Due to the traditional educational system, Chinese dominated pedagogy is examination-oriented and talent training, which restrict students' abilities of self-learning and group collaboration, so students lack reasonable and effective independent and cooperative learning opportunities and awareness. Additionally, because of the influence of national government will, most of Chinese university campuses construction process lack the consideration of the main users of them-students. They are hard to meet the students' rich daily lives, lacking the construction of ILSs. The students' learning and life on the campus are fixed on the three points of "classroom-dining hall-dormitory". Lacking the construction of spatial layers and atmosphere, public spaces on campuses are difficult to attract students to stay, to carry out various activities and to meet the diverse learning patterns of contemporary university students. According to the problems above, this paper puts forward the construction strategy of ILSs on university campuses by means of interviews and questionnaire. On the basis of this theory, this paper analyses the various environmental factors on the campuses based on the survey questionnaire, and further puts forward the conceptive ILSs unit model, which is suitable for outdoor and indoor spaces on campuses. Finally, according to the classification of external space and internal space, the six sorts of campus spaces which are square, landscape, pedestrian, architectural entrance, architectural transport and architectural atrium, are discussed respectively, and the construction strategies and theoretical models of ILSs which are suitable for these spaces are summarised. With the reforming of China's education, the pedagogy of higher education is changing gradually. The proportion of formal learning and informal learning will be balanced. Thus, the strategies and models this paper points out will help to advance this trend and the development of informal learning in Chinese higher educational institutions. However, the limitation is obvious, lacking of real cases to verify the validity of the results, so they are still theoretical.

MODELING OF PRIVALUL TINOASA CHANNEL, IN IRRIGATION SYSTEM BORCEA 2 - DANUBE ROMANIA

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ABSTRACT

Study case is situated in Calarasi County, Romania, in nearest of Danube river. The sprinkler irrigation arrangement serves the area of 1018.67 ha, useful, net irrigated area. The sprinkler irrigation arrangement comprises fixed irrigation equipment consisting of 16 central irrigation pivots equipped with nozzle ramps for water spray, the pivots are supplied with water through a network of underground pipes, pumping station, water source the Privalul Tinoasa channel fed from the Danube River The Privalul Tinoasa channel will be cleared and re-profiled, having the role of water accumulation basin that will ensure the aspiration for the designed pumping station. Numerical modelling was performed using the program MIKE11. MIKE 11 is a user-friendly, fully dynamic, one-dimensional modelling tool for the detailed analysis, design, management and operation of both simple and complex river and channel systems. With its exceptional flexibility, speed and user-friendly environment, MIKE 11 provides a complete and effective design environment for engineering, water resources, water quality management and planning applications. The Hydrodynamic (HD) module is the nucleus of the MIKE 11 modelling system and forms the basis for most modules including Flood Forecasting, Advection-Dispersion, Water Quality and Non-cohesive sediment transport modules. The MIKE 11 HD module solves the vertically integrated equations for the conservation of mass and momentum, i.e. the Saint-Venant equations. The input data are: area plan with location of cross sections; cross sections topographical data and roughness of river bed; flood discharge hydrograph. Advanced computational modules are included for description of flow over hydraulic structures, including possibilities to describe structure operation.

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HEALTH-PROMOTING PLACES: RAIN GARDENS AND SUSTAINABLE WATER MANAGEMENT

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ABSTRACT

What are the qualities of health-promoting places? Is the presence of water necessary? The rain gardens which are collecting the stormwater could become the dynamic elements of the urban landscape. Apart from ecological services they can also benefit human health. This paper presents two examples of sustainable water management in Gdynia, Poland and one in Asnièrs, close to Paris in France. The rain garden constructed near InfoBox in Gdynia is a good example of the implementation of the city environmental policy on a small scale. This rain garden in a planter helped to create an inviting place. Another rain garden developed as a part of the urban regeneration strategy in the northern part of Gdynia proves that such investment could make a huge difference in the quality of local living. A previously neglected space became lively and inviting. The Rue Soeur Valerie in Asnièrs is a good example of how to create a friendly, walkable street using a sustainable water drainage system. This paper discusses the positive health impact of water management.

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HEALTH-PROMOTING PLACES: ARCHITECTURAL VARIETY

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ABSTRACT

There are pristine landscapes that are believed to stimulate the processes of healing. The purpose of this research is to find the features which can be installed into the urban environment to promote health and well-being. Many researchers stipulate that one of such qualities is a certain level of complexity and details. Dull, repetitious environments are linked to modern diseases. One of the important health-promoting features seems to be the architectural variety. In this paper selected aspects of architecture and health-promotion are discussed using examples from ecological neighborhoods in Europe.

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THE EFFECT OF ARTIFICIAL INTELLIGENCE (AI) ON NEW PRODUCT DEVELOPMENT (NPD): A FUTURE SCENARIO

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ABSTRACT

During the past decade, there has been a growing interest and considerable attention to artificial intelligence (AI) as a discipline by scholars and Al products and applications by practitioners in many sectors such as manufacturing, consumer products, finance, management and medicine. Many companies, including Amazon, Apple, Google, Microsoft, Samsung, have developed digital assistants using Al technology, which was used to facilitate people's daily activities in many areas. The aim of this study is to understand the role of artificial intelligence in new product development and to create a future scenario for this role. It tries to establish a future scenario based on the results that arise by collecting data from Generation Z about the impact of digital assistants, their usability, and how they would be designed as a product. As Generation Z is expected to be the largest consumer group by 2030, those digital children will help us to improve the digital world. In the context of the concept of new product development (NPD), which is the process of using resources and capabilities of an organization to create a new or improved product, this study focuses on what kind of scenario the users expect in the future, while addressing the impact of artificial intelligence on developing products. To collect the required data for the scenario, the survey firstly gives information about Alexa, Siri and Google digital assistants. Secondly, the survey will ask whether people know those products, and whether/ how often they use them. Then, thirdly, the question of how and in what ways the products would have been changed and/or improved will lead the way for the idea of new product scenario. After the data collected from 101 Generation Z users born between 2000 and 2009 via telephone or face-to-face surveys and analysed, a future scenario is developed. It is concluded that the participants want to be friends with the product they were using, to turn those products into physical assistants, to have a product that could be interacted as a physical robot or as a hologram, and to help them with physical activities (e.g. guiding to choose clothes, cleaning the house). The future scenario developed has been in the direction of supporting the survey results. The robot digital assistant is offered not only as an assistant but also as a friend, confidant. It is designed to facilitate the user's almost basic tasks as well as to respond to specific commands, and to appear as an assistant that users can access as a hologram from everywhere (e.g. while walking in the street, driving a car). As a limitation of this article, there are no doubt various possibilities and scenarios to be addressed for the future but this study only focus one possibility. Future studies may discuss more on this issue of future scenarios and how artificial intelligence will be integrated into product design.

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COMPARISON OF GEOMETRIC AND EXPERIMENTAL MODELS FOR THE ASSESSMENT OF THE RUNOUT AND DEPOSITION HEIGHT OF A DEBRIS FLOW IN COHESIVE SOILS

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ABSTRACT

The objective of this paper is to validate if one dimensional runout and height deposition prediction models are suitable for large-scale landslides (debris flows in cohesive soils) based on a small-laboratory-scale test, because landslides are unpredictable hazards and involve a great quantity of triggering variables which in most cases determine the mass movement behaviour during its trajectory. Due to many of these variables cannot be obtained from theoretical methods, since they are natural to the soil composition, and to the high rheological variation this soil masses suffer during all the deposition process, it is necessary finding adaptable tools and assessment methods that require simple information, such as terrain slope and soil water content. This becomes one of the main reasons for this type researches. A laboratory experiment was designed which ground slope and soil water content were involved. Several laboratory-scale trials were performed, analysed, compared and validated with one-dimensional runout prediction models as Fahrböschung model and modified gradient model, where its suitability is discussed. Regarding models that involve more advanced tools for the analysis of a landslide, like the modified gradient model, it can be affirmed that its results are reliable and clearly reflect the sliding mass behaviour in a real scenario, without mentioning the advantages using a tool like geographic information system in cases where an exhaustive analysis of all the variables that influence a landslide is needed. In conclusion, a geometric model as the modified gradient model can be used for important analysis that require runout and height deposition estimations for the calculation of a structure physical vulnerability subject to the lateral forces of a sliding soil mass. This is an important parameter to cities planning.

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DEALING WITH INFORMAL AREAS BETWEEN CLEARANCE AND UPGRADING IN CITIES OF THE GLOBAL SOUTH: COMPARATIVE ANALYSIS OF CASE STUDIES IN MEDELLIN (COLOMBIA), CAIRO (EGYPT) AND MECCA (SAUDI ARABIA)

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ABSTRACT

The issue of informal areas has been on the agendas of many countries across the globe, especially countries of the global South, for more than 50 years. Several approaches have been applied to deal with slums in varying ways. From an aggressive intervention approach of demolishing and clearance of informal areas, to mere socially inclusive approaches through the upgrading of informal areas, Among the two, exists a tangible spectrum of these approaches, that are affected by several contextual aspects which influence the actual intervention to be applied. This paper attempts to examine three cases of dealing with slums in the global South, where each case is unique in terms of its context and settings. The first case deals with the informal areas in the city of Medellin – Colombia. They evolved as a direct outcome of violence and conflict in the country and later hosted the cartel activities for long time. The second case is the former informal area of Maspero triangle in Cairo- Egypt. This area has a unique location as it falls very close to downtown Cairo and only few meters away from the Nile. The strategic location of this area affected the decisions that were made to deal with the area and ended with its total clearance rather than its socio-economic upgrading. Finally, the third case focuses on the informal areas in the holy city of Mecca in Saudi Arabia. A city that had witnessed massive urban transformations over the last 40 years. With the expansion of the Holy Mosque perimeter in the inner core of the city and with the tradition of demolishing entire districts surrounding the Holy Mosque over the years, the slum areas over the hilly terrain in Mecca became closer and closer to the holy site. Accordingly, with the need for land for the Holy Mosque expansion as well as the land needed for further accommodation to meet the demands of the increasing numbers of pilgrims; drastic measures are applied to deal with the informal areas in the inner core of Mecca. This is shown through studying the case of AL Kidwa district in Mecca that is located about 1.5 kilometers away from the Holy Mosque.

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BIOCONCRETE: NEXT GENERATION OF CONCRETE

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ABSTRACT

In EU countries and worldly, concrete is the most widely used building material in the world because of its strength and durability, among its other benefits. Concrete also has a certain amount of limitations. They mainly include crack formation over a period of time and further by extension, an adverse effect in its strength, permeability and durability. Cracks may not be visible to the eye but can be accounted for initiation in the deterioration of reinforcements. In most cases it is not necessary nor economical to avoid cracks. In these cases, crack widths are primarily limited to water tightness, durability, or aesthetic reasons. There are many applications of concrete in which watertightness plays an important role in the performance of the structure (such as tanks for water, biogas station etc.). The term “watertightness” is used in reference to the ability of concrete to withstand hydrostatic pressure. Concrete must be impermeable for nearly every industrial and residential below-ground application. Such structures have to be waterproof or watertight to prevent damage due to the ingress and egress of water. An integral watertight concrete structure (WCS) that renders the concrete watertight can be an effective alternative. The latter method is controlled by the presence of cracks resulting from either direct loading or restrained due to deformations (indirect loading). Bacterial based self-healing (bio-concrete) is a promising solution for sustainable concrete maintenance. The use of microorganisms in concrete technology is quite a new field of civil engineering. In water tight concrete structures, which reinforcement is designed to control cracks width, the quantity of this reinforcement is higher than the required static reinforcement. Adding of bacteria to concrete could reduce the reinforcement quantity in concrete designed to crack width control. Other benefits of bio concrete are higher strength and durability of concrete. Possible field of bio concrete applications in the future are water purifier tank, floor lining of water purifier in homes or industries, can be used for purifying water. Use of bio concrete technology in concrete structure design could help build more sustainable. More researches are needed to produce good quality of organic concrete in association with the microbe.

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3D NONLINEAR ANALYSIS OF PRECAST PRESTRESSED HOLLOW CORE SLAB

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ABSTRACT

In the last decades, precast prestressed hollow core slabs have gradually increased their market presence in many countries due to their excellent structural performance at room temperature. Longitudinal voids through the one way prestressed (or reinforced) concrete slabs are very important for reducing the self-weight of the structure. Although the hollow core precast concrete is larger than on-site placement concrete, when viewing the entire construction of the building as a whole, the use of hollow core precast concrete contributes more to the reduction of energy consumption than half-precast concrete or on-site placement concrete. Precast prestressed hollow core slabs are among to the more advanced structural floor systems for all kinds of buildings. The advantages of these structures are not only in the production technology, which is nearly fully automated, but also in others features such as optimum used of materials, slenderness of construction, environmental friendliness etc. Compared to common concrete floors, hollow core floors can save 50% concrete and 30% steel for the same performance. The use of hollow core precast concrete slab reduces the amounts of generated harmful substances and waste. In addition, the use of precast concrete members can contribute to the mitigation of energy consumption, and noise and vibration generated at the construction site resulting from reduction of transportation frequency. This paper presents results from nonlinear numerical analysis of precast prestressed concrete hollow core slabs with dimensions 13,9m length, 1,19m width and 300mm thickness. Material properties obtained from testing of concrete (concrete cube strength) and 7 wire pre-stressing strands (yield strength) were used as input data for nonlinear simulation. The ATENA 3D FEM software was used for nonlinear numerical modelling. The results from numerical are compared with data from experimental investigation of a total 7 hollow core slabs.

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SHAPING A CULTURAL SPACE OF A CITY ON THE EXAMPLE OF HISTORY OF THE IV LOCK THEATRE IN BYDGOSZCZ

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ABSTRACT

The search for ways to develop a separate identity of a city has always involved providing a significant character to urban spaces. Nowadays, in the process of accelerated change and excessive growth, cities lose their individual character and become similar to each other. The elements that create an image of a city are public spaces and cultural and natural heritage. The indicated features of spatial forms and the manifestations of life associated with them allow the recognition of the sequence of city areas and identification with specific places. According to Kevin Lynch, elements of urban composition create cultural identity and symbols of collective memory. The aim of the article is to take up current research issues in the field of urban studies, on the example of history and creation of surroundings of the IV Lock Theatre in Bydgoszcz, in the area of the Old Canal. Assuming that this space creates identity of the place, an analysis was made concerning the architectural and compositional connections of public spaces with greenery in the theatre's surroundings. In the last 200 years, until the outbreak of World War II in Poland, the process of individualizing this area was subject to conscious, comprehensive planning activities, which affected the image of the entire city. In the area surrounding the IV Lock Theater, which is the main object of research studies, numerous entertainment venues were created, including restaurants and garden cafes, playgrounds for children and adults, and sports fields. Process of degradation of this part of quays began after World War II, and its almost complete destruction took place after the decision to backfill a fragment of the Old Canal in the 1970s. Demolitions included historic locks and a stone bridge of Władysław IV, connecting the Trinity street with Grunwaldzka street, and boulevard layout was broken by removing over 100 historic trees. Currently, attempts to restore the significance and importance of this space are closely related to an initiative to reactivate the IV Lock Theatre in Bydgoszcz. Analyzing the architectural and compositional connections of public spaces around the theater in the context of this historical object as well as the revitalized space will show the directions of further shaping the cultural space of this part of Bydgoszcz, which is important for restoring an image of a city by the water.

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THE ROLE OF GREEN PUBLIC SPACES OF THE OLD CANAL IN DOWNTOWN BYDGOSZCZ AND ITS IMPACT ON THE CITY'S CULTURAL LANDSCAPE IN 1773 – 1971

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ABSTRACT

One of the important roles of greenery in public spaces of cities is to shape and complement, on a par with architectural objects, the image of the city and building its identity. As professor Piotr Lorens stated identity is the existence of a physical reflection of the nature of history and the traditions of the city and its inhabitants or urban community, distinguishing them from other places and communities. Through conscious, rational and professional activities creating urban tissue, spatial order is achieved, which forms the basis of the identity of cities and determines their quality. Each city, developing its own social and cultural image, resulting from both history and tradition, as well as changes taking place, should cultivate its separate image. The greenery also decides about the identity of the urban space as the aforementioned factors. They are important in individualising and shaping his landscape. Harmoniously composed and decorated green areas also decide about creating the character of the city and urban spaces. Competition for urban areas and for economic spheres of influence, underestimation of the role of spatial planning, marketization of all activities and spatial chaos as a result - these are factors that have pushed into the background the priority of conscious urban landscape shaping, including greenery in the city center of Bydgoszcz. The purpose of this study is to analyze the role of green public spaces with against the background of the history of the creation and significance of the Old Canal along with the regard to the history and significance of the Old Canal along with the process of individualizing the cultural image of Bydgoszcz over the last 200 years. Used in the past, urban composition solutions can be a reference for new studies and planning activities in this area of the city.

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NUMERICAL INVESTIGATION OF ATYPICAL BUILDING IN TURBULENT WIND FLOW

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ABSTRACT

The article deals with numerical investigation of wind flow and wind pressure distribution on atypical building and influence of wind direction on external wind pressure coefficients. The wind load calculation is based on the specific wind situation in the given area or specific location where the structure is built. The following factors affect the resulting wind load values: site-specific wind conditions, roughness of the terrain, aerodynamic characteristics of the shape of the object. Analysis and computer simulation have been solved due to the collapse of the bottom of overhanging parts that have been damaged by strong wind. In the first phase, the selected building and its surroundings was investigated using CFD simulation. We chose the finite volume method implemented into program ANSYS Fluent, which offers several turbulence models. RANS k-ε model was used for our solution For near-wall treatment, the standard wall functions by Launder and Spalding were used. Additional inputs for k-ε model are equations for turbulent kinetic energy k, and turbulence dissipation rate ε. Size of the computational domain was used according to recommended value of block ratio 3%. The wind pressures obtained at the bottom of the ceiling were comparable with the Eurocode values and were not significantly higher. In the second phase, we tested the pressure distribution at the bottom of the suspended ceiling, assuming that the wind could enter the interspace of the ceiling. In the north wind direction, the streets around the building accelerate the wind flow, the wind runs down on the building's façade and through the openings gets in the bottom of the suspended ceiling and tears off the soffit because the resulting pressures are significantly higher than the Eurocode values for roofs. These specific problems in EN 1991-1-4 cannot be found and therefore atypical objects need to be analyzed thoroughly either by numerical simulation of the problem or by experimental measurements in wind tunnels. We have compared the results of the numerical simulations and EN 1991-1-4 values for roofs.

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SHORT REVIEW ON SOIL-STRUCTURE IMPLEMENTATION IN BASE ISOLATED STRUCTURES

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ABSTRACT

Structural control is a subject that has been gaining interest for almost the last forty years. However, soil-structure interaction (SSI) implementation in control studies is relatively new, but it has attracted many researchers' attention for both theoretical and experimental research. Besides structural control SSI is an important topic which should be studied more. SSI was not considered during the design stages of different structures, which led in the unexpected results after the earthquakes. In this paper the studies considering SSI in base isolated structures are reviewed. From the structural and earthquake engineering point of view, many studies considered near or far fault earthquakes and used scaled mathematical models for numerical examples. Most of the research is based on existing results of the earthquakes and real building damages. On the other hand, there are some researchers who designed scaled structures to perform experimental works under artificial earthquake excitation in order to investigate the seismic performance of the structures. This study aims to demonstrate the conclusion and numerical examples obtained from base isolation studies considering SSI. With regards to the short review, it can be mentioned that SSI affects the structure and the behaviour of the base isolation. Considering SSI in base isolation research might increase the authenticity of the corresponding study and might result in more realistic results than fixed base structural analysis.

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PERCEPTION OF STRUCTURE-BORNE SOUND IN BUILDINGS IN CONTEXT OF VIBRATION COMFORT OF HUMAN IN THE BUILDINGS

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ABSTRACT

Structure-borne noise is an extremely complex issue considering comfort of room users. The purpose of this work is to focus on the impact of vibration on humans in building together with the structure-borne noise generated by vibrating partitions of the room. Radiation of noise from vibrating partitions creates structure-borne noise, which is an additional stimulus, in addition to mechanical vibration of the floor. This means it may result in reduced comfort. Based on the review of current knowledge, it can be concluded that the perception of two simultaneous stimuli causes more annoyance than considering stimuli separately. Considering the fact that vibrations and structure-borne noise, due to the mechanics of the phenomenon, usually occur together, it is necessary to analyse the existing comfort assessment criteria. In addition, validity of given existing criteria has to be verified in the light of the phenomenon of structure-borne noise. This task was carried out using models with different approaches to the phenomenon. Basing on the given values of accelerations or velocities of floor two models were created. First model consists of single vibrating plate, with known vibration velocity. Vibrating plate radiates sound inside the modelled room. Sound pressure level was estimated using simple theoretical formulas present in literature. Second model is prepared as 3D FEM model with shell elements surrounding the room. Air was modelled inside room with 3D elements. Sound pressure level was calculated from simulations. The work aimed at determining the legitimacy of the assumption in the Polish standard PN-B-02171: 2017 of mechanical vibration perception threshold and the admissible values determining mechanical vibrations.

STRUCTURAL ANALYSIS OF GRADAČAC CLOCK TOWER: AIMING TOWARDS INTERVENTION IN PRESERVING AUTHENTICITY

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ABSTRACT

Old masonry towers, in all its variety – bell tower, city tower, clock tower, inhabited residential towers, and guard towers – could be found all around the world, representing typical urban centre feature, and in some cases, countryside panorama landmark. Statics analysis and calculation represents a first step towards engineering interventions on cultural and historical heritage buildings. Typical critical points in structural analysis of clock towers, and where damages are expected to be crucial and could lead to collapse, are in top parts of the building where oscillation amplitude reaches its maximal value. Effect on building structure is observed in relations of oscillation frequency and building's own frequency and energy, which could explain why minaret towers and high slim towers, in some cases, could withstand earthquakes better than extremely rigid buildings, where resonance, low quality materials and other factors could lead to vulnerability of building structure. This type of building is designed with simple, regular shape floor plan, or, in other words, symmetrical floor plan and uniformly distributed mass and height. The second statement provides that, depending on building materials and cross section dimensions, towers could be very heavy, which could lead to significant inertial forces during earthquake oscillations. If there's eccentricity of mass, horizontal loads could tip building over. Gradačac clock tower's load bearing structural walls are built with masonry stone blocks. Vertical loads are carried over slabs and wooden beams to walls, towards the foundations. Foundation structure consists of 80cm thick slab, positioned at -8.25m which sits on a well compacted soil layer. Vertical transportation between storeys are wooden staircases. Structural analysis calculation is based on a 3D model of a building, done using finite elements method (FEM) in calculation software Tower. Authenticity preservation requirements imply that interpretation and presentation must correlate with basic principles of authenticity in compliance to Nara document (ICOMOS, 1994), protecting cultural values both, from hazardous influences of intrusive infrastructure and visitors' pressure, and incorrect and inappropriate interpretation.

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GRADAČAC OLD CITY COMPLEX: CURRENT STATE EVALUATION

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ABSTRACT

Current state evaluation is very important phase in protection of historical heritage, which provides guidelines for project framework and decision making crucial for final goal of protecting Old City Gradačac complex. Old City Gradačac is consisted of several historical layers, starting with medieval fortification system, expanded in Ottoman period, when Ottomans added main buildings (residential tower, clock tower and mosque), extending all the way to Austro-Hungarian period where library and gymnasium were added. Complex follows natural terrain morphology, where today these green areas are used as main city park. Gradačac has two separate fortification zones, main area of around 33 000 m2, and accentuated part with tower of around 3 000 m2. Fortification (Old City) plan is approximately square, with sides of around 180 to 200 m, consisting of two main parts: Lower and Upper city. In North-West region, there's Upper city (fortification inside fortification, Husein-Captain Gradaščević's tower). City is accessed through three gates: North (main), South and West gate. Upper city with Husein-Captain Gradaščević's tower is positioned on topmost point in North side of fortification complex. It lies on terrace which encloses it in South and East side. On North side of Upper city there are outer perimeter walls constituent to whole complex. Preservation and valorisation of architectural heritage are increasingly important social and economic issues in many countries. Issues range from defining and choosing required safety level, to methodologies relevant for contracting reliable structural analyses and safety check-ups, to choosing design and installation of suitable materials, and intervention.

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BASES OF ELEMENTS OF MULTI-CRITERIA ANALYSIS OF QUALITY OF DESIGN DECISIONS

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ABSTRACT

Economic and mathematical models are focused on obtaining optimal solutions to particular problems in the field of transport construction (formation of organizational structures, provision of materials for construction, creation of specialized units, development of production standards, development of work schedules, etc.). None of the considered methods can claim universality in substantiating decisions, since the decision-making process itself has a complex hierarchical structure: part of the decisions is made “at the highest level”, the other part of decisions is transferred to the “lower” levels. No governing body is capable of making all decisions. Therefore, economic and mathematical models can also be recommended both in the field of macroeconomics (to the highest level of transport construction management) and in the field of microeconomics (construction organizations, enterprises, production units). In this regard, it is important to correctly assess the “niche” of the construction management system, in which one or another model should have a place. Obviously, most of them can be recommended to organizations and enterprises of the “middle” and “lower” levels in which the technological processes of the construction of transport facilities are implemented, although their application at the highest level is also possible (for example, cluster analysis models, linear programming, network models, etc.).

SOME ASPECTS OF ANTHROPOTECHNICAL SAFETY MANAGEMENT CONCEPT

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ABSTRACT

The basic model of management and planning strategy is the triad: “goals and objectives” - “conceptual programs, courses of action and sets of rules for decision-making” - “resources”. The strategy is also considered as the unity of five components (“pentad”): plan; sample, model, template; positioning; perspective; “trick”, i.e. a distracting manoeuvre. There are different manners of developing strategies and concepts: upon the fact of a pathogenically detected and already occurred problematic emergency; as a result of predicting the possibility of an emergency before its occurrence and with a desire to guarantee the anthropotechnical safety of functioning and the quality of life of a person, social groups and society as a whole. The destabilizing factors that arise in investment construction projects during the construction phase are of particular importance. The questionnaire-based survey of experts is used to determine these factors, their impact on the ultimate goals of the project that construction participants may encounter when implementing investment construction projects. Distribution of destabilizing factors by type, classification, and spreading them among a number of local public and private enterprises working in the construction sector is one of the important areas of anthropotechnical safety. Actions and resources, which seem safe at the moment, can cause emergencies and consequences in their unpredictable combinations. The study of this problem is an urgent task of the near future and one of the fundamental areas of anthropotechnics.

THE SYNERGISTIC EFFECT OF SECONDARY RAW MATERIALS AND NANO ADDITIVE ON PROPERTIES OF CEMENT MATRIX

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ABSTRACT

The purpose of this research was to analyse the synergistic impact of nano SiO_2 (NS), fluidized catalytic cracking catalysts waste from oil manufacture (FCCCw) and burnt at 700 ^oC temperature paper sludge waste from paper industry company (PSw) on cement matrix properties. The main properties of these materials are presented in the article. It is known, that nano materials reduce voids between cement particles, accelerate cement hydration, and increase the strength of cement matrix. Some quantity of FCCCw and PSw also accelerate cement hydration and increase the compressive strength of cement matrix, but it is important to analyse synergistic effect of these materials on properties of the cement matrix. Firstly, it was analysed pozzolanic activity of waste according ASTM C311 standard. The results showed, that both waste are pozzolanic active additive and the best quantity for cement matrix are 10% of FCCCw and 5% of PSw. The X-ray analysis, density, ultrasound pulse velocity and compressive strength of cement stone were presented in the work. It was established, that replacement 10% of cement to FCCCw and additionally using NS the compressive strength increases about 22% comparing with control sample. The replacement of 5% of cement to PSw increases compressive strength about 4%. Moreover, then we used 10% of FCCCw and 5% of PSw by using NS compressive strength increases even though the content of cement is reduced. Also, these contents of waste and NS improve density and ultrasound pulse velocity of cement specimens. The X-ray analysis showed, that the combination of FCCCw, PSw and NS increases the amount of calcium hydrosilicates formed, the less quantity of portlandite and unreacted cement minerals (allite and belite) was established.

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URBAN OPEN GREEN SPACES: A STUDY OF GÜZELYURT (MORPHOU), CYPRUS

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ABSTRACT

Globally, a dramatic demographic shift regarding urbanisation is occurring. Between 2000 and 2050, the proportion of people living in urban spaces is projected to rise from 46.6 % to 69.6%. Urbanisation poses difficulties through effects such as environmental pollution, urban heat island and climate change. Urban green areas, such as parks, forests, green roofs, streams, and community gardens etc. provide critical ecosystem services. Green space also promotes physical activity, psychological well-being, and supports public health of urban residents. Urban landscape areas are also significant for Cyprus as there is an on-going remarkable urbanisation. Particularly, due to urbanisation, the importance of green spaces in cities is becoming important. During this study open and green space as urban landscape areas in Güzelyurt (Morphou) were investigated. This is the first study to examine user satisfaction and views about open and green spaces in Güzelyurt (Morphou) region, north Cyprus. A questionnaire with 60 participants were conducted in order to understand respondents' suggestions about several aspects of existing open and green spaces in Güzelyurt, north Cyprus. According to the findings, respondents were mostly dissatisfied about urban spaces in the city. Our results indicate that local authorities or government entities should regulate the planning of urban parks, open spaces and other green areas with a long term perspective.

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APPRAISAL OF HERITAGE BUILDINGS IN THE POST-WAR PERIOD IN BOSNIA

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ABSTRACT

The unexpected loss of values as result of total destruction during the armed conflicts and war put us on the challenge to properly decide about methods of rehabilitation, integrating an understanding of the values and actions that could warry from restoration to many times even full reconstruction. During war 1992-1995 in B&H many valuable cultural heritage assets were destroyed and destructed, including national monuments, historical places, and historical structures. After aggression first step was to regain or establish the function of destroyed places, while for cultural assets these attempts were seeking more careful approaches. It is not just that importance or significance of destructed places and structures were different, also level of destruction was. These inputs were essential in preparedness for any action without possibilities to rely on unique methodology. 20 years after conflict still Bosnia is faced with post-war recovery while newly occurred problems are caused by unsuccessfully implemented methods of rehabilitation. Paper aims to give an overview of implemented interventions inside Bosnia and Herzegovina in accordance with the typology of building, its importance including intangible values and level of destruction. Giving examples of Ferhadija Mosque in Banja Luka and the Old Bridge in Mostar, examples of total reconstruction will guide one to understand aspects of choosing reconstruction as an appropriate intervention. There are also valuable examples of post-war recovery and rehabilitation for the historical place such as the Old town of Pocitelj with all valuable structures where after urban reconstruction we have the new challenge of managing the historic place. Inside view will be more oriented on the case of the Handanija Mosque in Prusac where correct methodology approach has been applied regarding, diagnostic, Identifying or determining the nature and cause of damage and decay through investigation, and some bad conclusion and decision had been derived from such an investigation. Also, some analyses of Index of shifts of minaret are conducted too. Index of shift represents the relation of minaret height –h and width of its layout r or diameter of circular cross-section. Analyses of conducted work could provide us with a better understanding of potential weaknesses and weak points of damaged buildings. Strengthening of damaged construction was among the most important tasks. In some cases, heritage structures and damages endangered authenticity, while sometimes limited knowledge of historic structures structural behaviour and material brought unexpected additional damages. The use of traditional crafts, techniques, and materials is one of the important elements in the process of the built heritage protection, contributing to its adequate protection, restoration, and conservation, as well as maintenance.

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PUBLIC GREEN AREAS AND THEIR DEVALUATION IN A DENSE CITY FABRIC OF SARAJEVO - CASESTUDY OF HASTAHANA PARK

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ABSTRACT

In a country that is still considered to be in the transitional period, even though the last war finished more than two decades ago, the laws and legislations of the urban development with a focus on green areas are loosely interpreted into reality in today's Bosnia. The laws on urban planning and development stipulated in the time of former Yugoslavia were precise in defining parameters. In the former system, the implemented planning laws resulted in a string of great urban developments. Such large urban projects were executed all over the former Yugoslavia in the late 1950s and1960s when the industry grew and cities expanded and modernized. These urban projects consisted of residential and public buildings such as schools, kindergarten, municipality buildings, commercial areas as well as healthcare and recreational facilities including sports terrains and public green areas. The ratio between built and unbuilt was greatly respected leaving enough green spaces for leisure activities. Nowadays, the laws and regulations inherited from the former system are often not respected or are being changed in favour of private investors at the cost of quality of life of cities' inhabitants. This paper aims to explore the importance of green areas and devaluation of the same, in new developments within dense city fabric in the period of post-war Bosnia, focusing on current developments in Hastahana Park. The Park is located in a popular and largely discussed area of Sarajevo's Marijin Dvor, were recent urban growth characterized it as a new business district of the city. The park is frequently used by many inhabitants from the surrounding area, especially by the children and the youth (it is the only skate park in the town). It is also a venue for special events throughout the year (amusement/sports events, concerts) attracting larger audiences from the entire city. Today, the remaining of Hastahana, the only public park on Marijin Dvor is endangered. Its future is uncertain because the site has been proclaimed, by the municipality authorities, as a construction site. Despite attempts by citizens to stop sales and construction in the park area, city authorities ruled in their own favour (or in favour of fast money gain) versus the welfare of the citizens. The example of Hastahana Park shows that due to strong political pressures the norms and regulations can be changed, the need for big investments is stronger than the care about the need of citizens. While European cities stream to improve the amount of public green areas in cities contributing to a healthier environment, Sarajevo at the same time decreases valuable green areas favouring construction activities and increasing already heavy traffic and air pollution. Beneficial turns can be made with changing consciousness of the majority of people, and not just small groups of professionals. The shift in believing that monetary underwriting is the only way for successful city development is crucial for the creation of healthy, sustainable and green cities with a focus on the health and social wellbeing of their inhabitants.

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STANDARDIZATION OF DOMESTIC SPACE AND THEIR RESPONSES IN EVERYDAY LIFE IN EARLY REPUBLICAN PERIOD TURKEY

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ABSTRACT

This study aims to analyze how Western efforts on standardization of domestic life reflected on home sphere and women's role in the household in Early Republican period Turkey (1930-1950). Transformation of domestic space was a central discussion within the modernization agenda of the Early Republican period in Turkey. In parallel, women had a crucial role at home, as the maker of a well-functioning and "rational" space and daily life. Therefore, popular media and architectural magazines targeted women and gave examples of a new house which should be organized with this regard. These journals mostly published household goods, furniture or scenes of interiors from Europe and the U.S, which were far from the traditional meaning of the house in Turkey. The proposed home was divided into sections and standardized, "comfortable" and "simple" were the keywords, and women were the administrators of "order" and "science" in the rationalization of domestic space. This "rational" and "function" based approach which stemmed from industrialized societies were detached from the context of Turkey in the Early Republican years, where the country was taking the first steps into industrialization. Therefore, concepts of "rationality" and "science" imposed from the West lost their meaning, and images in the magazines and daily life remained distant from each other, often contradicting one and other. This study, as a method, evaluates the standardization studies about domestic space and women with examples from architectural or women's magazines and popular media of the Early Republican period, and aims to reveal the reflections of printed media. The results show that top-down scientific approaches were not fully digested, but remained in a contradictory situation. Although the house was functionally divided into sections, traditional spaces; for example, the guest room, still remained as a part of the house. Furniture samples and interior scenes still remained in an eclectic style in Turkey, in contradiction with the images shown in magazines which resembled modern laboratories. In short, the Early Republican era showed contradictory reflections of printed media in domestic space and everyday life, as top-down rationalism and modernism was disconnected from its original context.

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ORGANIZATION OF TRAINING TECHNOLOGICAL PROCESSES OF CONSTRUCTION OPERATIONS BASED ON DIGITAL RESOURCES

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ABSTRACT

The purpose of research is to show the efficiency of the virtual construction site of a large-panel residential building as a digital resource of training technological processes of construction operations. As the research methodology appeared the digital paradigm, providing the application of digital resources into construction education, the correlation between the best practice and quality changes based on smart technologies. The principal results of the research are maintenance of the virtual construction site of the residential building; criteria for efficiency of training construction operation processes on the basis of a virtual construction site; method statement for optimization of the construction duration of a large-panel residential building; levels of student readiness for smart technology applications. The content of a virtual construction site is a complex multilevel menu consisting of a constant vertical line each element of which is provided with a drop-down menu. Points of constant vertical line correspond to technological processes of construction operations, which are detached for the purpose. The criteria reflect the need of the digital economy for construction engineers who master modern digital technologies. The preparation of the method statement made it possible to form a stable attitude to the construction operations of a large-panel residential building as a single object with an architectural and design, technological, installation-setup, service and operation, technical and economic parameters and characteristics, as well as to obtain a combination index of various types of works. The virtual construction site provided an opportunity to build a digital model of the house based on technical and economic characteristics. The levels of students readiness to apply smart technologies reflect the current situation in construction education.

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DEMOUNTABLE ROD STRUCTURES WITH FLEXIBLE CONNECTIONS ENSURING THE RELIABILITY AND SAFETY OF CONSTRUCTION OBJECTS

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ABSTRACT

Individual walls of structures based on wedge-type scaffolding can be different in height and are often used as enclosing structures for different cultural and sporting events. Usually, such structures are covered in the longitudinal direction with an awning cloth on both sides, which is why they take on the full wind load from the entire area of the awning. When calculating such structures, the wind load is the determining load. In practice, these structures are built according to the recommendations of the manufacturer's catalog of scaffolding, and they are repeatedly statically indeterminate systems with a large number of unloaded elements. This increases the material consumption of the structure and increases the cost of transport and installation work. In structures made of modular scaffolding, diagonal elements are used to give spatial rigidity to the structure, to reduce the calculated length of vertical elements, and to perceive the shift movements of the cell caused by uneven vertical movements of adjacent posts and horizontal loads. A structure with a full set of diagonal elements has a large number of weakly loaded elements. In this regard, it is possible to perform the so-called «discharged» construction scheme for more efficient use, replacing rigid diagonal elements with cable ties and reducing the number of diagonal elements in the longitudinal direction. The main task of the work is to analyze the stress-strain states of both the original system with rigid diagonal elements and systems obtained by partially replacing standard diagonals with flexible connections in the form of pre-stressed and non-pre-stressed cable ties. In order to study the actual operation of elements of rod collapsible structures and improve their design solutions, an experimental study of a fragment of the Layher system with cable ties was performed. Based on the experiment, it was determined that the actual movements when using flexible connections differ significantly from the calculated ones. The reason for the discrepancy is the deformation of the elements in the attachment points. To increase the rigidity, the design of the attachment unit needs to be changed.

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DEVELOPMENT OF FORCE LIMITERS IN MOBILE ROD STRUCTURES OF DEMOUNTABLE TYPE

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ABSTRACT

Large-scale mass events (sports, entertainment, etc.) require safe and high-quality organization of the visual and stage sector, so there is a need for pre-fabricated and mobile rod structures. To solve such problems, it is convenient to use the Layher system of modular building structures. The criterion for design failure is the failure of one of the most loaded elements, even when the entire system as a whole still has some resource. Compensating devices can be a solution to this problem. This study solves the problem of redistribution of forces in the rods using compensating devices, taking into account the stress state of the rod system. In the event of failure of one or more elements, their internal forces are redistributed between adjacent elements in proportion to their stiffness, so spatial rod systems can fairly well resist progressive destruction. However, the destroyed element does not carry any further load and adjacent elements can also fail. Compensating devices leave overstressed rods in operation and thus increase the load-bearing capacity of the rod system. The invention relates to the field of construction and mechanical engineering, namely to rod metal structures and their elements that work on tension or compression, primarily in statically indeterminate systems. The purpose of the invention is to obtain stable axial forces in a limited range separately for compression and stretching with the possibility of adjusting their size and length of the element. This goal is achieved by the fact that in the process of manufacturing the force limiter, which includes coaxial rod elements with a collet clip, the contact surfaces are made with ring waves (teeth), which can have a sinusoidal, triangular and trapezoidal profile with different angles of inclination of the sides. The height and pitch of the ring waves are assigned from the conditions for performing the calculated range and speed of loads, and the angle of inclination of the profiles from the conditions for ensuring different rates of change in forces (compression/stretching). Arbitrary schemes have been studied, the use of compensating devices in which allows reducing the metal content of the structure by 20%. A compensating device was developed and calculated. An experiment was conducted to identify the redistribution of forces between elements when using compensating devices: the results generally coincide with theoretical calculations.

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A EUROPEAN RECOMMENDATION: THE DEVELOPMENT OF AGRICULTURE IN DOBROGEA DURING THE COMMUNIST PERIOD

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ABSTRACT

For almost half a century following the Romanian annexation of Dobrogea, after the Independence war of 1877-1878, there had been no serious interest on behalf of the country's government with regards to the education of locals on the cultivation of the territory's arid soil. Few farms (Hamangia, an agricultural farm, Murfatlar, a winery, and Palas, an animal farm) were insufficiently supported, while their research was aimed locally and never sought the development of the entire region. Thus, during the communist period, the cultivation of Dobrogea's arid land became a recommendation for Romania on behalf of Europe. News stories of the München D.P.A. (Deutsche Press Ag) included the date of the Danube Conference held in Galați on October 10th,1949, hosting officials from the USSR, Romania, Bulgaria, Yugoslavia, and Czechoslovakia. However, the representatives of other Danubian countries such as Austria and Germany were not mentioned. During the conference, the German engineer O. Poebing presented his project entitled Cultivating the Arid Lands of the Danube Delta (dated 10.10.1938) regarding the enhancement of agricultural conditions by constructing a canal that linked the Danube to the Black Sea. In addition to agricultural benefits, the canal would also bring numerous advantages by shortening the navigable distance, by facilitating the irrigation of dry agricultural regions, and by contributing towards the draining of marshlands in Dobrogea. The project was received by Ion Antonescu's government in 1942 and work began on May 25th, the same year. Poebing's idea was not new. A similar project had been commissioned from the engineer Engles Wilson on behalf of the Ottoman Government in 1837. In addition to the drainage plan for the absorption of mud and the irrigation of the area with the aid of the built canal, Poebing's ambitious project for the cultivation of Dobrogea's soil entailed the colonization of one million farmers in the region in order to sow and harvest, biannually, enough grain for the feed of one hundred million people. One of the conclusions of the project mentioned that setting up the canal would solve an essential problem: that of feeding the region's population and moreover, that of Europe, contributing thus to securing world peace. The 1951 letter addressed to Gheorghe Gheorghiu Dej from the Secretary General of the Central Committee of the Romanian Worker's Party (signed also by those responsible for the Canal on behalf of all involved) mentions the great success with which the elaboration of the plan for the construction of the canal and of the buildings adjacent to it, had been followed through. The implementation of the project generated the gradual population of the entire steppe of Dobrogea with workers displaced from different areas of the country. Thus, on the site of Poarta Alba two schools were opened by the Communist party with evening agriculture courses that were attended by 22 students during its first educational cycle. Later, in 1953, the school was moved to the Administrative Palace of the Danube-Black Sea Canal in Poarta Alba. This building, at that time, was the largest agricultural school in Dobrogea, contributing to the formation of a plethora of specialists in viticulture, fruit harvesting, agriculture, and animal farming that contributed to the implementation of the agricultural development plan in Dobrogea.

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DETERMINANTS OF HOUSING INVESTMENT LOCATION SELECTION BASED ON EMPIRICAL RESEARCH

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ABSTRACT

The price criterion is undoubtedly a key criterion when choosing an apartment to buy. However, when buying an apartment, it is not the only one, another criterion, equally important, is location of the investment. The choice of apartment to buy is based on the compilation of various non-price criteria. These criteria are widely known and systematically used in the multi-criteria decision-making process. Nevertheless, their importance and weight may vary depending on the decision-maker preferences. In this paper, the authors, based on three housing investments, conducted a survey on the potential buyer's preferences in relation to the location as well as a specific example of a residential investment. In addition to the basic objective of the study, which was to determine the validity of criteria, preferences were set for individual groups of the population. The authors, analysing the rankings of the importance of individual criteria, noticed very large discrepancies in preferences depending on the aforementioned range, including by. respondent's age, place of residence (expressed in the number of inhabitants), education of a buyer. Finally, a set of criteria was obtained with specific weights, their characteristics and the unit of measure. According to the authors of the paper, such profiling of buyers in relation to preferences will allow the investor to precisely prepare the offer in response to the buyer's demand.

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PROJECT MANAGER COMPETENCIES AS A FACTOR FOR SUCCESS CONSTRUCTION PROJECT: QUESTIONNAIRE SURVEY

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ABSTRACT

The scope of responsibility and duties of a project manager can be divided into several areas of his professional activity and involvement in the project. The literature on the subject presents numerous requirements defining an effective project manager. These requirements relate to his skills, personality traits, knowledge, experience, attitudes etc., i.e. the competences of the project manager. Extensive sets of competences, presented by individual researchers, do not have a specific pattern. Therefore, it is difficult to create a hierarchy of importance of individual competences that an effective project manager should have. A small number of studies in this area have been carried out in Poland. However, due to the trend in construction for many years towards the evolution of structures in the organization of construction projects, the role of the project manager is changing. This change is caused by an increase in obligations or a decrease due to the possibility of delegating tasks and the lack of unambiguous, standardized competence guidelines. The scope of research presented in this paper is based on the questionnaire survey of Project Managers in the construction industry. An important result of the conducted research is the identification and hierarchization of key competences of the management staff necessary according to respondents for efficient project management. In addition, an in-depth analysis of research results has shown the superiority of the project manager's social qualifications and skills in selecting the right team.

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DEFORMABILITY OF STEEL-FIBRE BEAMS WITH EXTERNAL TAPE REINFORCEMENT

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ABSTRACT

In 2013, the Lviv National Agrarian University patented the construction of a steel-fibre concrete beam, additionally reinforced with an external steel ribbon armature with end anchors. This technical solution allows to reduce the cost of the structure by reducing the complexity of its manufacture, due to absence of a reinforcing frame in the structure. The purpose of this work is to develop proposals for a refined calculation method of deflections of steel-fibre concrete beams with tape reinforcement on the basis of our experimental studies. 3 beams with dimensions 1500x150x60 mm were manufactured. Beam B-1, reinforced with steel tape 1500x60x3 mm with end stops, did not contain fibre. Beams BF-2 and BF-3 in addition to the specified reinforcement contained fibre, corresponding the coefficient of fibre reinforcement by volume, $\rho_{fv} = 1{,}5\%$ і 2% respectively. Compressed prisms of 400x100x100 mm and stretched samples of 700x100x60 mm were also tested to determine the mechanical characteristics of concrete and steel-fiber concrete. Loose beams with a working run of 1400 mm were tested with concentrated force applied along the middle of the length. Mass production fibre produced both in Ukraine and abroad with bent ends HE 1050 1 mm in diameter and 50 mm in length was used for reinforcement. The percentage of fibre reinforcement by volume of concrete beams was taken ρ_{fv}= 1.5% and 2% to provide enough bearing capacity of the inclined sections. The cement of grade 400 (activity 42.3 MPa) of the Ivano-Frankivsk plant was used to obtain C20 /25 concrete. The test samples were made of fine-grained concrete containing sand from the Yasinets quarry with a fineness modulus of not more than 2.5. Mixtures for beams were made in a forced mixer. The composition of the mixture was chosen so that the settling of the cone did not exceed 4-6 cm and that the fibre did not settle to the bottom of the form. The composition of the mixture per 1 m^3 of the mixture was as follows: cement - 549 kg, sand - 1647 kg, water - 285,5 l. The deflections of the steel-concrete beams were smaller than the steel-concrete beams at equal moments. For example, at the moment of 210 kN/cm the experimental deflection values of beams B-1, BF-2 and BF-3 were equal to 0.116; 0.081 and 0.064 cm, and at the moment 420 kN/cm - 0.380; 0.213 and 0.140 cm, respectively. In this paper, it is proposed to determine deflections using the Mora integral and taking into account the results of the calculation of the beams by deformation method. The ratio of theoretical and experimental values of deflections was equal to 0.94 ... 1.04.

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BEARING CAPACITY OF STRENGTHENED REINFORCED CONCRETE BEAMS

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ABSTRACT

The need reinforcement building structures during operation arises not only during reconstruction but also because various damages. The various combination reasons for the need reinforcement, as well as the type and condition the building structures necessitates the use different ways reinforcement. Today, it is still effective to reinforce the bending elements of reinforced concrete structures with reinforced concrete and shotcrete. Therefore, the purpose of our work is to improve the calculation method, to evaluate the load-bearing capacity reinforced concrete beams, taking into account residual deformations and stresses of concrete and reinforcement. Methods for reinforcing reinforced concrete structures are described in detail in literature and are widely used in construction. The proposed experimental studies consisted 15 reinforced concrete beams with design dimensions 2300x200x80 (120; 145). Nine beams were reinforced with reinforced concrete, five beams reinforced with concrete and one beam without reinforcement. The test specimens were amplified by the extension of the lateral surfaces at different loading levels, namely 0.0; 0.3; 0.45; 0.6 from the devastating moment. To create such levels of load, a specially designed metal rig was used, transmitting its effect to the test beam in the form of two concentrated forces in thirds of the span. Before the reinforcement of the contact beams of the test beams, adhesive layers were applied, metal anchors were affixed to which the reinforcement frames were fastened. The bearing capacity of the normal cross sections of the experimental, reinforced concrete beams was evaluated according to the proposed algorithm, based on the deformation model. The algorithm is adapted to calculate reinforced concrete beam structures in various ways (extension, shirt or clip). In the calculation method, the joint work of the layers of "old" and "new" concrete was taken into account by assigning all elements of the section a single bend. Adopted structural and technological solutions in the test beams, namely the use of shotcrete concrete, adhesive priming, and glued metal anchors (Ø 8mm) protruding from the surface at 35mm, ensured the matrix and reinforcement layers work together. Based on the experimental studies, the analysis of the calculated data with the experimental results was performed. The proposed calculation method well estimates the bearing capacity of the normal cross sections reinforced with reinforced shotcrete concrete reinforced concrete beams, the difference reaches no more than 6%. However, as the analysis of the results of the studies in the cross sections of the test pieces of the main and reinforced part of the beam shows, the experimental and calculated values of concrete deformations have a greater divergence, similarly this phenomenon is observed in the results of deformation of reinforcement. The discrepancy between the calculated and experimental values of the main and reinforced part of the beam is revealed due to the delayed inclusion in the work of reinforcement of the reinforced part, which should be taken into account in the following studies.

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CONTAINER KINDERGARTEN PROJECT AS A SOCIAL RESPONSIBILITY PROJECT

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ABSTRACT

“ACT FOR”, a social responsibility project unit is a sustainable solidarity platform that was established in design faculty for the aim of creating collective act between designers and people in need. The main aim of this unit is to enhance design students’ critical perspectives how to prepare social responsibility project for their local environment and work collaboratively with other disciplines. The students are expected to understand the importance of social responsibility activities and its’ role for the universities and the community. The design students are also expected to learn how their attitudes translate into behavior and action while they are questioning what just and unjust is in their local environment. This study reports on Container Kindergarten Project as a social responsibility project. Believing that the success of social responsibility projects should be in harmony with the needs of the community, “ACT FOR” designers firstly analyzed the needs of their local environment. Later, developed “Container Kindergarten Project” for a chosen primary school where 25 children were trained in a space that could not meet the ventilation, heating and spatial organization requirements and continued to provide education as an unhealthy living space for children. Then, found sponsorships for the implementation phase. Creativity is the main element in design process; however, creativity should be encouraged and tempered by the need for realism such kind of social responsibility project. The design must work and be able to be made. The more you break away from reality, the more the project cost for the sponsors. Therefore, in the design process of the social responsibility project, a balance of creativity and reality is needed. With this project, the design students learned how to solve problems during design process and make design management to finalize project. In addition, they learned how to work as a team with different disciplines to ensure homogeneous distribution of tasks. They gained a chance to have time and self-management skills to finalize the project. At the end, design students discovered the healing aspect of the design and realized that design is not just made to make money. With all difficulties and contributions, it taught design students multi-dimensional education method that they never experienced before. As a result, community-university relationship is one of the most important point in determining and meeting the needs of a community, therefore, universities play a major role in raising awareness on this subject.

CHARACTERISATION AND TERRITORIAL DISTRIBUTION OF RELIGIOUS HERITAGE IN THE PARISH OF CERNACHE DO BONJARDIM, CENTRAL PORTUGAL

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ABSTRACT

Since Portugal is a mainly Catholic country, there are several testimonies of the practice of this religion and the faith of the people. In the parish of Cernache do Bonjardim, Central Portugal, birthplace of São Nuno de Santa Maria (canonized on April 26, 2009), there are several types of buildings related to religion, such as churches, chapels, crosses and built sets. The number of churches and chapels is impressive: 19 religious buildings exist in a territory with about 7000 Ha and 3000 inhabitants (Census 2011). These buildings date from different periods, have different characteristics and, within the same category interesting differences can also be found. The main objectives of this article are to characterize and analyze the current situation of this heritage and its dissemination, enhancement and subsequent protection. The methods used were based on bibliographic, iconographic, photographic, cartographic, webgraphic research, in situ surveys and interaction with local residents. The approach comprises the survey of the religious heritage mentioned above, subsequent cataloging and analysis regarding the orientation chosen for its construction, its age and its geographic distribution. With this analysis it is possible to group the elements into categories that facilitate their characterization. One of the main limitations of the investigation was the lack of documents and registrations about the described elements, which is partly due to the fire of 1917, in the City Hall, which destroyed all existing documents, and partly due to the disappearance of some of those elements and the subsequent reuse and relocation of the materials that made them up, making it difficult to recognize them, as well as the geographical and temporal location of their construction. The main conclusions are that most of the churches and chapels, against all expectations, do not respect the traditional canonical orientation and, that the majority of them was built in the 20th century and (probably) in the 17th century. Although distributed uniformly throughout the territory of the parish, the religious heritage is mostly found in the village of Cernache do Bonjardim and in the area of Serra da Santa, the highest point in this territory (475 m). This work does not intend to influence even more the attitudes of the population because they already value, appreciate and care for this heritage. However, the point of view presented in this article is different from the usual one and may open a new way of looking at this heritage. The originality of this work is that this type of heritage has not yet been approached in the territory under study. The article contributes to another study about this parish. As future developments, it is suggested an analysis of the relationship between the dominant terrain orientations and the location of these patrimonial elements in order to be able to estimate more relationships that may exist.

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INFLUENCE OF LINTEL AND OPENING ON BEARING CAPACITY OF AAC MASONRY WALLS

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ABSTRACT

This paper describes results from testing natural-size walls made of AAC (autoclaved aerated concrete) blocks under in-plane compression. Two series of tests were conducted. The first series of tests included four walls with unfilled perpend joints, and the second series covered four walls with filled perpend joints. In each series, two walls without openings and two walls with openings were tested. Typical precast lintels were used. The performed tests indicated that walls with openings had good strength and crack-resistance that was lower even by 2/3 when compared to the solid wall. Filling of perpend joints had no considerable effect on obtained cracking and failure forces acting on solid walls and walls with openings.

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INFLUENCE OF SUPERFICIAL STRENGTHENING WITH FRCM SYSTEM ON COMPRESSIVE STRENGTH OF CRACKED AAC MASONRY

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ABSTRACT

This paper describes results from studies on effects of superficial strengthening with FRCM system on compressive strength of autoclaved aerated concrete (AAC) masonry. Tests were carried out on models with one vertical crack. The research program included walls without any strengthening, strengthened at one or both sides. In addition, models reinforced by steel flat bars were tested. Two-side strengthened masonry demonstrated an increased compressive strength and deformability. Increased deformability was observed for one-side strengthened masonry when compared to tests on masonry strengthened by steel flat bars and without any strengthening.

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THE MARINA BAY SANDS COMPLEX IN SINGAPORE: A MODERN MARVEL OF STRUCTURE AND TECHNOLOGY

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ABSTRACT

The paper presents architectural and structural analysis of the Marina Bay Sands complex in Singapore, which consists of a hotel, an exhibition and conference center with shopping centers, two theaters and Art-Science museum. The Moshe Safdie Architects architectural studio created an unusual complex that shows Singapore as a center of innovation, culture and entertainment. This complex fits perfectly into the architecture of Singapore, which is full of ecological solutions and surrounded by vegetation that is dominated by orchids (the national flower of Singapore). Hotel Marina Bay Sands is the main element of the complex. The hotel complex consists of three 55 storey towers and is located on the axes of two streets. The spectacular design, which is now the island's hallmark, required many complicated structural solutions that can be considered as a modern marvel of structure and technology. The design of the hotel building, the co-contractor of which was Arup Company, due to its geometry and location on the reclaimed land of Marina Bay was recognized as the most difficult architectural task in the world. An additional goal in the design of the entire complex was to ensure adequate sound and thermal insulation inside the buildings while using natural elements. In the Art-Science Museum, as well as in the two theaters, a façade cladding system consisting of blocks of mineral wool was used, which significantly increases the evacuation time in the event of a fire. The complex, which is characterized by high strength buildings, good acoustics and high fire safety, was created thanks to multi-sector cooperation. Marina Bay Sands complex have played important role in development of technological and structural solutions for such type of structures.

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SELECTED MODERN PUBLIC CULTURE AND EDUCATIONAL BUILDINGS IN THE PERSIAN GULF COUNTRIES

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ABSTRACT

Over the past few decades Persian Gulf countries have been strategically working towards diversification of their economies by transforming their natural resources exploitation incomes into other areas of investment and infrastructure. Economic transformation has always affected on urban development. New urban identity of the leading countries of the Persian Gulf creates a new paradigm by constructing a new tradition as alternative contemporary heritage. Analyzing the development strategy of the Gulf cities, which main goal was to achieve the global city statute, three directions of this transformation can be distinguished. The first one is to transform the city into a replica of global metropolises such as New York, Chicago or Hong Kong. The second is the implementation of international projects related to the construction of cultural and educational buildings of global importance. The third direction is related to the concept of organizing global events. In this paper, the authors focused on the architectural and structural analysis of selected public culture and educational buildings in Doha (Qatar) and Dubai (United Arab Emirates). These countries have developed their vision for the future by giving unprecedented importance to the cultural and educational sector and have invested in economically powerful and rapidly growing regional cultural and educational hubs, what has provided domestic and international benefits of both the financial and reputational nature. At the beginning of the XXI century, Dubai and Doha introduced a new model of urbanism. As a result, Doha was designated as the “Arab Capital of Culture” by UNESCO in 2010. Doha’s and Dubai's plan for world class of cultural and educational buildings include, among others, buildings such as the National Museum of Qatar, the Museum of Islamic Art, the Qatar National Congress Center, the Dubai Opera House and the Dubai Future Museum.

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GEOMETRICAL CHARACTERISTICS OF THERMAL CRACKS IN CEMENT PASTE MODIFIED WITH MULTIWALL CARBON NANOTUBES

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ABSTRACT

Cement paste, apart from independent applications, is primarily a major component of concrete. The material embedded in the actual structure is subjected to constant deformations and stresses due to the forces acting on it. The most common effect of excessive deformation of cement paste is the formation of cracks. Cracking of a cementitious material is very dangerous because the load capacity of the material is reduced and the risk of internal corrosion is increased. One of the solutions used to limit the decrease in the load capacity of a cracked cement matrix is the use of all forms of reinforcement, from the classical steel bar reinforcement to reinforcing fibers (e.g., polypropylene, steel, glass, etc.) ending with nano-reinforcement, e.g., carbon nanotubes. The subject of the research are thermal cracks in cement paste with 0.1% addition (by weight of cement) of the multiwall carbon nanotubes (MWCNTs). The cement paste after 28 days of maturation was subjected to a sudden thermal load, consisting of placing samples in a preheated furnace to 250°C. Resulting deformations caused the formation of the characteristic cracks pattern on the sample surface. A total of 4 series of cement pastes were tested. The samples differed between each other in the class of Portland cement used (CEM I 42.5R, CEM I 52.5R), the presence of MWCNTs, and the water/cement ratio – 0.4, 0.5, and 0.6. To be able to analyze the geometrical characteristics of thermal cracks, the image analysis tools were used. The cracked surface of the sample was scanned on an optical scanner in a very high resolution – 2400 DPI. For the quantitative description of thermal cracks, the measurement of 4 stereological parameters was performed, i.e., the average cluster area ($\bar{A}$), average cluster perimeter ($\bar{L}$), average crack width ($\bar{I}$), and crack density (CD). In this case, the cluster should be understood as the area on the surface of the sample, which is limited on each side by a crack or the edge of the sample. Additionally, the compressive strength was also determined. The results indicated that the concentration degree of cement grains in a material volume has the greatest impact on the geometrical characteristics of thermal cracks. Regardless of the class of cement used and the presence of MWCNTs, the values of $\bar{A}$, $\bar{L}$, and $\bar{I}$ increased with increasing the w/c ratio, while CD decreased. Thus, the lower the concentration of cement grains, the less cracks were formed, but they are of greater width. In terms of corrosion resistance or mechanical strength, this is a negative phenomenon because the cement matrix is more durable (higher compressive strength) when there are more cracks but with smaller width. The addition of MWCNTs resulted in a similar relationship as the increase in the w/c ratio, i.e., the increase in the $\bar{A}$, $\bar{L}$, $\bar{I}$, and the decrease in CD. Combined with the results of the compressive strength, this confirmed the above conclusion that a less cracked cement matrix but with cracks of a much larger width is characterized by poorer durability.

THE GREAT WALL OF JAPAN – TECHNICAL AND CONSTRUCTION ASPECTS

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ABSTRACT

This article is concerned with the idea regarding the protection of Japanese coastal areas against tsunamis. The protection involves the construction of a 20-22-metre-high breakwater, called the Great Wall of Japan (GWJ) and this article analyses the technical and construction aspects of this wall. Contrary to commonly used breakwaters presented in literature, e.g., the GWJ is higher and has to withstand much higher values of horizontal forces (the forces resulting from a tsunami are many times higher than other forces acting on regular breakwaters). Depending on the coastline type and the degree of urbanization of the areas to be protected against tsunamis, five versions of the GWJ are proposed and discussed further on. It has also been proved that it is possible to construct the GWJ using contemporary technologies and materials. The structure capable of protecting the Japanese coastline effectively will increase the safety of the people living in the inflicted areas. Japan has been selected as a country where the wall should be built for economic reasons (it is the only country being able to afford the costs of this investment)[1] and because it is a country highly inflicted by tsunamis.

ENVIRONMENTAL FACTORS CAUSING MICROBIAL GROWTH ON BUILDING MATERIALS

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ABSTRACT

Biodeterioration is defined as unwanted changes in material properties caused by biological agents. Based on the deterioration of materials, biodeterioration can be classified as biophysical, biochemical and aesthetic. Biophysical or biomechanical deterioration refers to a reduction in the physical and mechanical properties of a material. It causes that initially durable materials become brittle and brittle [49]. Biochemical degradation processes are assimilation and dissimilation processes. The assimilation process occurs when organisms digest material for food. Living organisms excrete waste products or other substances that cause aesthetic biodegradation. The ability of microorganisms to degrade building materials depends on several factors. Biological corrosion occurs in close dependence with chemical and physical factors affecting microorganisms. The growth and development of microorganisms is stimulated by external stimuli, i.e. environmental factors. Microorganisms have a relatively large tolerance range for changes in environmental conditions. Under the right conditions, microorganisms thrive very well. The adverse effects may cause inhibition of cell growth, damage or lead to the death of the microorganism. Considering the impact of environmental factors on microorganisms, it is not possible to identify the most important of them. The resultant effect of overlapping factors determines the possibility of the growth of certain microorganisms. The main factors affecting the growth are: temperature, humidity, hydrogen ion concentration in the environment, oxidoreductive potential, water activity in the environment, hydrostatic pressure.

RECYCLING OF WOOD-POLYMER COMPOSITES IN RELATION TO SUBSTRATES AND FINISHED PRODUCTS

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ABSTRACT

Nowadays, the aim is to minimize the impact of a product or service on the environment in all phases of its life cycle. In particular, this applies to those in which the impact is greatest. One of the techniques that allow comprehensive assessment of the environmental impact of manufactured products is Life Cycle Assessment (LCA). With this method, an environmental declaration is made for the products obtained. WPC composites can be made in a sustainable way, without wasting any material and without altering. WPC composites can be made in a sustainable way, without wasting any material and without altering. Composites with wood fillers may be competitive to materials with inorganic fillers. Wood-polymer composites can be produced from original natural raw materials. They can also be obtained as a result of recycling, where either wood or polymers come from the recyclate. It is also possible to use both components from recovery. Another way is to use WPC as a future raw material. Research on the utilization of waste from such materials is also conducted in a number of research centres, taking material recycling as the basic direction, and technical products are manufactured from the obtained recyclate.

RECONSTRUCTION OF THE TECHNICAL CONDITION OF CONCRETE AIRFIELD PAVEMENTS WITH THE USE OF PREFABRICATED SLAB TECHNOLOGY

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ABSTRACT

The rapidly growing civil aviation industry is primarily an increase in the number of air operations, both in passenger and cargo traffic. This leads to an increase in the impact of aircraft on airfield pavement structures and, consequently, to an intensive operation process. Concrete airfield pavements occurring at airports in Poland, but also around the world, cover a wide spectrum, starting from newly built surfaces, used ones as well as those that are subject to renovation. Particular attention should be paid to pavements in the process of operation and pavements which age exceeds the designed useful life and which are already subject to renovation works. Basic types of failures can be identified on concrete airfield pavements including surface failures (e.g. spalling, cracks), local failures (e.g. pop-outs, corner cracks), linear failures (e.g. meander cracks, decrements of the pourable sealing compound in expansion gaps). Currently, where in many cases there is an urgent need to repair damaged pavement, companies and organizations responsible for road/airport construction are looking for new and innovative technologies, including prefabricated concrete pavement technologies, which can ensure effective repairs in a very short time, without closing the given lane or the entire airport. Due to the fact that the age of currently used airfield concrete pavements in Poland often exceeds 30 years, it became necessary to search for effective and fast technologies to improve their technical condition. This article summarizes the current state of knowledge in the field of existing prefabricated concrete technologies used at airports in Poland and worldwide. In addition, an innovative technology of using a prefabricated concrete slab has been described, intended for reconstruction of damaged, local airfield pavements in Poland, which were qualified for renovation due to the direct threat to the safety of aircraft operations. The technology guarantees the reconstruction and even improvement of the load capacity of the replaced airfield panels, which was confirmed during laboratory and field tests and verified practically in the process of real operation by air traffic. In addition, the concept of further research on the development of this technology based on cooperation with neighboring panels using dowel joints will be presented.

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NEWNESS TOUCHES CONVENTIONAL HISTORY: THE RESEARCH OF THE PHOTOVOLTAIC TECHNOLOGY ON AN WOODEN CHURCH HERITAGE BUILDING

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ABSTRACT

The case study that determined the present research is the restoration of one Transylvania wooden church from Cojocna, Cluj county, Romania. The original design (2018, Aqua Prociv Proiect Romanian company's project) assumed all ICOMOS's charters and the recommendation from this area in quality design, and it is in the stage of the execution auction. After nowadays standards, the restoration work does not need to achieve any form of energy efficiency and its primordial target is the preservation of historical values and many other essentials for humanity. The risk of museification of the heritage buildings with this architectural function, church, can sustain different and relevant points of views about the restoration, as could remark in the Leeuwarden Declaration (23 November 2018). There are some essential theoretical concepts linked or not to this specific domain, as art, history or philosophy, otherwise that can sustain the potential of this kind of intervention. The insertion of new materials in heritage works is not in the current practice of restoration. However, there is a need to adapt to the in changing world and within his changing needs—evaluation on the evolution of some building parts in the context of the technological revolution. We propose a study for the change of finishing roof material with the maintenance of the roof geometry or structure. The new material is the PV solar roof tiles. The numerical values for electrical energy produced with photovoltaic technology will appear evaluated with home made computer programme validated by comparison with dedicated software (PHPP_V9.6:; PVsyst 6.8.6). Other arguments from theoretical and more subjective points of view will also notice. The research started in the nowadays context from the sustainability area, and one question that appears natural was about how close to regenerative design can be achieved through restoration work.

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BRUTALISM IN THE ARCHITECTURE OF POLISH CHURCHES

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ABSTRACT

The main research problem presented in the article is the impact of brutalism on sacral architecture in Poland. The author analyzes six churches built in the second half of the 20th century. In addition, he compares their features with global the brutalist trend of this period. The following churches were examined in the article: Church of St. Michael in Sopot, Church of Our Lady the Queen of Poland in Nowa Huta, Church of St. Jan Kanty in Poznań, Church of Our Lady of Sorrows in Łódź, Church of St. Jadwiga the Queen in Kraków, Church of St. Joseph the Worker in Kielce. The brutalist style in architecture was initiated in the 1950s. It was based on Le Corbusier's post-war buildings and the architectural program developed by Alison and Peter Smithson called the New Brutalism. The brutalist style quickly spread throughout the world, reaching its apogee in the 1960s. In Poland, however, it was introduced relatively late and to a limited extent. Its influence is particularly visible in the architecture of Polish universities, apartment buildings, but most of all churches. The search for original, monumental forms of contemporary religious buildings coincided with such features of brutalism as individualism, strong expression and the use of raw materials. The new churches had to be different from the clichéd, standard and often repeatable buildings of socialist modernism. Brutalist architects in other countries followed similar assumptions. They rejected machine aesthetics of functionalism and preferred dramatized, complex forms. Based on the analysis of the presented churches, brutalist features and elements characteristic of Polish sacral architecture were indicated, including: monumentality, massive plasticity, complexity, strong chiaroscuro effects, expressive and sculptural forms, exposure of internal functions in building facades, emphasizing the importance of movement and articulating elements of pedestrian circulation, preferring craftsmanship over industrial methods. Architects often created rhythms on facades by repeating structural elements, and also introduced reinforced concrete details such as: roofs, gargoyles, window frames, *brise soleil* and *ondulatoires*. They favored rough and picturesque textures of concrete, brick and stone.

STOMATA SPACE: AIR POLLUTION AS A RESOURCE & ARCHITECTURE AS A RESPIRATORY SYSTEM

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ABSTRACT

Air pollution is one of the greatest worldwide challenges in the recent time particularly in industrial areas. It jeopardizes humans, animals and plants lives by causing several serious diseases. Those who live in contaminated areas are more prone to lung cancer, heart disease and many other chronic respiratory diseases. In Jordan, approximately 600 people die prematurely annually because of pollution. Therefore, looking for environmental sustainable solutions to reduce air pollution is an urgent need. This paper aims to present a sustainable architectural proposal 'Stomata Space' that responds to, and interacts with the environment, by creating zero emission zones in the air-polluted areas. The proposal shows how architecture can respond to the demands of breathers in space through addressing the simple exchange of clean air and toxic gases. The proposal is designed to create a clean air zone around the residential district of Al-Hashmeyah; as the most polluted district in Jordan. The sources of pullution in the area contains a petrolume refinary, a thermal station for generating electricity and a number of industrial factories which in sum greatly contaminate the air. The proposed design responds to the town's industrial landscape by creating series of purification towers that act as an environmental and visual counterpart to the factory emission towers that mark the town's periphery; to reduce, re-use, re-cycle and reverse air pollution architecturally and mechanically. In addition to purifying air, the collected remains and ashes of this process will be recycled into anti-pollution construction material that is expected to be three times stronger than the ordinary concrete block.

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HARMONIZATION OF CONFLICTS IN CONTACT ZONES BETWEEN DENSE URBAN LANDSCAPE AND PROTECTED NATURAL AREAS: CASE STUDY DEVINSKA KOBYLA (BRATISLAVA, SLOVAKIA)

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ABSTRACT

This paper explores the processes of harmonization the interests of green infrastructure and urban development of specific areas at urban fringe. The case study of Devinska Kobyla (Natura 2000 site) is located within the landscape with high density of urbanization in Bratislava located in close proximity to protected areas of Little Carpathians. The management and planning of contact zones is one of the tools for avoiding fragmentation of landscape, but one of its limitations in practice is that the concept of contact zones of urban and natural structures (Gažová, 2006) is not properly reflected in the existing policies, despite of huge conflicts threatening the conservation areas. Therefore, the conflicting behaviour and multi-actor decision-making of stakeholders with conflicting interests, such as residents and vacationers, environmentalists, municipalities, developers and activists leads to fragile sustainability of these areas. Consequently, there is a need to cultivate the spaces - to develop them into deeper levels of understanding, participation and sharing (Marques, 2014) - by thorough impact assessment, visionary planning, innovative design and sensitive management in the complexity. The paper concludes with a set of recommendations projected in the plan of measures for sustainable development of natural areas of Bratislava urban fringe developed in cooperation with local key stakeholders (Daphne and BROZ NGOs) and State Nature Conservancy of the Slovak Republic as the Natura 2000 Bratislava partners. Using the methods of field research, analysing historical and existing characteristics of the sites, participation of residents and visitors and consulting with experts, the landscape planning design proposal had been developed. Project segments – the buffer zones – were designed in greater details. These buffer zones respect both the values of nature and also human demands on democratic, accessible places with more opportunities for sociability, involving of the concept of learning landscape design. The paper contributes to the debates on practical examples of harmonization of various interests in specific locations of contact zones by design and planning, minimising fragmentation of ecological corridors, solving it by spatial planning and landscape design.

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RIVER RESTORATION AS A METHOD TOWARDS HARMONIZATION OF NATURAL HABITATS IN THE CONTEXT OF ECOLOGICAL CORRIDORS PRESERVATION: A CASE STUDY ON THE HRON RIVER

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ABSTRACT

Natural profile of the streams was conditional to the anthropological intervention, to channelling (canalization) of the watercourses due to the gradual settlement. The mentioned approach was involved because of the flood protection of residential areas, groundwater level adjustment, riverbed stabilization, etc. Corresponding anthropogenic interventions led to the devastation of several ecosystems and ecological corridors and their functions, occurring in the natural landscape environment. Consequently, rivers acquired new hydrological, hydraulic and biological parameters. The necessity of policy reaction led to the establishment of a framework for conservation areas, known as Natura 2000, in order to protect the threatened species and natural habitats (European Commission, 2008). This article presents a case study based on the real project aimed at the renewal of flow-through of blind river channel of the Hron River in its natural, historical channel's route with the length of 570 m and the width between 10-15 m. The aim of restoration of the river's arm included the recovery of aquatic habitats and stabilization of the floodplain area in the ecological corridor of the Hron River in the context of the efforts of the European Union (EU) towards strengthening harmonization. Restoration of the blind river channel required an integrated approach and connection of key stakeholders, Slovak Water Management Enterprise, state owner enterprise and municipality of Rudno nad Hronom. As the areas of the old channels of riverbeds represent an important type of ecosystem, the process of their restoration needs to be planned properly. Planning process consists of preparing detailed analyses of the current state of the bio-corridor with a focus on analysing the occurrence of vegetation and animal habitats, their combination and interaction. The connection between the ecological landscape and spatial planning leads to maximizing of benefits of the restoration, with the least possible interventions on the natural environment. Such an approach is fundamental regarding the harmonization and ecological connectivity between the natural and anthropogenic environment in the contexts of a sustainable strategy for the management and preservation of ecological corridors. River's channels are important ecological corridors of the natural environment of each country not only because of the water supply for adjacent floodplain areas but also because of the slowing down of water outflow from the environment and conservation of the richness of aquatic and terrestrial habitats. Revitalization and maintenance of river flows are essential for the preservation and reconnection of the existing bio-corridors in accordance to the European Green Deal (2019) and help the natural environment in adaptation to occurring climate change.

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THE ASSUMPTIONS FOR MODELING THE MECHANICAL PARAMETERS OF CEMENT CONCRETE INTENDED FOR AIRFIELD PAVEMENTS USING ANN

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ABSTRACT

This research paper concerns the issue of projecting the mechanical parameters of cement concrete intended for the airfield pavements. Application of ANN resulted from the necessity to identify the diversification of concrete parameters. They are the result of effect of changes in case of aggregate composition of concrete mix. Diversification of component materials results from the opportunity to use different content of individual cement, aggregate and water components, admixtures and additives. The material influences the obtained parameters of hardened concretes of airfield pavements. Preliminary assumptions for ANN modelling were formulated and a set of input data was developed. Particular stages of the adopted data processing scheme are discussed. The model assumes that neurons are gathered in some layers (one input layer, hidden layers and one output layer). The conducted cross-section of the influence of variables parameters values (learning constant α and momentum values η) on the accuracy of representation of mechanical parameters was analyses. Assessment criterion was assumed taking into consideration the lowest mistake level and 100% compliance. It was found that very good coincidence of component models with experiment results was achieved.

PUBLIC BUILDINGS DESERT ARCHITECTURE IN NORTH CHILE

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ABSTRACT

Public Buildings in northern Chile are the subject of this article. The Atacama Desert provides many examples of relationships between architecture and natural and cultural landscape. From Antofagasta to San Pedro di Atacama, we can see many examples of nearby buildings, such as museums, astronomical observatories and hotels, as well as buildings for tourist services. We can also experience landscape changes at the gigantic scales associated with copper opencast mining. One of such example is the Polish Japanese Sierra Garda mine. Experiencing the emergence of new architectural forms built in the desert and from desert materials is the subject of this research work.

THE TECHNOLOGIES OPTIMIZATION FOR TREATMENT OF UNDERGROUND WATER WITH IRON AND ARSENIC CONTENT – A CASE STUDY

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ABSTRACT

Generally, in Romania, the water treatment aimed at removing the classic compounds of iron, manganese, ammonium, nitrates / nitrites, etc. by the known classical technologies (chemical coagulation, precipitation, decantation, slow / fast filtration with free / under pressure, disinfection). When in the raw water, besides the classical compounds, heavy metals / semi-metals are also found, together with the classical treatment technologies, advanced technologies are required combined, known as hybrid processes (Electro-coagulation / EC, oxidation, adsorption / exchange ions, membrane filtration -UF / NF / RO), which can lead to the desired results. Along with iron, manganese, ammonium, nitrites / nitrates, arsenic is a naturally occurring element in the Earth's crust. Arsenic in drinking water is a global problem affecting the population worldwide. Arsenic and its components have carcinogenic properties. Skin diseases and the increase of the cancer cases endanger the population in the regions where there are too high values of arsenic in drinking water. Arsenic contamination of groundwater can have both natural and anthropogenic causes. Regarding the elimination of arsenic (As) found in the water especially collected from the underground, the studies and researches applied were much more restricted and the applications completely isolated, at present the subject being more intensely approached. This situation is also caused by the fact that the Water Framework Directive no. 98_15_CE transposed into national legislation (L.458 / 2002 supplemented by L. 311/2004) lowered the Arsen (As) chemical indicator limit to 10 µg As / L (from 50 µg As / L). An alternative / complementary technology with low maintenance costs for underground treatment is Electro-coagulation (EC), which has been of increasing interest in the last decade. The use of pilot stations / equipment for studying potential treatment technologies is essential for optimizing treatment schemes and in order to avoid the implementation of costly technologies that cannot work for various reasons. In this study case, it was analysed comparatively in a pilot station the water treatment with iron, manganese and arsenic content, coming from the medium depth underground source (western Romania). In the initially provided technological flow (oxidation with ozone, multimedia filtration and disinfection with hypochlorite for the remnant), an electro-coagulation / oxidation (EC) cell was introduced with titanium electrodes (without passivation) upstream of the multimedia filter. This process aimed at eliminating the use of chemicals (ferric chloride) from the coagulation process that would have caused the rapid alteration of the multimedia filter and consequently increased operating costs. The results showed that compared to conventional technologies the EC advantage includes high disposal efficiency, a compact treatment plant and the possibility of complete automation.

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STUDY REGARDING THE POSSIBILITY OF USE THE ALTERNATIVE HIGH EFFICIENCY SYSTEMS FOR INCREASING ENERGY PERFORMANCE IN SUBURBAN AREAS

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ABSTRACT

Energy efficiency is often characterized as the most valuable form of energy, since it reduces costs and the negative impact on the environment associated with energy consumption, but also the dependence on energy imports. The highest potential for increasing energy efficiency in Romania is found in the heating of buildings, in the transformation of primary energy resources into electricity. In Romania, 86% of the built area is represented by residential buildings. From the 8.1 million housing units, single-family homes are dominant, accounting for 61% of these. The article aims to highlight the importance of investments in rural areas in order to increase energy efficiency. Energy from renewable sources is not adequately considered in the rural development programming exercise. Energy efficiency measures provide medium-term gain opportunities and long, by promoting saving solutions by reducing production and consumption costs, reducing the environmental impact and at the same time ensuring the promotion of economic and social development. The results of this study show the possibility of developing the "what-if" analysis, which can help the decision makers to choose the best adaptation strategy. In order to be able to make the best investment decisions in equipment and choose the right energy sources, consumers need access to alternative energy sources (especially in rural areas) and quality information on the options they have and to financing opportunities. In the near future, it will be necessary to support the cogeneration systems based on biomass and biogas in semi-urban areas, with centralized distribution of the thermal agent.

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REINVENTING THE CHINESE CAPITAL

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ABSTRACT

This thesis investigates on the creation of Beijing's new official urban image – “an exclusive national capital city” which was defined by the planning authority in 2017. Behind this new concept of the capital is a long-term contradiction between spontaneous urban growth and the institutional limitations triggered by different visions of “ideal Beijing” since the founding of communist China in 1949. Those ideal planned urban images have been put forward by planning authority for how to conceive and manipulate the growth of Beijing in different time periods, and the corresponding planning efforts have strongly shaped Beijing's material and social landscape. Taking the past planning concepts and the continuing tensions as premise, the research will use Beijing's newly defined urban image of the capital city as a lens, through which to investigate the main planning mechanisms used to give shape to Beijing as both conceptual and physical construction. The period under investigation begins in 1949, with special emphasis on the period from 2013 to the present when the image of the capital has become the dominant reason for setting limits to urban growth. The project also research on how the re-conception of the capital city impacts the politics of city-making and the urbanisation process in contemporary Beijing, and the conflicts to which the image construction gives rise to. The research structure will follow the procedures of the Beijing planning process. Firstly, this study will analyze the conceptual framework used by the planning authority to conceptualise Beijing. Secondly, it will identify the planning strategies which allow the ideal capital visions to materialize. Thirdly, it will examine the subsequent impact on the everyday life space which experienced by the city’s inhabitants. After the investigation of the planning visions and concepts for the entire metropolitan region of Beijing, three small case studies will help to illustrate the concrete outcomes of the planned capital strategy. Each case study will focus on one spatial element as the agent of change: (1) the local effects of regional administration borders; (2) the effects of the ring roads as inner-city boundaries; and (3) the effects of small-scale planning interventions (architecture interface). The main goal of this research is to better understand the current urban planning process in Beijing. By combining approaches from the disciplines of planning, urban politics and sociology, the research will contribute to the conceptualisation of modern Beijing, as well as on the wider urban image construction practices.

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SPECIFICS OF EDUCATIONAL PROCESS IN ARCHITECTURAL SPACE OF RUSSIAN AND CHINESE UNIVERSITIES

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ABSTRACT

Given the globalization and internationalization of higher education, and technological and organizational changes in the domain over the last two decades, requirements to the infrastructure, architecture and design of universities have changed drastically. The architecture of each university is viewed as a kind of an intricate system, in which the architecture and the overall style largely define the social networks and the nature of educational interactions. The advancing pace of technological progress in the digital society poses new requirements to the university infrastructure, thus stressing on the need to thoroughly study the impact of the university architecture and infrastructure on the educational process. According to global ratings, Chinese universities are becoming more and more popular with foreign students. The trend is largely triggered by the convenience of the university infrastructure there, which includes modern design, interactive educational premises, comfortable campuses, and restricted access to the areas. At the same time, Russian universities are also witnessing the increasing number of Chinese students. However, foreign students, including those from China, are far from being satisfied with the infrastructure and architecture of Russian universities. Nevertheless, the recent advancements in the Russia-China cooperation in the area of higher education compels Russian universities to enhance the educational infrastructure and adjust it to the needs of Chinese students. However, no meaningful research has been conducted so far in this domain. Within the framework of our research project, we aimed to define the architectural image of Russian and Chinese universities from the eyes of students and come up with the list of key requirements to the infrastructure of a contemporary university. The research aimed to gauge key requirements to the university infrastructure and design specifics of Russian and Chinese universities, and to assess their impact on the nature of interactions in the educational sphere. The questionnaire-based research covered three universities in Yekaterinburg, a meaningful metropolitan city in Russia. The overall audience of the project comprised 500 Chinese students, and 500 Russian students who are either studying or sharing apartments with the Chinese ones. The qualitative part included overt observation over the educational process in Russian and Chinese universities. According to the results, the architectural style of universities is becoming a key factor of educational interactions. A long distance between academic buildings and campuses undermine the intensity and uninterruptedness of the educational process, while the lack of comfortable, modern, and technically advanced premises deteriorates the value of the education for all students and shapes their negative perception of the overall educational process. We developed a typology of the architectural and social space of universities. According to students, the architectural buildings of the 20th century associate with the classical university education, and the fundamental science and knowledge; those of the 1960s-1980s are seen as the aesthetical unappealing and comfortless Soviet-era holdovers, whereas modern architectural buildings are regarded as the centers of innovative activities and science. The study was able to identify architectural characteristics, develop recommendations to improve the architectural space of Russian and Chinese universities.

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FORCES IN THE LOCK-OFF DEVICE DURING THE ROLLING OF THE BRAKE PULLEY ROLLER OVER THE BRAKE RAMP IN THE BUILT AUTOMATIC PARKING HOUSE

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ABSTRACT

The paper describes the design of the device, which allows for the scanning and recording of force sizes impacting in horizontal and vertical directions during the rolling of the pulley, which is part of the brake of the lock-off device of the pallet truck, over the top surface of the brake ramp. The paper also presents the results of two experimental measurement procedures. The first measurements taken to obtain the values of the applied resistive forces when the cylindrical part of the pulley was inserted into the brake body were carried out without an installed cylindrical coil spring. The aim of the second measurement was to determine the forces acting on the brake body when the brake pulley holder resists the insertion into the brake body due to the rigidity of two types of compression cylindrical coil springs, type R16-102 and V16-102. These measurements were carried out in order to verify the theoretically calculated values of the acting forces. In the chapter “Pallet brake design” there is a suggestion and recommendation of the lock-off device manufacturer, which is used in the automatic parking system of variants “KOMA TOWER” and “KOMA MULTI TOWER”, to use a sensor to eliminate inaccuracies of parking location in a parking house using this APS option. The forces acting on the brake body, shown in the tables and graphs in this paper, are forces that occur when the brake pulley rolls over the upper surface of the brake ramp until the pulley engages in a circular recess in the brake ramp.

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APPLICATION OF THE VIRTUAL REALITY TECHNOLOGY IN STRUCTURAL SAFETY MONITORING OF SHIELD TUNNELS

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ABSTRACT

Many structural health monitoring (SHM) systems of actual tunnels are underused, with abstract data, chaotic information and the diagnostic results beyond comprehension. It is necessary to establish the visual connection between the visualization of monitoring network and massive structural information of tunnels. To address this issue, this study proposed a structural visualization method based on the panoramic virtual reality technology, combining the panoramic spherical image and the real-time monitoring data of tunnel obtained from SHM system. First, a software system for structural safety monitoring of an actual shield tunnel was developed on the basis of the combination of the panoramic visual technology and B/S (Browser/Server) architecture system. Second, the panoramic modelling method for specific tunnel structure environment was discussed in detail, and then the mechanism of data transmission and information access in panoramic virtual reality environment was investigated deeply. Finally, in view of the demands of practical application, the function modules of the abovementioned software system were described. Some key issues of how to develop each software module using the panoramic virtual reality technique were analysed e.g., online geographic information and cloud platform management. The results show that the panoramic virtual reality technology completely meets the needs of real-time processing, information management, virtual roaming and maintenance management in tunnel structural safety monitoring.

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MATURE CONCRETE—THE TECHNOLOGICAL ELEMENT IN POLISH CONCRETE ARCHITECTURE

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ABSTRACT

The primary intent behind taking up the subject of this article is to define the significance of the awareness of using concrete as a medium for creating original architectural figures among Polish architects. Apart from the understandable idea conveyed using concrete matter, supplementation in engineering, construction-related and technological knowledge is an inseparable element of the presentation of a creative aesthetic. It is believed—particularly in the case of concrete architecture—that the art of architecture is based on an effective synthesis of these two elements—it is then that we can speak of a work as being complete. It can be said that concrete architecture is an example of a work in which its creator makes ideational and formal decisions on the basis of matter that has been selected for the given structure *a priori*. Concrete is a matter that is created through a technological process—which gives rise to the questions about its specificity and detailed solutions. The architect should be able to foresee this process, even to design it, so that the concrete they will see upon the disassembly of the formwork will be that which was created as the starting point of thinking about the building as the product of an idea. Liquid concrete, poured into the formwork-matrix with its rebar, does not immediately become a complete object. The object devised by the designer must "mature" in its shell until the liquid mass sets and reveals its final and... ultimate form. This aesthetic "effectiveness" of concrete is a characteristic that is ascribed to the will of the designer to display a certain general message, in which concrete plays the role of a foundation, as well as a more detailed one, wherein concrete reflects the essence of its use. The article features a review of new concrete technologies and construction details found in Polish concrete architecture in the years 2008–2019 (examples: Ark House (R. Konieczny), Congress Center in Toruń (F. Menis), P4 Office and Hotel Complex (JEMS Architects), Museum of Aviation in Cracow (Pysall Ruge Kisielewski). Undoubtedly, concrete has two independent facets in the architecture that has been built in Poland in recent years—one that is expressive and based on all manners of similarities, and one that is rational and pursues perfection in the simplicity of objects. It appears that both styles of concrete architecture are distinct and, by demonstrating the sense of creative pursuits—create, in their own way, a cohesive world filled with the belief of architects in the ideality of the construction material they have used. Furthermore, both presentation methods—the metaphorical and the rational—should be treated not as opposites, but rather as the competition of contemporary forms. The detail of concrete architecture found in this collection appears to create new typologies and technologies that underscore the unique style of both the designer and their novel architecture.

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BUILDING PROBLEMS IN ARCHITECTONIC HERITAGE AND GEOTOURISM: IS THERE A CONNECTION?

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ABSTRACT

Architectonic heritage buildings attract millions of tourists for many reasons: their beauty, history, style, art, location, and so on. Presently, this list is being supplemented by the touristic exploration of the construction material, with particular emphasis on the natural stones. This material is the aim of urban geotourism, because it can give precious information about its age, origin, paleo-environment, as well as its provenience, way of exploitation, transport, treatment and finally degradation by weathering, among others. Therefore, the study of the construction stones of heritage buildings constitutes a complement to the "classical" cultural items which are shown and presented during a visit. A particular segment in geotouristic activities may be the presentation of building problems to the visitors. There are many examples in this field, like moisture or cracks in the walls, unusual solutions in construction, disintegration of stones, and so on. These problems can have various causes: capillary rise of groundwater in a wall, lack of construction material, heterogeneous composition of the substrate, seismic activity, weathering of material, to name but a few. For a visitor interested in science and technology, the knowledge of the problems, their origin and their solution (or, at least, the attempt of their solution) may be an unforgettable experience. The purpose of the work is to open a new point of view to architectonic heritage and its building problems, which can be used and explained in touristic activities. For this, mainly qualitative non-interventionist and participatory methodologies are applied. As a result, there will be the situation that the damage in one part leads to a profit in the other. This ambiguity may be resolved by considering that a better knowledge about the state of the heritage building, which is made accessible to a larger public, will contribute to its preservation. So, the main conclusion is that geotourism applied to architectonic heritage and its problems is an important support to its maintenance because of the dissemination of the knowledge of what may happen with the construction material. Likewise, the knowledge acquired during a geotouristic visit may help to avoid similar problems in other buildings.

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WIND TUNNEL WORLD PERSPECTIVE SINCE THE 1970'S TO OUR DAYS FOR PEDESTRIAN'S WIND COMFORT APPLICATION

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ABSTRACT

Experimental wind tunnel techniques have reached many domains from the late nineteenth century, mainly from aviation to buildings and bridge structures passing by aerodynamic tests on vehicles. The search for security and comfort, coupled with better performance concern created almost limitless applications to the use of the wind tunnel. It has developed not only as a facility on itself but also in different domain of application. This paper provides a world perspective on the past and present of the wind tunnels techniques since the 1970's to our days. The main concern lays with the domain of buildings environment and the use of the wind tunnels for the investigation of the outdoor wind comfort of pedestrians. In addition, it provides some insights on the expertise and the different methods and techniques used in order to investigate and analyze the wind phenomena through experimental approaches on scale models that were used over the years in order to provide more and more accurate results. The paper also outlines some of the latest achievements regarding the comfort criteria for pedestrians in the outdoor areas. Indeed, many countries adapted strict regulations in order to investigate the building effect on pedestrian comfort and security.

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REMEDIATION AND MONITORING Of UNSTABLE SLOPE OF RAILWAY CUT

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ABSTRACT

As part of the railway tracks modernization in Slovakia, a cut with a maximum depth of approximately 12 meters and a length of approximately 200 meters was built in the vicinity of the capital Bratislava. During the realization of the cut, in complicated engineering-geological and hydrogeological conditions, several instabilities and landslides occurred. This resulted in several remediation measures on a 200-meter long cut which were not considered in the original design proposal. After construction, geotechnical monitoring is carried out on the slope. The geotechnical monitoring aims to verify and control the effectiveness of remediation measures to maintain the safe operation of rail transportation. This paper evaluates the results of 3-year geotechnical monitoring and analyses its relationship to the given warning level.

Corresponding Author: Miloslav Kopecký

USE OF THE CLOSE-RANGE PHOTOGRAMMETRY TO DETERMINE THE DEFORMATION CHARACTERISTICS OF ROCKS

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ABSTRACT

In the building industry traditional deformation sensors, such as electrical resistance strain gauge, mechanical dial gauge, electronic digital indicator gauge (LVDT), are extensively used to evaluate the natural stone modulus of elasticity. These sensors work quite well, but sample surface preparation and sensor adhesion can be laborious and time consuming. On the other hand, conventional non-destructive test methods, such as a Schmidt hammer and ultrasonic pulse propagation rate, have the disadvantage of large data scattering and low reliability. In this paper, we focus on a use of a practical, reliable and cost-effective method of determining deformation characteristics based on a processing of digital images by the principle of photogrammetry (time base-line method). To verify the effectiveness of this method, a test was performed on a sample of natural stone from the tunnel Višňové. The data obtained by this method are in correlation with the applied load. After plotting the stress-strain curve, the static modulus of elasticity and the modulus of deformation of the tested sample were determined. The results were compared with those determined from resistance strain gauge measurements.

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THE STABILITY ANALYSIS OF A COFFERDAM USING THE NUMERICAL MODELING

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The foundation of the bridge pillars required the construction of cofferdams in the Danube River. The cofferdams protected the area of the excavation pit mainly against the effects of flowing water. The paper includes analysis of the cofferdam for the foundation of the main central pillar of the asymmetrical bridge. The cofferdam has the ground plan dimensions of 44 x 20 m. It's constructed of the double-row sheet pile walls. The stability of the cofferdam was analyzed using numerical modeling based on the finite element method using Plaxis geotechnical software. The level of backfilling inside the cofferdam, required for construction of the foundations, was 6 m above the bottom of the river. The depth of the excavation pit of the cofferdam was about 4 m below the river bottom. The numerical model included 15 construction phases, which corresponded to the procedure of the construction. The analysis was focused mainly on construction phases, such as, e.g., the total backfill of the cofferdam, the loading from the piling rig, creating the excavation pit inside the cofferdam and installation of struts, and the load from the maximum level of the Danube River. The analysis showed that there are two critical phases. The first critical phase represents the situation when the piling rig works near the edge of the cofferdam, and the Danube River is at a minimal level. The second critical phase occurs when the full excavation pit is created, and the Danube River is at a maximum level.

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EVALUATION OF THE INFLUENCE OF BROWN COAL OPERATION ON THE LANDSCAPE SHAPING AND THE ENVIRONMENT PROTECTION

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ABSTRACT

The article concerns the assessment of the new landscape and spatial effects of brown coal mining areas transformation of in the region of the Lower Lusatia in eastern Germany, in the context of the region's changes taking place after Internationale Bauausstellung (IBA) Fürst-Pückler-Land 2000-2010. IBA Fürst-Pückler-Land functioned in 2000-2010 as the institution responsible for determining the direction of transformation of Lower Lusatia. A region dominated by the brown coal mining industry, with a declining population and an unimaginably degraded landscape. The assessment, from the perspective of 20 years from the commenced process, raises research questions: in what part the assumed strategic goals were met, one of which was development towards industrial heritage tourism and is the process initiated earlier perhaps still ongoing? The research method involved the use of planning tools such as: graphic interpretation of the resources of Geoportal.de and Google Earth Pro, analysis of data provided by: Lausitzer and Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH (LMBV) and research trips in the years 2006-2019. Conclusions from the research are formulated through the prism of the European Landscape Convention [Florence, 2000], in which the postulate of treating landscape as an integrated term, consisting not only of natural and cultural elements but also human, is important. This approach provides the basis for establishing the rightness of transformations of post-industrial landscapes in the "pro-tourist" directions ensuring the connectivity of all elements using initiatives in the field of "industrial heritage tourism". In situ studies have shown that the transformation process has not been completed and is still ongoing, and the assumed effects are still far from expected. Tourism of industrial heritage may be an interesting "combination" of industrial areas in the European service economy, however, given the scale of the impact of the energy industry and its importance for the development of the whole country, its impact on regional restructuring may be limited. At present, care for the environment and its repair are more important in the context of improving living conditions along with the implementation of the postulates of using alternative energy sources. And modern use of the industrial heritage for other economic activities than just tourism can be an important alternative for the development of the region.

REFLECTIONS ON DECANTED WASTE WATER APPLICATION IN THE TIMIS COUNTY (ROMANIA)

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ABSTRACT

Livestock rearing in an enormous number on zootechnical piggery complexes is accompanied by a great quantity production of waste water, which needs a good management in order to turn to account and pollution control. At Timiș county, level worked at the 1st January 2018 – 32 zootechnical piggery complexes, located in the plain zone, with a daily effective of 530,882 pigs. At an medium discharge of 30 l/head/day, results a daily volume of 15,926 m^3 waste water which needs to be transported and stocked in a decanting pond. The positive aspect of this problem is the content of nutrients – about 2.3 g/l N_{total}, 0.07 g/l P_{total} and 0.7 g/l K_{total}, what means for all quantities of waste water a total quantity of nutrients of 36.6 tones N, 1.11 tones P and 11.15 tones K. Because to waste water contains also 62-72% C (relate to dry substance) through the biochemical decomposition at the soil surface, will be release 6370 m^3 of carbon dioxide in the atmosphere, emission which contributes to the climate change. For this reason, there is absolutely necessary to application the decantated waste water by placement. Owing to the great diversity of the soils cover and the present the ground water layer at 1.0-1.5 m depth on a large area, it is necessary a permanent monitoring so as to avoid water and soil pollution with Na^+, heavy metals or pathogens. The analytical data have been made for the Parța territory from Timiș county, in the years 2015 -2016 -2017 and were compared with a soil survey achieved in the year 2010.

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CONSTRUCTIONS FOR THE PROTECTION OF UNDERGROUND WATER AGAINST POLLUTION IN WAREHOUSE DEPOSIT AREAS

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ABSTRACT

Groundwater pollution can occur from the emission of a pollutant through the soil, which then interacts at biotic and abiotic levels entering the food chain and reaching directly or indirectly to humans. Such pollutant can be represented by deposition of household residues. The water infiltrated by these deposits and then by their sole and flanks, is an important source of pollution of groundwater, with the most serious effects. By virtue of this concept, for the protection of the groundwater in the area of household waste deposits, it is proposed to adopt a "clean technology" for the implementation of complex deposition improvements, which will prevent the appearance of pollutants, initially in the most important urban areas, and for the future generalization of these improvements in other localities. The essential elements of this complex arrangement of household waste depots refer to: the sealing system of the base layer which integrates a safety gallery from which checks and repairs are made; deep sealing walls that do not allow the circulation of the groundwater located below the deposit site so that in case of infiltration of some polluting substances in this area, their area of influence is limited; the sealing system that limits the flow of water infiltrating through the deposits and avoids air pollution with substances resulting from the anaerobic decomposition of household waste. Above the combined sealing system, it realizes a system of streams of granular material of ϕ 16-32 mm, casts the distance of about 20 m, to capture the infiltration water and to conduct it by gravitational flow spreading collector. For this purpose the streams will have a minimum slope of 1%

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INVESTIGATION OF THE EFFECT OF THE MORTAR THICKNESS IN MASONARY MINARETS BY USING ANISOTROPIC MODEL

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ABSTRACT

The masonry structures, together with the main structural materials such as stone or brick, consist of mortar material which serves as the adhesive between these materials. In general, the mechanical properties of brick, stone and mortar materials are different. However, they have been used throughout history and have been the unchanging materials used in masonry structures. The structural walls are formed by heterogeneous joining of two materials with different mechanical properties. However, these heterogeneous structural elements are generally considered homogeneous for ease of calculation. It is important to investigate the properties of the wall in the horizontal direction, reminding that the damage in the masonry structures mostly occurs due to horizontal loading. The main purpose in modelling masonry structures is to create a model that acts as close to the real structure as possible. In this study, the effects of different joint thicknesses on masonry structures on minarets structure were investigated. Changes in structure behaviour were investigated by using different material properties to a masonry minaret and some typical walls structure. By examining these differences, the effect of isotropic or anisotropic modelling on the result, the effect of mortar thickness on the result was compared and the results were interpreted. In comparison of long minaret and short minaret, in the anisotropic solutions, the tensions formed at the base were compared with the increase in the mortar thickness in the long minaret.

MODERNISM IN THE CASE OF SPORTS ARCHITECTURE IN YUGOSLAVIA

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ABSTRACT

Former state Yugoslavia, after World War II, declared wish to establish own social and state system somewhere between capitalist West and the socialist East of Europe, representing a specific area, in the geopolitical, but also cultural sense. New socialist society declared ideals which coincided with the modernists' promotion of importance of architecture and architects as creators of base for social welfare and happiness. More intensive relationships and openness of socialist Yugoslavia to the West than the countries of the so-called Eastern Bloc, architects "infected" by modernist ideas during education in the West Europe and unquestioning and phenomenological support of the system have generated an authentic modern expression. Through research of different study cases and examples of architecture from socialist Yugoslavia and studies of relevant scientists from the field of architecture and sociology as predominant methodology for this study we can investigate relations between architecture and socio-economical and cultural conditions. Sports buildings constructed in Yugoslavia in the beginning were created in accordance to state strategy for development of sport and accordingly promotion of massive physical activities for wider population. The most influential moments for development of sports infrastructure correspond to state strategy for self-promotion to the World as open society, by using sport success and organisation of international sports manifestations. Yugoslavia successfully apply and gain the most important international sports competitions as World and European championships in some of the most popular sports, Mediterranean games in Split, University sports games in Zagreb and Winter Olympic games in Sarajevo. These international manifestations were used as chance for remarkable urban and architectural developments and structural changes of the host cities. Through research of different study cases and examples of architecture from socialist Yugoslavia and studies of relevant scientists from the field of architecture and sociology, as predominant methodology for this study, it will be investigate relations between architecture and socio-economical and cultural conditions. Some of the examples from this study have promoted idea of combined functional uses related to sports, cultural and commercial activities, built under clear influence of brutalism architectural principles. Others present innovative structural and functional solutions in accordance to the most recent technology of that time which resulting in some of the most beautiful temples of sports architecture in this part of Europe and wider.

MODERNISM IN THE CASE OF CULTURAL ARCHITECTURE IN YUGOSLAVIA

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ABSTRACT

As a result of very strong and organised antifascist resistance on domestic territory during the World War II and historical conditions in the rest of Europe, new established socialist country Yugoslavia on geostrategic games was planned to stay part of eastern block in the new division of post-war Europe. But just three years after the war Yugoslavian political establishment led by charismatic president Tito, despite the serious threats from USSR and Stalin, decide to start with their own way of socialism based on self management with reduced influence of the state into economy, society and culture. Result was atypical socialist system for that time, which was very open to the world, but especially to the Western Europe and USA. During the whole history, architecture was always the best represent of historical developments and social circumstances in different civilisations through different periods. Yugoslavian modernist architecture developed by domestic architects, influenced by modernist ideas from Central and Western Europe and with phenomenological support of the state can be considered as indicator of social and cultural movements during existence of that avant-garde socialist country from 1945-1990. Through research of different study cases and examples of architecture from socialist Yugoslavia and studies of relevant scientists from the field of architecture and sociology, as predominant methodology for this study, it will be investigate relations between architecture and socio-economical and cultural conditions. In accordance to declared ideas for general modernisation of the entire society, modernist architecture in Yugoslavia was widely accepted as tool for realisation of proclaimed ideals for open, human oriented and contemporary society. Architecture of cultural buildings was some of the best examples for mentioned direction in the content, but even more in conceptual and visual expression. Yugoslavian architecture of the representative cultural centres, museums, libraries and concert halls are some of the most successful realizations of modernism in the region of south east Europe, but even much wider. In the same time these buildings were witnessing well organized, state supported institutional work that was able to arrange some of the most prominent cultural activities on the highest world level.

THE REFLECTION OF WESTERN CULTURES ON THE VISUAL COMPOSITION OF ARCHITECTURE AND URBANIZATION IN EGYPT

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ABSTRACT

Western cultures played an important and influential role in the formulation of Egyptian architectural thought, and reflected on the visual composition of architecture and urbanization of many cities and neighborhoods of Egypt throughout the ages and historical periods, which requires preservation as a documentation of those historical periods that followed Egypt. The broader scope of the research is determined spatially in the city of Cairo, where it represents a center for all the cultural changes in Egypt, which in turn reflected on the urban and the architecture of many of its neighborhoods, including the suburb of Al Maadi in Cairo city, as a case study to monitor and analyze the reflection of western cultures, on the architectural and urbanization of the suburb, adding to it a distinctive architectural character that calls for preserving it from any blur, and distortion operations that have already begun in that neighborhood recently due to the weakness and non-activation of laws. The research is divided into two parts, the first includes theoretical review of some concepts related to the characteristics and levels of culture, the concept of foreign cultures, and a historical overview of the factors affecting the spread of Western culture within Egyptian society, while the second part represents the scope of application through the study and analysis of the extent of reflection of Western cultures on architecture and urban design of Maadi suburb since its inception.

MECHANISMS OF FATIGUE FAILURE OF BONDED ANCHORS IN CONCRETE IN RELATION TO THE THEORETICAL MODELS AND EXPERIMENTAL TESTS

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ABSTRACT

Bonded anchors are forms of reinforcement, repair parts to prolong the life of the three-layer, which in contrast to the anchors do not generate additional mechanical stresses in the concrete. An additional advantage of bonded anchors is that they can use close to the edge of the concrete element. This is one of the possibility of destroying the connection anchorage in which there is a model of destruction due to breaking the edge of the concrete. Author in his research considering both bonded anchors perpendicular to the surface of the concrete blocks, which is at an angle of 90 degrees and at angles of 60 degrees, 45 degrees and 30 degrees. For damage mechanisms, which are rare, the destruction of the connection due to the breaking of the anchor rod in the anchor set in concrete were used in concrete elements. The premise of the article presented theoretical models to estimate the theoretical load capacity of anchors. The goal of the tests was to determine the limit of destructive force anchoring the above-described configurations, the anchorage and the possibility of obtaining any mechanisms for the destruction described in the literature, i.e. where the load capacity of the anchor to pull-out is: the destruction of the steel anchor by breaking the mandrel breaking concrete cone, destruction by pull-out the anchor, destruction by splitting the concrete base. In the case of shear, which is caused by movement of the outer layer relative to the other have failure mechanisms which can include: chamfer of the anchor rod (possible bending) the edge of the concrete breaking and damage to the anchorage by undermining (interaction force transverse and longitudinal). In experimental tests, we managed to get almost all the mechanisms of fatigue damage reported in the thematic literature. The most common mechanisms of damage could destroy the anchor by pull-out the anchor (loss of adhesion at the contact zone of epoxy resin - concrete). All the anchors have a standard diameter of 12 mm. In several cases the destruction was a result of splitting the concrete element. The mechanism of destruction due to breaking the anchor rod could only be accomplished using concrete elements concreted anchors. In these experimental tests, the results of the breaking force of the 43.5 kN anchors were obtained; 44 kN; 40.2 kN which was similar to the results of the characteristic resistance value specified by the manufacturer as a value equal to 42 kN, which can also be defined as the fatigue strength of the steel anchor. The effect of interactive load capacity of the anchors was obtained by the influence of shear force, the value of which gave only the effect of bending the anchor. The result of the simultaneous increase in pull-out strength and shear also resulted in several cases of destruction of the bearing capacity anchoring effect by undermining. The results comparing the load capacity of the anchors depending on the anchor angle were discussed by the author in other publications. All considerations are derivative component of ensuring sustainability, strengthening and repair of joints in the outer walls of three-layer of panel buildings in Poland. The program of strengthening the three-layer walls of large slab panel buildings and ultimately thermo-modernization and modernization of installations by installing mini installations of renewable energy sources received financial support from the Polish Government for the years 2020-2029 from the Thermo-modernization and Renovations Fund.

TOWARD MORE ROBUST ESTIMATION OF DAM INFLOW USING A DATA-DRIVEN, LONG-SHORT TERM MEMORY NETWORK

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ABSTRACT

Estimating dam inflow is an essential requirement for flood and drought control and is one of the most important issues in water resources planning and management. Thanks to the breakthrough of computational science, deep learning (DL) algorithms have developed and widely applied to many other science fields. In this study, we used a novel data-driven, machine learning (ML) approach to estimate and predict the inflow to dam infrastructure using a Long-Short Term Memory (LSTM) network based on the current state-of-the-art network architecture. Specifically, (1) how to efficiently pre-process the input data required for LSTM, (2) how to determine the hyperparameters of LSTM, and (3) how to evaluate the effects of different loss functions chosen were all addressed. The LSTM model proposed was first adjusted to calculate the daily inflow for the next step as a function of three input variables, including daily rainfall (R), inflow (Q), and basic flow (BF). Subsequently, we created new input variables using Cross Correlations (CCF), Autocorrelations (ACF), and Partial Autocorrelations (PACF) technologies. Increasing the three input variables to nine variables with three temporal lags at t, t-1 and t-2, these are all supplied to the LSTM model. We then applied the LSTM network model to estimate the inflows of nine dams from 2014 to 2020 in the Han River basin, one of the largest river basins in South Korea. The results indicate that pre-processing the input variables improves the behaviors of the LSTM model. The LSTM model adopting a new combination of loss functions has better performance than that using the loss function of the mean square error only.

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ELASTO-PLASTIC PROGRESSIVE COLLAPSE ANALYSIS BASED ON THE INTEGRATION OF THE EQUATIONS OF MOTION

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ABSTRACT

This paper considers the progressive collapse analysis of reinforced concrete load-bearing structures based on the sudden removal of a load-bearing structural element and simulation of the dynamic structural behaviour, taking into account the elasto-plastic properties of the material and the degradation of concrete during cracking. A specially developed finite element library is used, which includes triangular and quadrilateral shell finite elements of medium thickness, and a two-node finite element of a spatial frame, which take into account the discrete arrangement of reinforcement and various elasto-plastic material models for concrete and reinforcement. The problem formulation does not contain any simplifying assumptions other than the conventional hypotheses for Mindlin-Reissner shells of medium thickness, Timoshenko beams, and the elasto-plastic constitutive models. The destruction of concrete is modeled by the descending branch of the stress-strain diagram, and the computational stability of the method when the finite element mesh is refined is ensured by the reinforcement which does not have the descending branch. The work of the reinforcement is taken into account not only in tension-compression, but also in transverse shear, which significantly improves the computational stability of the method in cases where the finite elements are in the tension zone and, as a result of cracking, the concrete is fully destructed. The problem is reduced to the numerical integration of the Cauchy problem with inhomogeneous initial conditions obtained from the nonlinear static analysis of a structure subjected to the static load and the reaction of the removed load-bearing element, the sudden removal of which causes the movement of the system. This approach is free from assumptions related to the introduction of a dynamic amplification factor into the quasi-static analysis, which is widely used to solve such problems. The paper provides a numerical example illustrating the effectiveness of using an outrigger floor to prevent progressive collapse. A comparison of the results of linear and nonlinear dynamic analysis in the presented example shows that the peak values of displacements in the control nodes obtained as a result of nonlinear analysis more than double the peak values of displacements obtained in the linear analysis. Peak values of internal forces in the nonlinear analysis are up to 30% smaller than the corresponding values in a linear analysis. It turned out that the characteristic periods of oscillations that occur after the sudden removal of the structural bearing element are much larger for the elasto-plastic model than for the elastic one. We believe that obtained results also will allow us to formulate approaches to the justification of deformation criteria for their further use in developing simplified analysis methods for mass application.

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TREATMENT OF NONLINEAR MULTI FREEDOM BOUNDARY CONSTRAINTS IN FINITE ELEMENT ANALYSIS OF FRAME SYSTEM USING LAGRANGE MULTIPLIER METHOD

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ABSTRACT

This paper is concerned with the treatment of nonlinear multi-freedom and multi-point boundary condition in finite element analysis of frame system. The treatment of boundary constraints is required to produce modified system of equation based on master stiffness equations considering nonlinear multi freedom constraints. The nonlinear constraints considerably increase the difficulty in constructing and solving the modified system of equations. Generally, the operation of imposing multi-freedom constraints can be developed using master-slave elimination, penalty augmentation or Lagrange multiplier adjunction methods. The master-slave method is useful only for simple cases but exhibits serious shortcomings for treating arbitrary constraints. The penalty method has difficulty in selecting appropriate weight values that balance solution accuracy with the violation of constraint conditions. In present work the Lagrange multiplier adjunction methods is employed and endowed with possibility of substitution and works particularly well for nonlinear constraints. The incremental-iterative algorithm based on Crisfield arc-length method is proposed to solve the nonlinear modified system of equation. Based on the presented algorithm, the paper proposed calculation procedure and established programs for determining internal forces and displacements of frames having nonlinear multi-freedom constrains condition. The numerical test examples are presented to investigate load-displacement and load-internal relationship of system having nonlinear multi freedom constraints. The calculation results show the efficiency and convergence of proposed algorithm.

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MIXED FINITE ELEMENT METHOD FOR GEOMETRICALLY NONLINEAR BUCKLING ANALYSIS OF TRUSS WITH MEMBER LENGTH IMPERFECTION

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ABSTRACT

This paper focuses on numerical method for the geometrically nonlinear buckling analysis of truss with initial member length imperfection. The solution of nonlinear buckling problem of truss with imperfection using displacement-based finite element is dependent on the imperfection implemented. Generally, the operation of incorporating the initial imperfection to the master stiffness equation develops by master-slave elimination method, penalty augmentation method or Lagrange multiplier adjunction methods. Obviously, the initial imperfection considerably increases the difficulty in finite element formulation nonlinear buckling problem. This research proposes novel approach to formulate the nonlinear buckling problem of truss with imperfection using mixed finite element method. The mixed balanced equation of truss is formulated using principle of stationary potential energy. The paper presents novel mixed finite truss element, including initial member length imperfection, considering large displacement. Using the arc length technique, the research develops new incremental-iterative algorithm for solving the nonlinear buckling problem of truss with initial imperfection in different cases of model formulation, including displacement-based finite element and mixed finite element formulation. Numerical test is presented to investigate the equilibrium path for plan truss with initial member length imperfection. The calculation results of solving problem formulated in both displacement and mixed finite model are converged showing the efficiency and reliability of proposed method.

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GRAVITY AND COMPRESSED-AIR-HYDRAULIC-POWER-TOWER ENERGY STORAGE PLANT

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ABSTRACT

In the era of the increasingly implementation of renewable energy sources in the electrical energy supply the demand for energy storage continues to grow. This because the renewable energy sources, mainly in the form of wind and solar energy, are sustainable, but at the same time are subject to natural fluctuations. The wind doesn't always blow, and the sun doesn't always shine. Therefore, a stable and reliable power supply is more challenging than ever. It now must regulate fluctuating electricity demand and fluctuating electricity supply. In the same time decentralized energy supply systems based mainly also on PV and wind energy (e.g. as hybrid systems) storage requirement will become a key component of these local electrical energy supply networks especialy to balance the energy demand and supply. Among the many storage techniques an important example is the Hydro-Power-Tower an innovative hydraulic energy storage system based on pumped storage technology. Depending on the actual storage method that can based on gravity (lifting / falling of a weight in a vertical underground or above ground Tower), on air compression / decompression or on combination of both techniques, can be distinguish the following Storage systems, Gravity Hydro Power Tower Storage (GHPTS), Compressed Air Hydro Power Tower Storage (CAHPTS) and Gravity Compressed Air Hydro Power Tower Storage (GCAHPTS).The GHPTS is the classic form of the Hydro Power Tower Storage and is widely discussed in the literature with scientific results and technical applications especially in the last decade. Besides the many advantages of (GHPTS) an important disadvantage is the very high weight and high cost of the tower piston (usually metal) which is the key component for potential energy storage.Storage based on Compressed Air is also widely applied in different storage systems but less so than Power Tower. Regarding the application of compressed air in PTS system are to mention some own results, proposing a replacement possibility of the heavy overload piston of (GHPTES) using a part of tower as compressed air reservoir. The present study considers the combination of both storage techniques Gravity and Compressed Air integrated in a so-called Gravity-Compressed-Air-Hydro- Power- Tower - Storage (GCAHPTS). It will be analysed the combined influence of compressed air pressure and high of weight tower piston on the stored energy. The obtained results allow the optimally design of such a combined power tower storage system. When the compressed air or high weight piston is missing on obtain GHPTS or CAPTS system respectively.

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CONSTRUCTION DISASTERS CAUSED BY EXCEPTIONAL IMPACTS

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ABSTRACT

Construction disasters are caused by exceptional impacts that are very difficult to predict in advance. Exceptional impacts can be defined as loads acting on a built structure produced by unlikely phenomena such as: fire, explosion, flood, vehicle impact, aircraft impact, above-average snowfall, severe wind gusts, excessive icing and others. Exceptional impacts are considered in the design process in exceptional computational situations for exceptional combination of actions. Based on many years of design practice, it can be stated that the exceptional combination is used extremely rarely, only for the structures that are actually exposed to the possibility of an exceptional impact, e.g. fuel tanks, overhead power lines, airport buildings, viaducts. On the other hand, for the majority of buildings, the design includes the basic combination of loads with constant and variable actions. Currently, in the light of advancing climate change, we are dealing with rapid and supernormal environmental impacts. The paper presents various types of exceptional impacts as well as provides design situations and combinations of actions in relation to exceptional impacts. The term *construction disaster* was defined in line with the Construction Law. PN-EN 1991-1-7 Eurocode 1 (Actions on structures. Part 1-7: General actions. Exceptional actions) was used as the basis for providing specific strategies ensuring construction safety. The standard also gave grounds for dividing the consequences of structural damage into appropriate classes. For the purposes of the study, the number of construction disasters was analysed through the data from the General Office of Building Control, covering the area of Poland in the period from 1995 to 2018. The disasters were classified by voivodships and reasons for their occurrence, supplemented with information on the number of people injured. Construction disasters are of particular media interest. The society requires to be informed about their causes and effects, following with attention the progress towards explaining their reasons. This raises public awareness of the possibility of such phenomena due to improper performance or use of buildings.

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TOWARDS SUSTAINBLE SOCIAL HOUSING IN THE UAE: ASSESSING THE TRANSFORMATION FROM CONVENTIONAL TO BIPV HOUSES

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ABSTRACT

Sustainability has been recently encouraged in the federal and local social housing programs in the UAE. But, most of the concern has been given to the new housing leaving behind a large stock of existing housing. Even for the new housing projects, the effort has been largely dedicated to enhancing the thermal performance of the houses with little attention devoted to the utilization of renewable energy as a plausible sustainability application. Actually, for the case of existing or even new housing, Building-Integrated Photovoltaic (BIPV) seems to offer a promising sustainability approach. As BIPV avoids the limitation of placing the PV panels over the roofs of the buildings, it depends on integrating the PV panels with the architectural elements of the building's envelop. Thus, freeing the roof space of the house to be allocated for domestic use. This research aims at, first, exploring an appropriate way of integrating photovoltaic panels in the typical social housing design in the UAE, without compromising the architectural style and shape. Secondly, is to assess the efficiency of the generated electricity through the proposed BIPV settings. For the adopted method, a frequently developed house model in social housing projects in the UAE was selected. Then, the most suitable architectural elements of the selected house's envelope were defined for being utilized in accommodating the integrated PV panels. Consequently, a complete set of to-scale BIPV customized panel designs for the defined architectural elements (walls, louvers, spandrels, etc.) of the selected house was prepared. The dimensions and areas of the proposed customized PV panels and their proposed type as facilitated in the four house orientations were defined in these designs. The proposed height and inclination angles (90 and 24 degrees) of the peripheral PV panels were adjusted to prevent casting shadows on the PV panels. The total PV panels area on the vertical elements (external walls at 90-degree) of the four elevations of the house reached to about 39.86m^2 and about 166.5m^2 for the 24-degree inclined elements such as louvers. After considering the efficiency of the selected PV Panels type (20%) and figuring out the expected system losses (11.42%), the PVWatts Calculator was used for undertaking the electricity output simulations. It uses hourly typical meteorological year (TMY) weather data and a PV performance model to estimate annual energy production and cost savings. The simulation was done for the four main orientations of the house as well as the overall average output. The results of the yearly electricity output were very close regardless of the orientation of the house (N=60,070, S=59,690, E=60,300, W=60,720 kWh/year) with the total average output of about 60,197 kWh. This actually exceeds the average yearly electricity consumption of this house model of about 58,300 kWh/year indicating the efficiency of the proposed BIPV system, especially given the continuous decrease in the initial cost of the PV panels and their increasing efficiency. The results of the simulation are to be validated through actual transformation of an existing house in one of the social housing projects.

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ARCHITECTURE VS GLOBALIZATION

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ABSTRACT

Globalization affects all areas of life. It is also present in architecture. It is a continuous process that has definitely accelerated in recent years. Global processes, fast flow and exchange of information, ease of movement, and rich experiences related to it allow crossing borders and breaking barriers of culture, politics, and in architecture, losing regional features and changing aesthetics. All of these effects definitely affect changes in design processes and architectural message. Architectural design takes on a new expression resulting from the cultural mix, as well as detachment from context, tradition and often cultural roots. The first example of globalization in architecture was the international style (the rise of the 1920s), which was characterized, among others, by a free plan, the form of objects resulting from functions, large glazing, and lack of ornamentation. It experienced its splendor in the 1930s-1960s. Today, its features are still being noticed in world architecture. Repeatability, unification and typification, as well as often copying and commercialization, the pursuit of dominant, detachment from cultural, climatic, natural and often social context causes the design and implementation of objects with the same characteristics in culturally, climatic, natural and economically different environmental contexts. The research questions posed in the article are: a. To what extent do globalization processes lead to the loss of national/local/regional identity? b. Can this process be prevented in the context of architecture? c. How to create sustainable architecture and preserve its regional character in the conditions of progressing globalization? The goal is to confront the ideas of sustainable development and globalization and to show the consequences of globalization in the transformation of the architectural message. The research methods used were: case studies, literature studies, as basic in-situ research and a descriptive method. The reason for taking up the topic were the research conducted by the author during study trips to European, Asian and American countries.

RESEARCH PROJECT AND CONCEPT DESIGN OF THE SPATIAL DEVELOPMENT OF THE AREA EARMARKED FOR RECREATIONAL FUNCTIONS IN MYSŁOWICE KOSZTOWY

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ABSTRACT

The objectives and premises of the competition design were formulated on the basis of the assumptions of the research project. The partner defined their expectations connected with the design. They also designated plots of land in the city of Mysłowice, Kosztowy district, which are earmarked for recreational functions for the district inhabitants in the future. The partner simultaneously assumed that the designated plots will be linked by means of traffic and pedestrian circulation becoming thus an attractive, multifunctional leisure area. Specific circulation and road communications solutions may contribute to the increase in the inhabitants' mobility and physical activity due to the creation of a circulation loop. While moving along the loop, either on foot, by bicycle, rollerblading or nordic-walking, users can access the route at any point, complete the whole loop and come back to the original point. Another attraction is that the loop is accompanied by adjacent recreational plots serving different purposes and featuring various facilities. The design took into consideration all age groups of the inhabitants – from small children to senior citizens. The research project aimed to develop guidelines for the urban-planning concept design for the development of recreational areas in the district of Kosztowy in the city of Mysłowice. The research work consists of two main parts:Part I of a research nature involved urban-development analyses of the areas earmarked for recreation – in situ research, development of research tools for the evaluation of the existing conditions and functional requirements; the studies of inhabitants' needs were conducted during focus meetings with their representatives, carried out within the framework of workshops with the participation of students, external parties interested and inhabitants – future users of these areas. As a result, the guidelines for the project were elaborated. Part II – of a design nature involved the preparation of the design concepts of the development of five plots earmarked for recreation in Mysłowice-Kosztowy on the basis of the project guidelines. The whole project was carried out on the grounds of the competition rules of the Students' Research and Design Competition. The investigations were conducted at the Faculty of Architecture of the Silesian University of Technology (Politechnika Śląska), within the framework of the subject of a research nature: Survey and Examination Methods of the Quality of Buildings and Urban Spaces (MBJBiPU), at the level of full-time, first-degree studies, in the winter term of the academic year 2018/2019. The investigations involved 85 students, who formed 16 design teams consisting of 5-6 persons. The work at the project was divided into phases, including the following parts: research, concept and designing. As a result, taking into consideration previously developed project guidelines competition designs were created.

INFLUENCE OF GRAPHITE OXIDE ADDITION ON THE PROPERTIES OF MAGNESIUM OXYCHLORIDE CEMENT COMPOSITES

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ABSTRACT

Magnesium oxychloride cement (MOC) is considered as an eco-friendly construction material that is used in industrial as well as in residential applications thanks to its better performance in comparison with Portland cement (PC). Magnesium oxychloride cement composites, formed during the reaction between light burned magnesium oxide powder and magnesium chloride solution, belong to nonhydraulic materials and offer the advantage of high early strength and low porosity. These performances could, however, be further improved by incorporating of selected nanomaterials. This paper therefore presents an experimental investigation of magnesium oxychloride cement paste with graphite oxide admixture. The chemical composition of raw light burned magnesium oxide powder was analysed by X-Ray Fluorescence (XRF) and the morphology of graphite oxide was characterized using High Resolution Transmission Electron Microscopy (HR-TEM). Graphite oxide (GO) was added into the mixture in a concentration of 0.5 wt %. Subsequently, the influence of GO on the properties of hardened MOC paste was analysed in terms of its bulk density, specific density, open porosity and compressive and flexural strength measurement. The characterisation of studied pastes using X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM) analysis was done as well. It was found that the presence of GO significantly enhanced the flexural strength, decreased the open porosity and slightly improved the compressive strength compared to the plain MOC paste. The obtained results suggest that with the addition of graphite oxide to magnesium oxychloride cement MOC-based nanocomposites intended for civil engineering can be developed. These are characterized by high strength and low porosity which is particularly important for reduction of moisture related damage.

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MOC CEMENT-BASED COMPOSITES WITH SILICA FILLER AND WOOD CHIPS ASH ADMIXTURE

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ABSTRACT

Billions of metric tons of Portland cement are produced over the Earth annually which represents serious environmental burden due to the release of huge amount of CO_2 within the decomposition of limestone and burning of coal in cement production plants. As Portland cement and cement-based materials are the most widespread materials in construction industry, there is a concern to develop and search cement alternative materials with similar or better functional properties and a lower negative environmental impact. Magnesium oxychloride (MOC) cement is considered as low-energy and low-carbon binder possessing some advantageous properties superior to Portland cement. Therefore, lightweight MOC cement-based composites were designed and tested in the presented study. As filler, silica sand was used in composition of control composite mix. Later, it was partially replaced with wood chips ash coming from bioenergy production from biomass. The chemical composition and morphology of raw additives were characterized using X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) analyses. For the hardened composites, bulk density, specific density, and total open porosity were measured. Among mechanical parameters, flexural and mechanical strengths were tested. The thermal performance of composites was studied using a transient hot disk method and the assessed parameters were thermal conductivity and volumetric heat capacity. The use of fly ash led to the great decrease in porosity compared to the control materials with silica sand as only filler. The mechanical strength of all developed materials was high. If required, this makes possible lightening of the composite structure and thus improvement of thermal insulation performance. Both the compressive strength and flexural strength decreased with the dosage of wood chips ash in composite mix. However, the decrease in mechanical resistance was lower than the sand replacement ratio. It clearly proved assumption of filler function of fly ash, whereas its assumed reactivity with MOC cement components was not proven. The heat transport was partially mitigated by wood chips ash use, similarly as heat storage. Based on the obtained data, the developed composites were considered as alternative low-carbon materials possessing interesting functional properties for construction practice. Moreover, the reuse of by-product from biomass bioenergy treatment can be considered as an environmentally friendly solution for production of sustainable advanced building materials.

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EFFECTS OF COGNITIVE DISTRACTION ON DRIVER'S STOPPING BEHAVIOUR: A VIRTUAL CAR DRIVING SIMULATOR STUDY

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ABSTRACT

Drivers are prone to distractions while driving, due to conversations they have with passengers on board, processing their thoughts or using their mobile phones. These distractions result in a mental workload that compromises driving safety and requires the implementation of risk compensatory behaviours. This study examines the effects of hands-free mobile phone conversations on young drivers' stopping manoeuvres when a pedestrian enters a zebra crossing. A cohort of seventy-eight university students, aged 20-30 years old, performed a driving task in a virtual urban environment, by means of a virtual car driving simulator. They formed a control and an experimental group, balanced on age and IQ level. The control group was left free to drive without any imposed cognitive task. The experimental group was asked to drive while making a phone call that was planned to diminish the amount of cognitive resources allocated to the driving experience. For both groups, the analyses focused on a specific moment, i.e., while a child suddenly entered a zebra crossing from a sidewalk. Throughout the simulation, the intensity of the participants' actions on the brake pedal, accelerator, and steering wheel were recorded with a time step of 250 ms. Before the virtual driving experiment, each participant completed a questionnaire on his/her daily driving style, involvement in road accidents, and general mobile phone usage even while driving. A two-way between-groups ANOVA was applied to analyse the impact of mobile phone distraction on average speed profiles of drivers nearby the pedestrian crossing and to control for the potential effect of gender on driving behaviour. The results showed the absence of any gender-related difference in the participants' speed profiles. Nonetheless, a significant difference was found for distracted and non-distracted drivers. Indeed, the former assumed lower initial speeds as an element of risk compensation and took the first action to stop at shorter distances from the pedestrian crossing. This suggests a delayed perception of the presence of the pedestrian. In addition, the fluctuation in speed after the distracted driver had released the accelerator pedal reached a statistical significance compared to the control group. These findings suggest that the distraction induced by the use of the mobile phone through the ear-phones may adversely affect driving behaviour and raise significant safety concerns.

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NUMERICAL CHARACTERIZATION OF HIGH MODULUS ASPHALT CONCRETE CONTAINING RAP: A COMPARISON AMONG OPTIMIZED SHALLOW NEURAL MODELS

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ABSTRACT

Knowing the relationship between the stiffness modulus and the empirical mechanical characteristics of asphalt concrete, road engineers may predict the expected results of costly laboratory tests and save both time and financial resources in the mix design phase. In fact, such a model would make it possible to assess a priori whether the stiffness of a specific mixture, characterised in the laboratory only by the common Marshall test, is suitable for the level of service required by the road pavement under analysis. In this study 52 Marshall test specimens of high modulus asphalt concrete were prepared and tested in the laboratory to determine an empirical relationship between stiffness modulus and Marshall stability by means of shallow artificial neural networks. Part out of these mixtures was characterised by different types of bitumen (20/30 or 50/70 penetration grade) and percentages of used reclaimed asphalt (RAP at 20% or 30%); a polymer modified bitumen was used in the preparation of the remaining Marshall test specimens, which do not contain RAP. For the complex and laborious identification of the neural model hyperparameters, which define its architecture and algorithmic functioning, the Bayesian optimization approach has been adopted. Although the results of this methodology depend on the predefined hyperparameters variability ranges, it allows an unbiased definition of the optimal neural model characteristics to be performed by minimizing (or maximizing) a loss function. In this study the mean square error on 5 validation folds was used as loss function, in order to avoid a poor performance evaluation due to the small number of samples. In addition, 3 different neural training algorithms were applied to compare results and convergence times. The procedure presented in this study is a valuable guide for the development of predictive models of asphalt concretes' behaviour, even for different types of bitumen and aggregates considered here.

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FINITE ELEMENT MODELLING OF ULTRA-HIGH PERFORMANCE FIBRE REINFORCED CONCRETE

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ABSTRACT

Ultra-high performance fibre reinforced concrete (UHPFRC) is a relatively new material showing increased use for practical engineering problems. While a number of experimental studies on the response of UHPFRC members can be found in the literature, limited finite element based numerical studies have been reported. As such, the aim of this research project is to provide the analytical tools required to ensure safe and efficient design of UHPFRC structures. Specifically, the project will investigate constitutive models for finite element analysis and develop recommendations on modelling techniques for UHPFRC elements. Although significant research has been undertaken in the development of constitutive models for steel fibre reinforced concrete (SFRC), the reliability of using these models to analyse UHPFRC remains unassessed. Current algorithms in nonlinear finite element analysis software VecTor2 were modified and improved to strengthen the program's capabilities in modelling UHPFRC elements. Using data from five large-scale pure shear tests previously conducted at the University of Toronto, a finite element model was developed for the analysis of UHPFRC shear-critical elements. These specimens contained 2% fibres with varying amounts of conventional reinforcement, and were loaded in pure shear using the University of Toronto's Shell Element Tester. Parametric studies, including Stochastic Monte Carlo simulations, were conducted to determine the parameters affecting the behaviour of UHPFRC elements. In VecTor2, existing tension stiffening models for SFRC members such as the Variable Engagement Model (VEM) and Simplified Diverse Embedment Model (SDEM) were compared and investigated for their applicability in analysing UHPFRC. Localized behaviour at cracks was also investigated, which led to improvements in current crack spacing formulations through the inclusion of an effective aggregate size for UHPFRC due to fibre frictional effects. An embedded steel reinforcement rupture formulation for specimens subjected to tension was also implemented to predict reinforcement rupture strains of reinforced concrete specimens. Finally, studies were conducted to validate these models for structures subjected to other loading effects by comparing the finite element simulations with experimental results found in the literature.

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PROPOSAL OF EMPIRICAL HOMOGENIZATION OF MASONRY WALL MADE OF AAC MASONRY UNITS

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ABSTRACT

The article present own validation procedure of numerical FEM model of masonry wall made of autoclaved aerated concrete (AAC) masonry units. Empirical calibration of masonry's mechanical parameters was carried out in standard tests of compressed and diagonally compressed wall. In the numerical calculations an elastic-plastic material model with degradation was used. This model in compression phase uses the Menetrey-William (M-W-3) plasticity surface and in tensioning state the Rankine criterion is used. In the first stage, axially compressed walls were analyzed. Fracture energy was changed, leaving the remaining parameters unchanged. The relation between load – vertical and horizontal strains was compared. Walls cracking patterns was also analyzed. In the second stage, the calibration involved changing the tensile strength of the wall in diagonally compression test. The relationship between shear stresses and form strain angle was compared. Satisfactory convergence in the range of maximum stresses and significant differences in terms of form strains were obtained. In the third stage, the modulus of elasticity was calibrated, the results of laboratory tests and numerical calculations were compared. Along with the reduction of the cracking energy value, the mean square error of vertical deformations also decreased. In the case of horizontal deformations, this tendency was not so pronounced. The reduction in cracking energy also affected the way the walls were scratched - the smaller the parameter value, the scratches were closer to the vertical edge of the model. The best convergence in terms of maximum tangential stress and scratch morphology was obtained in the model in which the tensile strength was reduced by 80%. However, the values of the form deformation angle were more than twice smaller than empirically determined. The calibration of the modulus of elasticity resulted in a better matching of relationship between shear stress and angle of form deformation. Unfortunately, this approach generated an increase in the estimation error in the calculation of compressed walls, especially in vertical deformations. The reliability of the proposed validation method was additionally verified on wall models of larger dimensions. The article is a continuation of the author's considerations regarding the author's validation method of the FEM masonry model (Jasiński, WMCAUS 2019).

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RESEARCH OF INFLUENCE OF BED JOINTS REINFORCEMENT ON STRENGTH OF MASONRY SHEAR WALLS WITH OPENINGS MADE OF CALCIUM SILICATE MASONRY UNITS

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ABSTRACT

The article is an extension of the topic presented in 2018 (Jasiński 2019 - WMCAUS 2019) in which the influence of reinforcement on the behaviour of reinforced shear walls reinforced in bed joints is discussed. The article presents the results of tests on unreinforced and reinforced walls made of calcium silicate masonry elements with openings of various shapes. The main purpose of the experiments was to determine the impact of the reinforcement used on the morphology of cracking and the values of cracking and destructive forces. All walls are made of calcium silicate masonry elements with vertical hollows (Group I acc. EN-1996-1-1). 12 walls with external dimensions equal to l = 4.45 m, h = 2.45 m, t = 180 mm with openings varying in shape and size were made and tested. Steel truss type reinforcements EFZ 140 / Z 140 type (type Z1) and plastic meshes (type Z2) were used for reinforcement. The models were divided into six series differentiated in terms of the shape of the opening and the type of reinforcement. The openings in the walls were designated conventionally with the symbols A, B and C. The A-type hole was a single window opening 1.50 m long and 1.12 m high. In this series of elements, two models reinforced with steel trusses (HA-Z1 – Z1 type of reinforcement) and two reinforced with meshes (HA-Z2 – Z2 type of reinforcement) were made and tested. Also, the B-type opening was a window opening with a larger length of 2.50 m and a height of 1.12 m. Also in this series two reinforced models were made and tested (HB-Z1 – Z1 type of reinforcement) and two reinforced with mesh (HB-Z2 – Z2 type of reinforcement). In contrast, the C-type opening was a combination of a 1.50 m long and 1.12 m high window opening and a 1.0 m wide door opening 1.90 m high. The HC-Z1 series was tested as in the series with A and B type openings (Z1 type of reinforcement) and HC-Z2 (Z2 type of reinforcement). The results were compared with test results for unreinforced walls with openings, tested under the same initial conditions. In all reinforced models, the reinforcement ratio of the elements was $\rho = 0.07$ ($>\rho_{min}$ 0,05). The walls were tested at initial compressive stress $\sigma_c = 0.1$; 1.5 or 0.75 N/mm^2. The mechanism of wall damage and changes in cracking morphology were analyzed for cracking and destructive stress values.

NUMERICAL VERIFICATION OF THE ELASTIC-PLASTIC MENÉTREY-WILLIAM MODEL (M-W-3) MASONRY SHEAR WALLS MADE OF CALCIUM SILICATE MASONRY UNITS

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ABSTRACT

The author's publication presented in 2019 (Jasiński, 2019 - WMCAUS) presents the methodology for validating the elastic-brittle model (SBeta) and the elastic-plastic model Menétrey-Willam (M-W-3) implemented in the ATENA system. The material parameters of the material models used were determined on the basis of triaxial tests of calcium silicate masonry units (Jasiński, 2016 - WMCAUS). This publication presents the practical application of a calibrated numerical model to shear walls. Shell, four-node finite elements (2D model) with two degrees of freedom at each node were used. Shear walls of varying lengths (l = 4.5 m and 2.25 m) 2.45 m high and 0.18 m thick were modeled. The walls were loaded sequentially in two stages. In the first stage, initial compressive stress σ_c of 0.1 was developed; 0.75 and 1.5 N / mm^2, in the second stage the walls were monotonically sheared horizontally. Calculations were carried out in a flat state of stress ($\sigma_1 \neq 0$, $\sigma_1 \neq 0$, $\sigma_3 = 0$). The obtained calculation results were compared with the results of tests on unreinforced walls (Jasiński, 2018 - WMCAUS) made of silicate masonry elements tested in identical initial and boundary conditions. The patterns of cracking at the time of destruction were compared, as well as the relationship between shear stress and strain angle, as well as values of cracking and destructive stresses. Calculations showed that the best convergence was obtained in the case of shear stress at the time of cracking. The largest discrepancies were obtained in the case of shear deformations at the time of destruction.

AN INTEGRATED APPROACH FOR DESIGNING A ZERO NET CARBON (ZNC) RESIDENCE IN A HOT AND HUMID LOCATION

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ABSTRACT

This paper presents the performance results of a residential project located in a hot and humid climate zone (2A). Multiple design tools focusing in building performance were used since early design stages. The tools covered climatic and site analysis, envelope geometry, shading, daylighting, material selection, assembly, ventilation, energy codes, and annual energy consumption. Each tool provided feedback to the designers to make informed decisions. The house has 158m^2 (1,700ft^2) of conditioned area, and a detached garage of 55.7m^2 (600ft^2). The house has a rectangular layout along the East-West axis, within a trapezoidal lot of 906m^2 (9,755ft^2). Most of the windows are South-facing, with minimum openings to the East and West. The building owner aimed for a ZNC building (ZNC is an energy efficient building that produces enough carbon-free renewable energy to meet annual building energy consumption). The house is currently under construction. The design approach was to integrate to the design process the use of multiple non-BIM tools with the goal to comply with AIA Architecture 2030 Challenge to reduce energy consumption and greenhouse gas emissions. The simulations were done using weather files for the years 2020, 2050 and 2080. The tools were used to optimize the building shape, orientation, window size, shading, insulation levels, glare. Parametric design tools were used to optimize the design during the development and construction phases based on costs. Strategies included, passive solar, passive cooling, daylighting, ventilation, shading, high insulation, hurricane protection, photovoltaics (PV), and reduced infiltration. The overall simulated performance demonstrated that the predicted EUI is below Architecture 2030 target of 12 kBTU/ft^2/year, without PVs. The daylighting levels in the regularly occupied spaces achieved LEED 4.0 daylight credits: Spatial Daylight Autonomy over 75%, and Annual Sunlight Exposure was below 10%. Glare metrics (Daylight Glare Probability and Daylight Glare Index) reported imperceptible glare.

INVOLVING CITIZENS THROUGH WALKING: URBAN WALKS AS A TOOL FOR AWARENESS RAISING IN HISTORIC BUILT AREAS

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ABSTRACT

Public participation in decision making is a hot topic for spatial planning for many decades. The Aarhus Convention since 2001 is granting the public, among others, rights for public participation. However, as Arnstein already in 1969 wrote, there are many levels of participation and ever since the publication of her paper scholars as well as practitioners are deliberating various levels and multitude of tools of how to involve the public, in what stage, up to what depth to make it as effective and efficient as the situation allows. Urban walks present one of the methods of stakeholder involvement in which participants, usually local citizens, are guided through a walk in the site with experts explaining their ideas and collecting remarks from the participants. They offer an opportunity of community engagement and informal discussion on various topics in the decision making processes, to witness successful examples and innovative tools. They are one of the most appropriate ways for awareness raising among the general public as they offer in-situ exploration together with face-to-face discussions with professionals who are guiding the walk. The paper examines a set of 8 urban walks taking place within the INTERREG-Central Europe BhENEFIT project aimed at raising awareness and building capacities in the field of sustainable management of historic built areas. Altogether, there were 148 participants in these events and at the end of the urban walks they filled in the feedback forms. Responsible partners also prepared detailed reports about all of these events and together with feedback forms these are analysed and the results are presented within this paper. The method of urban walks had been selected as a proper way to involve citizens in the project, to help disseminate the project results and make the citizens a part of the decision making in historic built areas in the project pilot sites. The results from the analysed reports give evidence supporting the effectiveness of this method. The paper further on discusses different forms of public involvement for future events and ways how to include the public in the decision making processes.

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SPATIAL PLANNING TOOLS AS KEY ELEMENT FOR IMPLEMENTATION OF THE STRATEGY FOR AN INTEGRATED GOVERNANCE SYSTEM OF HISTORICAL BUILT AREAS WITHIN THE CENTRAL EUROPE REGION

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ABSTRACT

A strategy represents a plan of actions designed to achieve a long-term vision, mission and related goals according to a generic definition. Regardless of the quality of a strategy, it´s still only plan or framework which need to be implemented. For reaching the genuine effects and qualities incorporated within the objectives of the strategy, a wide set of integrative tools needs to be considered. Especially, when we are talking about the integrative strategy not only from a territorial point of view but also content, sources, challenges, time or multilevel integration. The strategy for the integrated governance system of historical built areas (later only HBA) is precisely this type of integrative strategy. The paper is focused on the provision of an overview of available integrative spatial planning tools (socio-economic, land-use, land-scape planning tools) which have the potential to support or realised implementation of the goals. Spatial planning offers wide range is integrative approaches and tools supporting the participation of all groups of stakeholders what is also key aspects of successful implementation of this kind of strategies. The article demonstrates this approach on best practice from the city of Poprad (Slovakia) where historical built areas are important parts of the city, while the strategy is including also this city. The paper, in particular, summarizes the preliminary outputs of international project Bhenefit supported by Interreg Central Europe Programme. The project is focused on improving sustainable management approaches of historic built areas and looking for novel solutions improving decision-making and managing processes efficiently, through strategy-based approach and effective monitoring and assessing, risk prevention, environmental sustainability, conservation and re-use.

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THE MODERNIST RESIDENTIAL BUILDINGS OF LODZ - TENEMENT HOUSES AND VILLAS

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ABSTRACT

In the history of city construction, the process of previously existing buildings has always taken place. Buildings were always adjusted to the changing utility, as well as technical needs. Inner-city tenement houses and villas erected in the years 1918-1938 became the topic of this article. The residential buildings of Lodz which appeared during the interwar period are still relatively well preserved. These objects are strongly rooted in the city's current landscape. The images of these buildings are dependent on the awareness and aesthetic sense of their current owners and residents. The discussed structures crystallize the city's space and builds its identity. The author attempts to show, through particular examples, the changes which are taking place, as well as their influence on their surroundings; she tries to zoom in on their current function and appearance. This paper constitutes a type of a report from own research, based on information collected during filed studies and analyzing available literature.

RELIABLE STRENGTH DOMAINS FOR LRPH

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ABSTRACT

As well known, the modern approach to the structural optimization consists in designing structures possessing adequate resistance, stiffness properties and ductility for optimal behaviour in serviceability conditions as well as in limit conditions. Therefore, in order to satisfy the above requirements, an optimal structure should be constituted by structural elements exhibiting elastic and limit behaviour independent of each other. With reference just to the improvement of the ductility capacity, some researchers proposed suitable modifications of standard steel element geometry in order to obtain a reduced resistance capacity. In particular, the so-called “dogbone” profiles (see, e.g., Plumier, 1997) and the approach developed within the research project FUSEIS (see, e.g., Tsarpalis, 2017) have been proposed. Both methodologies are aimed to obtain a greater structure ductility and a high protection of the node in terms of stresses, but they do not obtain the desired independence between stiffness and strength features of the involved elements. In some recent papers (see, e.g., Benfratello et al. 2017, 2019, 2020), some of the authors proposed an innovative device, called Limited Resistance Rigid Perfectly Plastic Hinge (LRPH), with appropriate and independent stiffness and resistance characteristics. LRPH is a special steel connection devoted to join beam elements of plane or spatial steel frames. It is covered by patent n. 102017000088597 at the Italian Ministry of Economic Development and identified in the International Patent System with the number PCT/IB2018/055766. The fundamental novelty of the proposed device consists in the mutual independence between its resistance and stiffness features. The device is constituted by a sequence of three steel elements of limited length bounded by two parallel steel plates joined up with the connected structure elements. The cross-sections of the three steel elements are classical I-sections with appropriate wing and web thicknesses. In order to verify the full reliability of the proposed device it is necessary to evaluate its limit behaviour, by the definition of appropriate resistance domains, and its equivalent (bending) stiffness. These features depend on the material strength characteristics, on the material elastic characteristics and on the special device geometry as well. Indeed, the relevant device is produced in factory by the realization of flanges of given thickness suitably welded. All the involved quantities must be considered as stochastic variables and their variability can be defined by means of appropriate probabilistic distribution functions. Fundamental aim of the present paper is the evaluation of the influence of these stochastic variables on the resistance domain definition and on the determination of the equivalent bending stiffness of the device. By the present study, it will be possible to evaluate in stochastic sense the real reliability of the proposed device with respect to the expected behaviour.

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SPATIAL REPRESENTATION AND MEMORIES OF VIOLENCE

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ABSTRACT

Spatial transformation may require several events that any community experience over a period of time. At the intersection of space, people's behaviour and ethnography, this paper connects spatial representation of memories of violence and the engagement of public space in the creation of collective local identity like the cases of many cities in Palestine, mainly Nablus and Jenin. Living many decades under the Israeli occupation directed and generated the production of syntax of commemoration extracted from the sense of identity, resistance and violence. In other words, the urban fabric becomes the medium to communicate the stories of those who are not present to tell them. Memories are scrawled on the city walls with graffiti for those who had been martyred during the several Israeli attacks. Similarly, public space has been altered to incorporate spatial memories in forms of murals, monumental sculptures, and engraved names of those who sacrificed their lives. It is quite challenging for people to survive and to maintain the future and the *now* is unsecured "[p]eople have to make do with what they have" (de Certeau, 1984). The phenomenon of commemorating the Palestinian martyrs create a new sytax of spatial documentation and representation either within the existing urban fabric or the newly built. Following an ethnographic research approach carried out in the old town of Nablus and Jenin Refugee Camp, this paper attempts to bring people's stories and memories to shed light on the emerging spatial representation. It also discusses that the notion of bringing memories to the "everydayness," the Palestinians embedded enormous momentum of resilience supporting their survival and ongoing resistance.

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EXTRACTING THE CURRENT SEASONAL COLORS AND SMELLS USING SOCIAL NETWORKING SERVICE

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ABSTRACT

The purpose of this study is to examine a method to extract the “sense of the season” through colors and smells. The research method is based on the Twenty-four Divisions of the Solar Year as units to extract. We analyse the collect data using geospatial information system and text mining (KH coder) software. The results show that there are from 64 to 77 seasonal colors. The smells of the season occur in the Specific period. Outside of this we cannot significantly detect the seasonal smells.

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MODELLING OF STORMWATER DRAINAGE SYSTEMS IN RESIDENTIAL AREAS

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ABSTRACT

All the processes that take place in an urban water system are part of the hydrological cycle of water. Any urban development will have a negative impact on the environment, but through an optimal approach and management of rainwater, stormwater drainage and pollution leakage, we prevent the degradation of these natural resources. This paper presents aspects regarding the management of the stormwater on the surfaces related of the developed residential areas within the localities, which do not have a centralized system of meteoric sewage. In the most localities, the stormwater is not collected centrally. Its is been evacuated through the slopes of the lands to the gutter, where it is existing and to the areas with the lowest levels of the localities. In recent years the climate change and poor management of the stormwater in these localities lead to a major risk of flooding. The paper analyses the potential flood risks of the drainage system designed for the residential area in the analysed river basin.

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STORMWATER MANAGEMENT IN INDUSTRIAL AREAS IN BUILT-UP AREA AND NON-BUILT-UP AREAS OF LOCALITIES

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ABSTRACT

The theme of the paper is managing the meteoric waters of industrial areas located in built-up and non-built-up areas of localities. In order to better administer meteoric waters in localities, it is necessary to have a study on water management of these meteoric waters, in which it will be included a plan of implementing it. Until the implementation of these studies, water management of meteoric waters in the industrial areas will be carried out independently, but which must consider the solutions provided for it, in the study for each locality. The meteoric sewerage system for industrial areas must consider: the location of the objective towards the locality, the nature of the land, the existing sewerage system of the locality, the existence of water courses and the drains in the studied area. The most optimal technical solutions for the collection, storage, treatment and disposal/use of meteoric waters from industrial zone premises shall be analysed.

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CHILDREN'S GENDER AND USE OF SPACE AT HOME

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ABSTRACT

Previous studies show that the formation of children's gender roles are primarily affected by their family, the home environment, friends, and their choice of toys. The most vital and primary factor that shapes children's gender, is their psychological and social life with regards to their domestic life and within the home environment. This study discusses possible issues connected to gender-based play and toys, and relations with children's space use at home. Research shows, gender-neutral children's spaces may assist in providing children spaces that enhance freedom and creativity. Thus, this study was conducted with Turkish children between the age of 7-13. During the research, children's play and lives at home were analyzed. The study was focused on the relationship between space use and gender identity of children and examined how it affected children's behaviour. In addition, the study concentrated on how parents affect their children's choices while the children select and define a specific space like a room or corner in their homes. The study progressed with three instruments, which are; schematic plan/ diagram, photography, and one-to-one interviews with both children and parents. The whole process was recorded on video with the permission of the parents. According to the results, children were found to be more willing to play and spend their times in their living rooms. While, girls were more interested to represent themselves in social spaces, boys were more reserved than girls. The children generally preferred to spend time close to family members. Therefore, if there is an intention of creating gender neutral spaces for children, parents should consider such issues such as, decreasing the gender-typed colours and objects, providing flexibility regarding the transparency of the space, increasing the interaction between parents and children, and giving children the option of being both inside of the space and also outside of the space. This study was completed with the aim of reducing gender differences of children's spaces and creating guidelines for interior designers and parents in this regard. This is believed to have significant value in designing independent spaces with interior design principles for children who are desperate to identify a space of their own.

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UNDERSTANDING OF CLIMATE CHANGE FROM THE ENGINEER'S PERSPECTIVE

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ABSTRACT

In this paper we want to answer the question: What role does the engineer play in climate change? We are talking about climate change today, and this is observed in the variation of extreme phenomena. Floods, drought, fires affect the infrastructure and the installing engineer design, executes, maintains and rehabilitates the infrastructure. In this paper, when we refer to the infrastructure, we talk about water supply systems, energy, gas, but also sewage systems. They must take into account the reduction of greenhouse gases, the adaptation to climate changes and at the same time they must provide safety and be sustainable. Anticipating the negative effects of climate change is necessary to prevent or reduce as much as possible damage. At present, all EU countries must achieve, a reduction of greenhouse gas emissions by at least 20%, an increase in the share of renewable energy with at least 20% of consumption and energy savings of at least 20%, which involves energy transition. That is, historically speaking we refer to the fourth energy transition (the transition from fossil fuels to renewable sources). The structural change objectives of the present energy transition will motivate the installation engineer to approach innovative solutions or to find systems for integrating renewable energy into existing systems. Given the difficulties that this energy transition faces, considering and in the context of current climate change, we consider that the plant engineer will have a major role in adopting and implementing "green" technologies. The work will be structured on three parts. In the first part we will talk about what the notion of climate change means for an engineer, in the second part we will highlight the sectors in the field of installations with an impact on climate change and in the third part, the case study will be an analysis of to the installing engineer regarding the relationship of comfort - environmental protection - cost. The conclusions will highlight the importance of the engineer, and especially of the installation engineer, in the process of anticipation, adaptation and mitigation to climate change.

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POTENTIAL IMPACT ON THE ENVIRONMENT AND REDUCTION MEASURES IN THE CASE OF THE TEMPORARY PERIMETERS OF MINERAL AGGREGATES EXPLOITATION: CASE STUDY OF "TEMPORARY PERIMETER OPERATING IN RIBIȘULUI VALLEY", SOCOL LOCALITY, CARAS-SEVERIN COUNTY, ROMANIA

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ABSTRACT

In order to achieve the objectives of the exploitation program for the resources of magmatic rocks in the perimeter of Valea Ribișului, Caraș-Severin County, works of opening, preparation and exploitation will be carried out during the validity period of the exploitation permit. The analysis of the geological-mining conditions of the metadolerite deposit leads to the conclusion that the metadolerite reserves can be exploited by mining works in the quarry. In the geological-mining conditions of the deposit, for the execution of the quarry, the method of exploitation with descending steps is envisaged, which can be used in deposits of massive industrial and construction rocks. The landscape given by the vegetation will be permanently affected as a result of the exploitation of the aggregates and measures can be taken to reduce the impact. The purpose of the paper is to evaluate the impact on the environment using models and participatory methods, taking into account the situation when there are no concrete data related to the evaluation of the objective, or they are not sufficient or relevant.

PREDICTING THE SHEAR STRENGTH OF FIBRE-REINFORCED CONCRETE DEEP BEAMS BASED ON A SIMPLIFIED TWO PARAMETER KINEMATIC MODEL

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ABSTRACT

Deep beams with small shear span-to-depth ratios (a/d ≤ 2.5) are typically used to resist large shear forces due to their ability to develop direct strut action. Fibre-reinforced concrete (FRC) can be used to further enhance the shear strength and crack control of such deep beam members. As the improved shear strength of fibre-reinforced concrete is mainly due to its enhanced behaviour in tension, it is not well suited for the traditional strut-and-tie approach which neglects the tensile strength of concrete. This presentation proposes an alternative model based on first principles: kinematics, equilibrium and constitutive relationships. The proposed model simplifies an earlier two-parameter kinematic theory (2PKT) for the complete shear behavior of FRC deep beams, to predict the shear strength and components of shear resistance in a sufficiently simple manner. The new simplified method (S2PKT) is validated by comparing the predicted results to 22 tests from literature, as well as to FEM and 2PKT predictions. It is shown that the proposed simplified kinematic approach models well the shear strength with an average experimental-to-predicted shear strength ratio of 1.12 and a coefficient of variation of 12.9%. Furthermore, the model is used to discuss the effect of shear span-to-depth ratio and fibre volumetric ratio on the shear strength of FRC deep beams.

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FRAGILITY CURVES FOR ASSESSING THE SEISMIC VULNERABILITY OF MULTI-DRUM ANCIENT COLUMNS

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ABSTRACT

The paper deals with assessment of the seismic fragility of multi-drum ancient columns in the probabilistic assessment framework of incremental dynamic analysis (IDA). The dynamic response of multi-drum ancient is governed by the motion of stone-drums which can rock and slide individually or in group, individuating different possible collapse mechanisms, which are also depending on ground motion intensity. In this research, two different in geometry columns i.e. different height and number of drums analysed. The columns were modelled using the UDEC software based on the discrete element method (DEM). IDA were carried out for 10 ground motion records with and without considering the vertical component of earthquake excitation, in order to assess also its influence on the resulting fragility. Results are provided in terms of fragility curves and allow evaluating the influence of the geometrical assembly of the columns and vertical component of the ground motions

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CRACKING ANALYSIS OF PLANE STRESS REINFORCED CONCRETE STRUCTURES

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ABSTRACT

This article presents the numerical analysis' results of reinforced concrete elements subjected to plane stress in early cracking stage. The elements are modelled by a concrete two-dimensional matrix, discrete reinforcement bars and bond-slip elements. The aim of this study is to investigate the behaviour of RC structures before and after the formation of the first cracks to understand the influence on the crack spacing and width of bar orientation with respect to crack direction, bar spacing and diameter and presence of shear stresses on the crack. Discrete crack non-linear analysis of elements with reinforcement both orthogonal and skew to the crack directions are performed. The interaction between concrete and steel is ensured by a non-linear bond slip law at the interfaces between the two materials. The crack spacing obtained numerically are compared with the ones calculated using different design codes. The analysis of models with different reinforcement geometries allows to individuate and discuss the main factors governing two dimensional plane stress concrete cracking behaviour.

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CALIBRATION OF GROUND PRESSURE ON TUNNEL LINING IN GENETIC ALGORITHM APPLICATION FOR STRUCTURAL MONITORING

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ABSTRACT

The realization of underground structures is today more common than in the past within the construction of modern infrastructures for road and railway transport. Tunnel excavation has positive effects on the protection of landscape and traffic noise reduction, but it is nevertheless a procedure that faces many unknowns, because of the high variability of geological and geotechnical parameters that may be found during the realization. Monitoring of tunnels during excavation is today a standard approach, but structural health monitoring (SHM) of these structures throughout the complete service life is not a widespread technique. During the last years, the evolution of low cost sensors, the development of high-speed internet communication, the birth of cloud based services and the rise of big data platforms, have changed the possible applications of structural monitoring that can now be deployed on large scale to infrastructures. This article presents the evolution of an algorithm that can be applied to a diagnostic system for tunnels developed by the same authors. The aim of this work is the analysis of typical ground trust shape functions to be introduced in the library of a genetic algorithm in order to calculate the forces acting on tunnel lining starting only from the quantities measured by a set of clinometers and pressure sensors placed inside the lining itself, without any other knowledge of geotechnical or geological parameters. The knowledge of proper trust shapes, derived from geotechnical simulations, increases the performance of the algorithm in terms of convergence and correctness of the result. Some benchmarks of the genetic algorithm applied on geotechnical f.e.m. results is also given.

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ARCHITECTURAL DESIGN AND METHODS INSPIRED BY CHILDREN'S CULTURE AND CREATIVITY (GLOBAL CULTURE AND SPATIAL INDIVIDUALIZATION)

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ABSTRACT

The topic of children and adolescents in architecture was particularly explored in the modern era. This phenomenon was among others a result of actual social and demographic conditions and development of social sciences and psychology. The 20th Century, that was called a Century of the Child, was a period of specific 'childhood worship'. It was a time of tremendous hopes placed in the young generation and its potential to rebuild the world. The result was that the ubiquitous theme of child and childhood has appeared also in the architectural theory and practice. The purpose of research is to answer a question: How a topic of 'child in architecture' may inspire in the times of aging societies? Principal results of the research is to distinguish three aspects of the phenomenon of 'child in architecture'. 1. A child was discovered as a user - special places were prepared for children - zone of special characteristics at home and in the city, with design solutions inspired by the child's developmental needs. 2. Children's culture and creativity has become an inspiration of spatial solutions of the environment [designed for children and adults] and urban regeneration of the public space. 3. A child was asked as a co-creator in the process of the participatory design. It became an active user, communicating his needs, a partner that inspire future project activities. The subject of the child in architecture, discovered and explored in the last century, generated a new typology of solutions [directed to children or inspired by the culture of childhood]. Over time, patterns from the world of adults and children began to intertwine, creating a new type of multi-generational solutions in the public space. The child's zone has been built into the architecture of the city in the concept of mixed use [which is a distinguishing feature of contemporary solutions]. Major conclusions of the paper can be drawn as following. Homogenization, unification of the culture is one of the effects of globalization. Individualization of design solutions [for example adaptation to the requirements of specific age groups of users] can be a way to resist unfavorable space unification processes.

The paper is based on comparative studies of public utility buildings [serving in particular out of school education], as well as observations and comparison of the work of practicing architects, students and children participated in the workshop classes implemented at the Silesian University of Technology.

SPATIAL CHANGE OF LVIV IN THE POST-SOVIET PERIOD AND THEIR ASSESSMENT BY THE RESIDENTS

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ABSTRACT

The purpose of this study is to determine the tendencies of reflection of the socio-economic and spatial changes of the post-Soviet period in the minds of Lviv residents, to outline the factors influencing the transformations that are taking place. As the results of this research; historical development of Lviv – a multifunctional city with almost 800 years of history, cultural and educational center of Ukraine, was artificially transformed into an industrial center in the Soviet period. Transformations of Lviv image of the post-soviet period were investigated on the basis of official statistics, analysis of town-planning projects and selective urban inventory. The actions of the authorities in influencing the changes in the image of the city are analyzed on the basis of approved strategic documents of development, as well as the activities of local self-government bodies. During the last three decades, Lviv has lost its competitiveness, and there is a decrease in population due to both natural growth and migration; increasing concentration of people and business functions in its central part; problems of transport and preservation of the historical environment of the city are aggravated; tourist anthropogression on the city is growing and tourist erosion is increasing - Lviv is gradually becoming a «city of waiters and servants», traditions and values, developed over centuries, are destroyed. Assessments of image change in residents perceptions are analyzed by comparing their own research and questionnaires. 200 surveys were conducted, the results of which are follows: 1) An increase in the disorder of urban life and an increase in its intensity were recorded; 2) c the spatial image of the city is associated mainly with the growing importance of the old part of the city (localization of more and more services); 3) post-industrial territories are treated as places where the crisis of the city is visible; 4) the symbols of the city are unchanged, new ones are not named; 5) areas of high attractiveness in functional, social and aesthetic relations are distinguished, as well as low attractiveness spaces; 6) peripheral areas of the city as a place of residence provided a good communication system with Lviv is highly appreciated. It can be concluded that the spatial changes of Lviv in the post-Soviet period are generally assessed as critical. The residents point out that Lviv does not create a sacred image any more, it loses the aura of its intellectual and cultural center; the center is not attractive to architecture and history, but to restaurants that have transformed former art salons and bookstores; architectural identity and uniqueness are lost; space polarization is deepening (expensive commercial housing adjacent to neglected public spaces); commerce with a devastating excitement about the existing spatial order burst into the historical environment. The lack of a unified vision of city development and management of urban planning processes «in manual mode» causes chaotic and unsystematic changes that destroy the spatial structure, principles of city development and causes irreparable mistakes in its construction.

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ON RELATIONSHIP BETWEEN URBAN PARK AND SURROUNDING AREA

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ABSTRACT

The parks in cities have various functions. The functions are as s space for recreation, for creating a good urban landscape, for adjustment of urban environment such as air, for conservation of urban disaster prevention, for protection of disaster in the city. The parks have been used for a variety of purposes, but their use has been reduced since the 1980s. The reason for this is that the number of children playing outdoors has decreased, and human relations in the neighbourhood have become sparse in urban areas. Numerous studies have pointed out the lack of communication among nearby residents, which is attributed to the spread of video games, personal computers, smartphones. In this study, we investigated the accessibility of parks closed to us. This aimed at designing people to actively use parks that are considered important as a communication space for people. We also focus on the connection with the city. The target area is a block park in Asahi Ward, Osaka City. First, a field survey was conducted on usage conditions. The field survey was conducted from 15:30 to 17:00 in June and in July. Multiple regression analysis was performed to examine the relationship with the structures of the park. Field surveys were conducted for facilities inside the park, structures were extracted using GIS outside the park. The image analysis of the park viewed from the street was performed. From these results, it is clear that urban parks place importance on safety and security. In addition, it was found that the usage rate was high when there was a pavilion and street lamps. The usage rate was high when the visibility from outside of the park exterior was low.

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EVALUATION OF SCENIC HEALING AT VIEWPOINTS IN PARKS CONSIDERING DIFFERENCES IN MIGRATION BEHAVIOR

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ABSTRACT

Research background is that city optimization and efficiency are important in the development and conservation of cities, but on the other hand, they change the material properties and functions of the city to practical use, that is, inorganic materials. To promote urban optimization and efficiency, and to build attractive cities (assuming healing is given), we will focus on migratory behavior in urban green spaces. The reason for focusing on green spaces is that there is concern that the attractiveness of park stock will decline. Parks, which are public spaces, are places for people to relax, suggesting that they may contribute to diminishing communication with families and society and improving the quality of life. The purpose of this research is to capture the change in psychological potential associated with the change of visual landscape in migratory behavior in green space, to clarify quantitatively and qualitatively the extraction and structure of healing factors, and to evaluate the healing as a place. It is to show the way. The research method first identifies landscapes with significant differences in healing evaluations from the results of questionnaire surveys and field surveys. The landscape composition in the landscape is clarified, and the correlation is analyzed from the questionnaire result and the landscape composition ratio. As a result, we clarified the quantitative boundaries of landscape components as a place to give healing. This is to identify the boundary line where the sign of the healing evaluation changes in trees, lawns, roads, and other components among the ten landscape components. In the future, we will work to further improve the credibility and reliability of the research results by evaluating the place from a 360-degree viewpoint, which is an issue.

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ASSESSMENT OF THE EFFECT OF ENERGY SAVING AND HEAT LOSS THROUGH EXTERNAL ENCLOSURE STRUCTURES WITH LOW RESISTANCE TO AIR PENETRATION

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ABSTRACT

The features of heat and mass transfer through external enclosure structures with capillary - porous material, which are not taken into account in the norms of thermal protection of buildings, are considered. Such features more often occur in buildings with a long service life because of the increasing heat losses, caused by the violation of the terms of repair for a long time. For structures, located in the lower part of the building and having little resistance to air penetration, a calculation model is considered to determine the value of the economizer effect and the saving of thermal energy in conditions of cold air infiltration. The developed model clearly demonstrates, that for two - and twelve-story houses the saving of thermal energy, as a result of the economizer effect, is about 3% and 10% respectively. A computational model of exfiltration of warm air through similar structures, located in the upper part of the building, is proposed. An additional value of heat loss during exfiltration of the warm air from the rooms is determined, using an example of old building with a wooden floor of a cold attic and bulk insulation in the absence of layers with high resistance to air penetration. This value is 3.5 times higher, than that determined by the standard method, which does not take into account the redistribution of cold and warm air densities along the height of the building. This leads to a deterioration of the indoor climate and an increase in heat losses. By calculation, the dependence of the value of heat losses on the total thermal resistance of the attic floor and on the number of floors was established. A number of measures, aimed at improving the energy efficiency of existing residential buildings, are proposed, such as laying a vapor barrier layer and an additional layer of effective thermal insulation on top of the bulk insulation as part of the attic floor and installing a cement-sand screed for this insulation.

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EMANCIPATION THROUGH DUO SECTORAL MOBILITY

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ABSTRACT

Emancipation is setting free from legal, social, or political restrictions. What makes this concept the core of this research is that independence and equality are the two main principles embraced enabling duo-sectoral regional mobility, constituting emancipation along with their cooperation (Salihoğlu, 2016). Hereof, regional agglomeration economies stand as the source of regional inequality in most of developing country contexts. Therefore, the gap, rooted by such regional economic inequalities, reveals two parties; host as superior region and the parasite as non-superior one. For the host region in this sense, self-awareness by breaking their own chains is the key factor for the recognition and development of cities in it. The case research region, covering Antalya, Isparta and Burdur provinces at the West Mediterranean part of Turkey, exemplifies such metaphoric struggle of host (Antalya) and parasite cities (Burdur and Isparta) in one regional unit. Antalya, having the geographical advantage, creates the inequality gap such as the unequal regional distribution of logistics and investments. The accumulation of investments, activities and economic development in Antalya represents parasite-host relation between cities. Consequently, the aim is creating a regional balance by enabling emancipation of parasite cities. Finally, a strategic spatial plan research is conducted suggesting the solution as duo-sectoral mobility that reinforces the economy of Burdur and Isparta by using the opportunities and strengths in two sectors: industry and tourism. At the end of the research, it is revealed that the regional inequality can surely be reduced thanks to the sectoral mobility that provides a potent flow of goods and information within the region itself and the country. This process will break the chain on the arms of parasite cities. The new balance through new duo-sectoral mobility will have a vital role in the global market, through re-obtaining the self-awareness.

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CLASSROOM DESIGN FOR CHILDREN WITH AN AUTISM SPECTRUM

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ABSTRACT

In modern societies, the group of people with dysfunctions related to the spectrum of autism is becoming increasingly numerous. A specialized approach to space design for this group of people is becoming a necessity. Particular attention should be paid to the rooms where children with autism spectrum disorders spend a lot of time in a day - to classrooms. The arrangement of space can strongly influence their behavior. Special attention must be paid to the size and proportions of the room, the sense of order in space, proper sunshine, shading and ventilation, as well as to reduction of detail, the excess of which leads to aggression and lack of concentration in this group of people. The room's acoustics is also very important. Another important element is proper furnishing of the room, clearly informing about its purpose, or creation of clear zones. However, we are not always able (for procedural and financial reasons) to build new complex day care centers or schools for autistic people, and adaptations of existing rooms impose many limitations. However, despite this, at Tadeusz Kościuszko Primary School No. 11 with Integrated Classes in Katowice, an original attempt was made to implement the above assumptions. It includes space zoning (with the design of new toilets), floor differentiation, appropriate lighting, adequate equipment with the elements that are not typical for regular classrooms, as well as color markings and pictograms on the walls, which will be presented in more detail below. All this will undoubtedly lead to better comfort of use.

DRIVERS' DYNAMIC SPEED BEHAVIOUR AT APPROACHING SECTIONS TO UNSIGNALISED PEDESTRIAN CROSSINGS

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ABSTRACT

Pedestrian crossings occur to be critical places in city road network for road accidents involving pedestrians and motor vehicles. Due to the relation between speed and injury severe the driver's speed behaviour has a crucial impact on pedestrian safety. In Poland the traffic-related death rate of unprotected road users remains on very high level comparing to other countries of European Union. The goal of the paper is to investigate driver's dynamic speed behaviour evaluated on the basis of spot speed while approaching to unsignalised pedestrian crossings. Investigated zebra crossings were located in mid-block segments and in inlet sections of chosen intersections. For this purpose, the spot speed measurements in free flow traffic conditions were conducted with the employment of video recording methodology. Drivers' behaviour is strongly influenced by the presence of pedestrians waiting for the opportunity to cross the road. Hence for the further analyses only those vehicles were taken into account when pedestrians were already at or about to enter the pedestrian crossing. Speed measurements were conducted on single and dual carriageways along an approaching section of 60m length measured from the crossing location. At each investigated section additional check points were located and spaced in 10m intervals. As a result, driver's dynamic speed behaviour expressed by average speed, 85th percentile of speed, number of speeding drivers, deceleration ratio and breaking distance in relation to the pedestrian crossing localization and a roadway cross-section type was analysed and evaluated.

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CONCEPT OF BEAUTY IN CLASSIC APPROACH IN THE AGE OF DIGITAL TOOLS

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ABSTRACT

The author attempts to answer questions, what is beauty in architecture and how the canon of beauty has changed in view of extending the possibilities of geometric control and the development of digital technology. Subjectivism in our appraisal excludes the possibility of establishing one canon of beauty. However, it is not about the canon, but about general principles of creation process planning. Harmony is a measure of the consequences, logic and consequence control. Although the beauty of architectural works does not describe one theory, but there are some laws. Complexity of buildings makes it difficult to define harmony, but architects are still trying to determine the principles they design. The basis of classical beauty was the aesthetics of forms based on the belief that there was an objective beauty that the antique understood mathematically. Using the achievements of predecessors gives the opportunity to develop their thoughts using the principles originally laid the base for further research, or to widen the field of the methods used. New technologies do not stand in opposition to the classical concept of beauty. They provide the ability to find and develop it through new forms, for which the principles of harmony, geometry and proportionality are as important as in ancient times. At the moment, technically, practically nothing limits us, but the concept of beauty in this classic sense is still as important as for our predecessors. Ancient architects and Renaissance humanists sacrificed themselves with the numbers and the relationship between them to bring them to perfect proportions. Today, in the digital age, we are given new opportunities to use predefined principles, using them as a base for further research and to broaden the area of applied methods to find in them new beauty.

ANALYSIS OF THE PILE SKIN RESISTANCE FORMATION

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ABSTRACT

Since deep foundations were introduced to world of engineering, they undergo constant development. Due to the need of applying deeper, stronger foundations in various soil conditions, engineers face the challenge of working with more difficult tasks. For few decades there have been built quite big database of pile tests that provide valuable information to work with. The most common way to validate if pile bearing capacity is well estimated is static load test, nowadays instrumented with different types of measurement accessories f.e. extensometers. Result of static load test is often presented as load-settlement curve. Extensometers provide additional measurements of forces and stress distribution, pile shortening effect. That allows engineers to implement such information into practical calculation. On the West Pomeranian Institute of Technology in Szczecin we are working on Meyer-Kowalow curve theory [Z. Meyer, M. Kowalów, 2010]. This presentation is focused on implementation the CPTu results and combining it with static load test and stress distribution along skin of the pile. Its scope is focused on predicting skin stress distribution based on the experimental results, while still working on the basis of Meyer-Kowalow curve. Authors use real executed piles for research. With the use of extensometers during static load test, the results provided broader spectrum of information. There are direct correlation of load and stress distribution in conducted research. Practical calculations that comes as effect of Authors work are meant to be the next step in current research ongoing in Geotechnics Department and will be developed with further theoretical and practical works.

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ANALYSIS OF STATIC LOAD TEST RESULTS REFERRED TO LIMIT BEARING CAPACITY OF A PILE

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ABSTRACT

In the paper authors used results of static load tests of piles that have been conducted in full range of loads in order to verify calculated statistically parameters obtained for a continuous load-settlement curve. For a description of continuous static load test curve of a pile the authors have used Meyer-Kowalow method (M-K method). The result of static load test is a load-settlement set $\{N_i, s_i\}$ which is the background for further calculations of M-K curve parameters. Calculations that are presented in the paper were carried out using original computer program and the authors compared M-K curve parameters, specifically limit bearing capacity of a pile calculated using statistical methods from data set and measured values obtained from static load test performed in full range of loads. Research was done in order to determine optimal method of calculating bearing capacity of pile based on static load test which can later be practically used in M-K method to obtain full range continuous Q-s curve. Results obtained during the analysis performed by the authors show that values of limit bearing capacity of a pile can be calculated with sufficient for practical use accuracy from different parts of the data set. As an example using just chosen part of the set. Research conducted by the authors points the fact that limit load bearing capacity which is the most important parameter determining safety can be effectively obtained for different M-K curves using least squares method, even in cases when static load tests were not performed in full load range. After determining M-K curve parameters it can later be used for further analysis of pile-soil interactions.

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EFFECTS OF QUALITY, ENVIRONMENTAL, OCCUPATIONAL HEALTH AND SAFETY INTEGRATED MANAGEMENT SYSTEM DEVELOPMENT AND IMPLEMENTATION IN CONSTRUCTION COMPANY

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ABSTRACT

The quality and reliability of buildings, occupational health and safety of all employees and keeping of all environment and safety regulations on national and international level must be one of the most important factor of each construction company, which plans to be successful on world market. The development and successful implementation of Integrated Management System (IMS) focused to quality, environment, occupational health protection and safety (QEOHS) is not easy role, especially in bigger companies. During last 5 years were created new standards concerning the Quality Management Systems (ISO 9001:2015), Environmental Management Systems (ISO 14001:2015), Occupational health and safety management systems (ISO 45001:2018), in which are defined requirements for development, implementation and certification of these management systems. All these standards have the same structure, which allows many processes in construction company integrated. This integration reduces required documented information and at the same time audite all processes in company departments and buildings. In our contribution will be described changes brought by new versions of higher described international standards, analysed key processes concerning the development, implementation and continuing improvement of Quality, Environment, Occupational Health and Safety Integrated Management Systems in construction company. Achievement of exceptional quality, environmental, occupational health and safety level is now considered a necessity if an construction organization wants to succeed in a market in a hard competitive fight. Integrated Management System of all these three important factors mentioned in the contribution represents a significant tool for construction organization improvement effort and success on market.

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TECHNOLOGY OF ADDITIONAL IMPERMEABLE LAYERS AND ITS USE IN RESTORING OF HISTORICAL BUILDINGS

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ABSTRACT

Moisture and its negative effects on monuments are a widespread problem that needs to be tackled especially to save historical buildings. The wetting of objects, whether historical or new, is not only part of our climate zone, but can be attributed to a global character, as evidenced by a number of publications and research on the issue of water logging of buildings that date back to 1892. It is not only a threat to the preservation but also the functionality of historical structures, because it is responsible for reducing the mechanical performance of the masonry, as the presence of water in the pores of the building material negatively affects the tensile strength and also the compressive strength. It also causes degradation of these materials, which can be constantly exposed to cyclic freezing and subsequent thawing, biodegradation and migration and subsequent crystallization of salts. Moisture also contributes to increasing the thermal conductivity of these constructions, resulting in high energy consumption for heating. Last but not least, we can associate various respiratory diseases of people living in this environment with moisture. Due to the serious effects associated with rising moisture in the masonry, water capillarity is rightly considered a key factor in the protection of heritage. The origin of moisture can be attributed to several facts, but in the present research we focused mainly on rising moisture and its negative impact on historical structures. The paper will summarize the results obtained so far and conclusions from various authors investigating the technology of additional impermeable layers. Subsequently, we will analyze and describe the obtained measurement results before and after the use of undercutting technology on two specific historical buildings in Slovakia. All the research and measurements were carried out in situ, which helped us to achieve objective results, the outcome of which is this work. The measured values show a significant drying of the structure above the plane cut and a positive effect on the repaired structure. The research also encourages further investigation of moisture acting mainly below the level of new insulation and its impact on masonry.

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CONTRADICTION OF METHODICAL AND TECHNOLOGICAL POINTS OF VIEWS ON MOISTURE FIGHTING TECHNOLOGIES ON WALLS OF ARCHIOTECTURAL HERITAGE BUILDINGS

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ABSTRACT

The moisture affects all materials on the earth surface, but we have developed a specific sensitivity toward moistening of architectural heritage buildings. Water in construction materials and on their surface influences partially their technical state like their stability, but usually not that much as people can think. Unwanted moisture is usually dangerous at very soft construction materials, like clay bricks. But especially the water soluble salts, the water transports through the masonry, can act as a very dangerous destructive material, influencing destructively especially surface plasters. And in the case of historical wall paintings are the losses on cultural heritage invaluable. To deal with moisture effectively we can use some specific technologies, but the most effective ones have a specific destructive influence on the historical construction material. And this is the point of conflict between technical and methodical points of view. So the basic scientific questions in this field can be such ones: are the destructive technologies for fighting moisture in historic masonry really effective? And are they to be accepted also methodically?

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ARCHITECTURE OF DEFENSIVE GATES OF WESTERN UKRAINE CASTLES IN THE 16th – 17th CENTURIES

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ABSTRACT

On the territory of Ukraine there have been preserved a number of castles which as relics of cultural heritage are attractive tourist landmarks. In modern information sphere, alongside great number of historical-descriptive sources on the castles of Ukraine, there is a market lack for the results of comparative and typological analysis of their defensive structures. In particular, investigation of the architecture of the castle entrance junctions as predominant structures of the castle complexes reflecting its representative and defensive functions is topical. The objectives of the investigation are: to determine the state of preservation of entrance gates in the castles of the 16th -17th centuries in Western Ukraine; to define forming preconditions and factors in the period of their military functioning and after it; to identify and describe types of volumetric-spatial characteristics of the castle gates on the basis of the patterns of the systems of defensive structures organization formed in the history of military art; to characterize elements of entrance junctions (structures in front of the gates, external fortifications, lifting bridges) and external decoration of gate structures. As a result of the investigation, the degree of entrance gates preservation has been found. We have discovered that out of the whole range of castles functioning as defensive structures in the mid – 16th -17th centuries in the western region of Ukraine only in the 9 of them there are gates with the integral volumetric-spatial structure operating as part of museum complexes and other public buildings; 8 gates are in ruins, still they have preserved volumetric-spatial structure; other 7 castle gates have preserved only separate fragments as part of the later structures or as ruins. Five variants of volumetric-spatial structure of the gates have been defined and analyzed. Relying on the structural analysis of the preserved gates and historical sources, we have found out that within the period of the 16th -17th centuries when application of the firearms on the investigated territory was widespread, in the castles along with the prevailing number of structures characteristic of the bastion DS (defence system) there continued to function separate earlier structures peculiar to the tower and round bastion DS. This is explained by the fact that some castles were laid down before the investigated period, which offers possibility of further investigation with the aim of going into the constructional history of the examined castles.

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THE ARCHITECTURE OF THE CATHEDRAL OF SAINT SOPHIA IN KYIV: UNIQUENESS AND UNIVERSALITY IN HISTORICAL CULTURAL SPACES

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ABSTRACT

The Cathedral of Saint Sophia in Kyiv (from the beginning of 11th c.) is the largest, most complicated, most monumental architectural object that cross-links the Ukrainian architecture stylistic experience of all times. The purpose of the study is to identify the contemporary understanding and the multifaceted cultural content of this monument, which combines the logic of thinking of medieval Byzantium and the traditions of local pagan constructions, as well as European Baroque fashion in its regional variability. The square outside the cathedral was invariably fundamental to state-building cultural events, but its context also varied in each era according to urban fashion. Uniqueness and universality are combined in this building, creating endless space to reveal its cultural content. The new interpretation of this content in every scientific generation enriches and broadens the understanding of this object itself as well as hidden inside of it the genesis of the monumental architecture style-formation phenomenon's in its historical and contemporary dimension. The publication demonstrates an up-to-date interpretation of the understanding of the content and form of Saint Sophia Cathedral. This is, in some meaning, a demonstration of the current state of development of Ukrainian fundamental science, which cannot have definitive answers to "eternal" questions, but aims to approach scientific truth through permanent refinements of knowledge. The article defines the planning, constructive, three-dimensional compositional, artistic-aesthetic and figurative characteristics of Sophia Kyiv's architecture. There is also developed an innovative analysis of the genesis and sacral sense of Cathedral's architecture based on the author's original definition of archetypal (basic, initial) semantic models of world temples formed in different geographical and religious contexts. Cultural mutual influences and historical changes in the architecture of the monument are also noted. In the field of historical building experience, the acoustic features of Saint Sophia Cathedral are noted, which remain relevant in the modern design of temples. In conclusion, it is resulted that the Cathedral of Sophia in Kyiv is an outstanding example of combining the continental traditions of sacral construction of the Pre-Class Age with the context of the achievements of the monumental experience of Christian antique and Byzantine architecture. Sophia Cathedral, as the most monumental ideological achievement of the Kyivan Rus' state, reflects the merger of these two lines, two traditions. That is why this monument is of utmost importance for deepening understanding of the evolution of Ukrainian and world architecture. In addition, the Cathedral of Saint Sophia in Kyiv became the basis for further historical forms of Ukrainian Orthodox temple construction – both folk (wooden multi-tower churches) and stylistic professional monumental architecture (Ukrainian temples of the Renaissance and Baroque, Art Nouveau). Therefore, we consider that the Sophia's Cathedral in Kyiv is a key object for the scientific study of the development of Ukrainian architecture.

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INFORMATICS KNOWLEDGE FOR SETTING REQUIREMENTS ON IFC DATA AND ITS SUITABILITY IN EDUCATION FOR CHEMICAL ENGINEERS

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ABSTRACT

IFC becomes popular for the exchange of building information model data among participants in construction projects. To get the desired data, it is necessary to specify requirements on these data. The paper identifies fields of informatics knowledge required to understand the IFC data schema mostly to get the ability to define requirements on desired IFC file content. There were identified mostly topics connected with the EXPRESS data specification language but also with the STEP data format and computer graphics. There were also mentioned fields of informatics knowledge related to processes that use or produce the data. It is generally assumed that building information model data collected and stored during design and construction processes are valuable also during the operation of the modeled facility. Sometimes the most value is expected during the operation of the modeled facility. Then requirements on data for facility operation may differ based on the purpose and use of the facility. Specific knowledge related to the purpose of the built environment may need to be taken into account during setting requirements on building information model data – including IFC data. This sets the question about the importance of informatics knowledge for setting requirements on building information model data (also IFC data) also for other professions than those from information technology and civil engineering domain. A brief review of the discussion about using building information modeling principles and building information model data for plant engineering is included in the paper. The focus is on the use of the IFC data. It was found that building information modeling principles and informatics knowledge connected with an understanding of IFC data schema may have an important role also in the education of chemical engineers especially with the connection to the development of the implementation of building information modeling principles in plant engineering.

THE DOME IN CONTEMPORARY MONUMENTS OF THE UAE, BETWEEN TRADITION AND POSTMODERNITY

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ABSTRACT

In recently constructed cultural projects in Abu Dhabi the 'dome' as a symbolic and structural element has re-emerged highly visible within the living city's urban context. Prior to the Industrial Revolution in the early 19th century, domes resting on pendentives or squinches were considered as masterpieces in medieval and Islamic architecture as manifested by Aya Sophia and mosques of Sinan Pasha. Their value as symbols of religious space was gradually reduced with the advent of pre-fabrication and reinforced concrete. However, in an attempt to create distinct architectural character in a globalized world the dome has re-emerged in mega projects in Abu Dhabi as exhibited by the Louvre's 180 meter perforated steel dome. The Louvre Abu Dhabi dome revived the symbolic structure and represented a turning point in terms of re-visiting tradition. The space of gathering below the massive structure has unique architectonic qualities that interlace light, shade, shadow and water elements. Another, more recent example is the single dome covering the prayer space of Sheikh Khalifa Bin Zayed Al Nahyan mosque in Al-Ain. The 80-meter dome of Sheikh Khalifa's mosque with massive calligraphy adorning its exterior re-interprets the 'dome' within the context of contemporary architecture. Qasr Al-Watan (Palace of the Nation), Emirates Palace and Shaikh Zayed Grand mosque in Abu Dhabi with their plethora of domes have become popular tourist sites for photography, and representatives of Abu Dhabi as the cultural capital of the oil rich Gulf State. This paper studies the emergence of the 'dome' in Abu Dhabi Emirate within the context of contemporary architecture.

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MODERN CHURCH ARCHITECTURE IN EAST GALICIA AS A SEARCH FOR NEW FORMS AND NATIONAL STYLE

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ABSTRACT

. The article highlights some of the results of the scientific work on the study of sacral architecture in Western Ukraine, conducted by the Institute of Architecture and Design of Lviv Polytechnic National University in conjunction with the Department of Fine Arts and Design of Volodymyr Hnatiuk Ternopil National Pedagogical University. The purpose of the article is to investigate the process of revival of sacral construction in the territory of East Galicia and to determine the role of the leading Ternopil architects in this process. It has been established that due to the long-term ban of temple construction by communist regime, sacral construction skills have been lost in Ukraine, as in other post-Soviet countries. The task was complicated by the low technological level of the construction industry. Architects and builders often had to experimentally revive construction techniques to create vaults, domes, sails and other architectural elements that were widely used in the creation of temples. Therefore, the first sacral buildings on the territory of the region were marked by a tendency to reproduce forms and images that historically took place at the end of 19-th – beginning of 20-th centuries. The process of transition from the tendency of reproduction of historical forms and images of Ukrainian sacral architecture of the late 19-th - early 20-th centuries to modern experiments in the construction of temples is traced. An analysis of the creativity of the leading Ternopil architects showed that many of them were involved in this process. Using national heritage in architecture, architects have become actively involved in the world's processes of cultural development and in the search for Ukrainian identity in temple architecture. Usually, using traditional plans in the form of an elongated cross at the request of parish customers, architects after 1995 design modern buildings, the image of which is in harmony with the new trends in world sacral architecture. For the first time, data about some modern architects of Ternopil and new major temples in the territory of the region, created by their projects, have been introduced into the scientific circulation. Thus, the architecture of Ukrainian temples reflects ancient national traditions in combination with contemporary world trends in temple building.

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CORRELATION OF SACRED ARCHITECTURE AND PAINTING IN WESTERN UKRAINE

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ABSTRACT

This article highlights some of the results of the scientific work conducted under the direction of the Institute of Architecture and Design of the National University "Lviv Polytechnic" together with the Department of Fine Arts and Design of Ternopil National Pedagogical University, Kremenets Regional Humanities and Pedagogics Academy, Lesia Ukrainka Eastern European National University, Department of Fine Arts. Scientists are exploring sacred arts in Western Ukraine as one of the highest achievements in the work of Ukrainian architects. In particular, the article is about the Ternopil region. The aim of the article is to cover the work of architects of the Ternopil region, correlation in their creativity of architecture and painting; the introduction into the scientific circulation of data on some temples - architectural monuments and modern churches. The territory of Western Ukraine occupies a special place in the cultural and spiritual space of the state. It is located at the crossroads of European roads, has long been noted for its multinational character and wealth of faiths. Temples of different denominations are the decoration of cities and villages and enrich their architectural landscape, and in terms of potential and value of architectural heritage, it is one of the richest regions of Ukraine. One of the spiritual symbols of the city of Ternopil is a temple built in the eighteenth century - a monument of late European Baroque architecture. The building was many times on the verge of destruction; it was burned and destroyed by wars and the communist regime, but with the declaration of independence of Ukraine the shrine was revived. Modern paintings, sculptural groups, stained glass windows and other works of sacred art have transformed the sanctuary into a city beauty, attracting visitors with its grandeur and splendor. Scientists do not often turn to the creative personality of architects. Among the renowned architects of Ukraine, who have designed projects for more than 200 temple complexes, is Ternopil artist Mykhaylo Netrybyak. He combines the work of the architect with the work of the teacher, and the creative nature of the artist is reflected in the paintings. The famous painter of Ternopil with professional architectural education is Mykhaylo Kuziv, who also combines artistic work with pedagogical activity. His works are known far beyond Ukraine and are exhibited in state and public institutions, in private collections of Ukraine and in many countries of the world. Thus, as a result of the research, the data on some contemporary architects and artists of Ternopil region were put into scientific circulation; their role in the process of revival of temple construction of Ukraine is defined; it describes some of the temples – architectural monuments and modern architectural buildings.

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THE PECULIARITIES OF FORMATION OF ARCHITECTURE AND DESIGN OF THE FARMSTEAD IN MODERN CONDITIONS ON THE EXAMPLE OF THE WESTERN REGION OF UKRAINE

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ABSTRACT

The purpose of the scientific work is to determine the peculiarities of the formation of farmstead architecture and design in modern conditions of formation of united territorial communities on the example of the Western region of Ukraine. To achieve this goal, empirical theoretical methods of research and generalization are used. Rural population surveys, benchmarking, classification and generalizations were used. Studies of the modern farmstead conducted in the villages of the Western region of Ukraine have shown a great variety of farmstead development, which reflects the natural and climatic conditions, peculiarities of the life of the population, folk, religious customs and traditions. The region's peculiar architectural forms of farmstead development are significantly influenced by the location of the territory and the frequent migration of the population abroad. Researchers have shown that residents of farmsteads are changing the way of life, living conditions and activate non-agricultural activities, for which houses and buildings for entrepreneurial and production activity are erected next to a dwelling house. Accordingly, new functional zones are allocated in the structure of the estate: sports, health, technical, sacral, entrepreneurial, production and guest. Based on the labor activity of the inhabitants of rural settlements, the typology of farmsteads was expanded: entrepreneurial, representative and bi-functional types (economic-entrepreneurial, economic-production, production-entrepreneurial and guest subtypes). It is proved that proper organization of the estate development will contribute to creating of comfortable, safe and accessible living space, preservation and multiplication of traditions and regional peculiarities in the formation of the rural environment. The topic of the study remains relevant as changes in spatial planning and integrated territorial development take place in the context of decentralization reform and the formation of united territorial communities. They are to provide the villagers with a modern level of competitive, comfortable, accessible, object-space environment of the new generation, which would meet their needs, opportunities, cultural achievements through the development of new types of farmsteads and residential homes. In order to implement the new standards, it is necessary to review the existing State Building Standards and bring them into line with EU standards.

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THE SET OF CONTEMPORARY AQUATIC ARCHITECTURE

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ABSTRACT

The presented investigations prove that there are exist the set of architecture connected with water. The investigations started about 10 years ago state that it is possible to indicate the contemporary objects which has some common features creating the set of aquatic architecture. The relation between architecture and water has different aspects. The first is placement the object in the water as the environment, the second is when the water is the purpose of constructing the building (ex. swimming pools) the another is to use the water as the decoration material or medium for energy flowing in the building and the last one is to find any intangible associations between water and architecture. It is described the simple method to include the object to the set contemporary aquatic architecture basing on the determination of function of water in the building. The utility water function is excluded from the set, because it is part of another discipline as for example water treatment or sewage technology. On the base of several case study investigations It is prove that the aquatic architecture is the significant part of architecture. The approx. 12% of raised buildings can be attached to the set. The passed study confirmed that the architecture paying attention to the water is realised not only at the border of land and water or in the water, it can be also find in the middle of dry land in that case it follows the intangible associations. The immaterial relation base on personal experience a connotation to cultural environment of human.

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DESIGNING FOR PUPILS WITH THE AUTISM SPECTRUM DISORDER, CASE STUDY OF THE AUTISM CENTRE IN MUROOR, ABU DHABI

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ABSTRACT

The number of diagnosed cases of autism spectrum is increasing. The peculiarity of the perception of the outside world by people with ASD leads to reflection on the impact of architectural solutions on their sensory comfort and the effectiveness of therapy. Leo Kanner was one of the first to speak out about the needs of patients with autism. He said they see a world built from small elements which make up layouts and sequences. Experience acquired under the given conditions will not be accepted when any element is disturbed (Kanner, 1943, p.249). Teams of therapists, neurologists and psychiatrists need a properly prepared infrastructure which will provide stable conditions to work with an autism spectrum pupils. It is therefore necessary to develop benchmarks for the specialised design of new buildings, on the basis of which the existing buildings will be possible to be adapted properly. The article is a case study for the Autism Centre in Muroor in Abu Dhabi designed by Simon Humphrey. The facility was classified as the best suited for people with autism according to Autism ASPECTSS™ developed by Magda Mostafa at the American University of Cairo. The study was based on the opinions of designers. Previous design studies in this area are an important part of the design process and require detailed definitions to be formulated. The basis for careful analysis is the question: what is autism and why we say it is a spectrum. Autism is a triad of disorders that occur in communication, social interactions and stereotypical behavioral patterns. Spectrum refers to the fact that in each affected person the disorder consists of different mechanisms and causes which are responsible for developmental difficulties. Sensory sensitivity of people with autism has different faces. It is not possible to develop a universal pattern that will work in any case. The basis of developmental dysfunctions are sensory perception disorders, i.e. hypersensitivity or insensitivity to sound, light, touch or smell. The study shows that an important aspect is the conscious use of the elements that affect these senses. The studies presented in the article concern the assessment of the impact of selected elements shaping the sensory aspects of the internal environment of the building, such as acoustics, lighting, finishing materials, colours, ventilation and visual identification. The evaluation of the building presented in the article is an expert one, and is based on the opinions of specialists working with people with such spectrum. It was carried out on the basis of archival design and photographic documentation provided by the designer. The result of interdisciplinary cooperation is defining these elements by analysing the solutions used in the Autism Centre special school in the context of their impact on the perception of people with such spectrum. Certain rules will help eliminate erroneous design assumptions. Shaping the space of educational facilities can greatly help in revalidation. Therapeutic and architectural treatments should be aimed at providing an enclave in which the pupil will be able to achieve psychophysical comfort.

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CHILDREN AS CONSCIOUS RECIPIENTS OF SPACE: THE ROLE OF ARCHITECTURAL EDUCATION IN THE PROCESS OF TEACHING

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ABSTRACT

Nowadays, in which more and more often we are witness of the chaos, lack of aesthetics, respect for historical buildings both in cities and rural settings – the social awareness of space in which we are living is extremely important for the preservation of its quality. The discussions in scientific circles from around the world: among architects, urban planners and cultural anthropologists, which have been going on for years, postulate that education from an early age is one of the most important ways of protecting the cultural landscape and maintaining sustainable development. This issue is very broad and includes various aspects, aesthetic, cultural, creative, but also civil – a shared responsibility and a critical attitude towards the environment. The aim of the article is to bring attention to the need for architectural education for children, in order to prepare them to actively and consciously function in the surrounding world and participate in activities connected to the environment in which they are living. Based on examples from different countries, where the topic of integrating architectural educational programs into the core curriculum from kindergarten to high school is very popular, the author highlights the situation in Poland, where in recent years more is happening to raise architectural awareness among the youngest. Joint actions of parents, teachers and architects can help children better understand their neighborhood and its function, help stimulate their creativity, spatial imagination, the sense of observation, as well as to spread regional education and a sense of local identity.

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SUSTAINABILITY FROM THEORY TO PRACTICE: AN ARCHITECTURAL ANALYSIS OF THE PRINCIPLE OF SUSTAINABILITY IN BUILDINGS

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ABSTRACT

What is a sustainable building? According to the Brundtland Report, a sustainable approach should be resource efficient ("development that meets the needs of the present without compromising the ability of future generations to meet their own needs"). How is this definition applied to architecture? And when did it occur? Strange as it may seem, it did not appear in the past decades. It is as old as the building process itself: vernacular architecture can be translated as a process of building taking into account the impact of the rules of nature on the environment; religious, monumental or industrial architecture might have components that provide sustainability, if they meet some conditions. The paper aims to present some considerations of the architectural evolution of the concept of “sustainability”.

THE CHALLENGES OF THE BIOCLIMATIC ARCHITECTURE IN ROMANIA

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ABSTRACT

Bioclimatic architecture is an architecture style, new as terminology in the history of architecture, but old in its principles, that can be found in history in the vernacular architecture since the first types of houses appeared. Nowadays, due to the need of eco-friendly ways of building and due to the need of green energy consumption, it emerged in different architectural styles that aim to develop the built space in different manners. Green, Passive, Solar and Bioclimatic Architecture. Each one of them is depending on the natural factors, but from all of them, Bioclimatic Architecture uses all the natural resources in the site through the volume of the construction in passive ways, using no energy. The bioclimatic models that appeared in hot climate successfully responded to the needs of cooling the interior air by solar protection and by natural ventilation, and also using the thermal inertia for providing warm air during the cold summer nights. The main problem appears in the temperate climate where, during the winter, it appears the need of active systems for obtaining a warm indoor temperature against the sub-zero outside temperature. This paper aims to highlight the particularities of Romanian temperate climate that influences the bioclimatic model, and to mark the limit where the passive bioclimatic principles stops, and from where the active systems begin.

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REDEFINITION OF PREFABRICATED LARGE PANEL BUILDING SYSTEMS - FACE LIFTING OR DISRUPTIVE REVOLUTION

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ABSTRACT

The notion of "a large panel system (LPS)" means a building system from prefabricated structural elements, concrete slabs, used for the construction of blocks of flats and other buildings. Despite its simple definition, the name evolved over time into an urban, architectural and sociological phenomenon of massive impact changing the character of many European cities for good. It is estimated that nowadays in Europe (excluding the countries of the former Soviet Union) around 41 million inhabitants live in housing estates built from prefabricated panels. The presented elaboration aims to determine a real scale of this issue and provoke a discussion on the basis of undertaken actions - the discussion about the possibilities of stopping the destructive spatial and social processes affecting such areas. On the basis of the above-discussed architectural, urban planning, sociological and technical aspects of the large panel system housing estates and their juxtaposition with competitive contemporary housing estates, an attempt can be made to compare the negative and positive characteristics of these areas. A division into three groups is proposed: **a.** Spatial and functional parameters in urban planning, **b.** Spatial and functional parameters in architecture, **c.** Technical and aesthetic parameters. However, the above-described terms mainly function on the grounds of the downtown (city-centre) building development. Therefore, only by the reference to the revitalization of housing estates do we understand specific areas in degraded housing complexes. Finally, the undertaking of the revitalization actions in the context of large housing developments made with industrial technologies is called ‘the humanization of housing estates’. This term refers to a whole range of works, beginning from the survey of the technical condition, through consultations with the local community, to the selection of solutions in the field of architecture, economics or ecology. Contrary to typical modernization, humanization focuses its activities also on the analysis of the collective addressee, their needs and expectations. Humanization of huge housing complexes is coupled with the strive for sustainable development of cities, which has recently become a strategic term in the economies of all developing European countries.

A HYBRID CONSTRUCTION METHOD FOR SHALLOW BURIED URBAN TUNNEL WITH ULTRA-SMALL CLEAR DISTANCE

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ABSTRACT

During the construction process, it is difficult to ensure the structural safety of shallow buried tunnel with the ultra-small clear distance since the tunnel is prone to instability and the surrounding rock and soil are in an adverse stress condition. To address this issue, a hybrid construction method is proposed to enhance tunnel stability and reinforce the surrounding rocks and soil. First, aiming at an actual tunnel, numerical analysis are provided to compare the effectiveness of different construction methods such as the bench method, advanced reinforcement method, and grouting reinforcement method. Second, the performance of the combination of advanced reinforcement and grouting reinforcement are discussed, and, on the basis of this discussion, the hybrid construction method, combining the advanced small pipes reinforcement, middle rock wall reinforcement, and grouting reinforcement, is proposed. And the characteristics of proposed method is compared with the traditional CRD construction method. The results reflect that using the comprehensive construction method can enhance the stability of the tunnel and its effect is similar to that of the CRD method. Finally, the effectiveness of proposed hybrid construction method is verified by using the measured data obtained during the construction of an actual tunnel with the ultra-small clear distance. The results shown that the proposed method can enhance the stability of the tunnel and improve the bearing capacity of the surrounding rock and soil.

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EFFECTS OF DESIGN SCHOOLS ON STUDENTS' DESIGNS

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ABSTRACT

Considerable attention has been paid to school design and it plays a vital role in the learning environment. In literature, several theories have been proposed to explain that the learning environment is a strong component that motivates students of all ages to study and progress. Learning is defined as a relatively long-lasting change in behavior that results from interactive experience and a central part of everyone's life. Students' learning methods are necessary to develop themselves with different learning methods, have an observer's perspective and develop their ability to interpret. The physical environment not only affects the student's learning experience but also significantly increases their observation skills. Design characteristics of learning environments have a major effect on schools that adhere well to effective environmental and educational spaces can expect impressive benefits in student performance. Therefore students can easily visualize the meaning of different areas of the building that facilitate interaction by the way of layout, between design disciplines. The spatial arrangement of the school affects the character of the learning setting that has a strong correlation to the students' performance. While spatial design and configuration play an important role in triggering the students' movement, they also affect their interaction patterns and social behaviors. This study aims to find out if and in what ways higher education learning environments have an impact on the style of design students'. The study was carried out in the Faculty of Fine Arts and Design building in the Izmir University of Economics, Turkey. Students from Interior Architecture and Environmental Design, Architecture, Fashion, and Textile Design, Visual Communication Design and Industrial Design departments were asked about their design style through questionnaires. The head of departments was also interviewed about students' and graduates' design styles. Results were gathered and categorized into four categories such as; surrounding, classroom, floors and building style. With the questionnaires, the main aim is to find the possible relation of the environmental design elements with the student projects. Findings are believed to be useful for design educators and designers of learning environments, especially for higher education spaces for design. Overall, a comprehensive account of design style, design methods, and the effect of the learning environment on university design students are portrayed.

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THERMAL PERFORMANCE OF HYBRID VACUUM GLAZING INSTALLED IN WOOD-ALUMINIUM FRAME

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ABSTRACT

The current development in building energy efficiency towards nearly zero energy buildings (nZEB) represents a number of new challenges to design and construction. One of these major challenges is lowering need for heating by means of highly insulated glazing units by means unique glazing technologies such are vacuum glazing (VG) or hybrid vacuum glazing (HVG). Hybrid vacuum glazing combines vacuum glazing with double glazing technology by adding one low-emissivity glass to the vacuum glazing using a thermally-improved distance profile to eliminate the thermal bridge at the edge of the vacuum glazing. The gap between the vacuum glazing and the low-emission glass is filled with the inert gas Argon. The thermal performance of a hybrid vacuum glazing was tested using guarded hot box method developed in accordance with the requirements of ISO 8990. Hybrid vacuum glazing has thermal transmittance about 0.43 W/(m^2.K).

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OUTDOOR CLIMATE PARAMETERS AND HEAT ENERGY CONSUMPTION FOR THE NEEDS OF HEATING THE BUILDING

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ABSTRACT

In this study, meteorological data were analyzed for the needs of heating the building. For this purpose, data from a typical meteorological year were used, which allow determining the general characteristics of the building. Temperature analyzes were carried out, modeling its changes over time. To this end, time series theory was used. In this analysis, the decomposition of the original time series was used. As a result, the obtained results were used for computer simulation for the test object.

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EFFECT OF 1D VERTICAL VARIABILITY OF SHEAR MODULUS ON THE SEISMIC RESPONSE

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ABSTRACT

The urban development is increased and the construction of building on poor quality soils becomes inevitable which increases the geotechnical risk. Below of these circumstances, the probabilistic approaches to study the behavior of a soil profile in a given environment have been proposed in recent years. The purpose of this research work is to study the effect of vertical variability of soil shear modulus on soil seismic response using the probabilistic approach. Two types of heterogeneity are considered: (1) a heterogeneity due to the random distribution of the shear modulus in a soil profile; (2) a heterogeneity of soil layer with shear modulus increasing linearly with depth. The first heterogeneous soil models are generated by Monte Carlo simulation. The spatial variation of the shear modulus is controlled by the variation coefficient parameters. These heterogeneous soils are generated and then integrated into the computer program based on the one-dimensional wave propagation, resulting in seismic responses at the 'free field' soil. For demonstrate and show the importance of considering heterogeneities in the model, the results were compared with example of determinist analysis and experimental value of shear modulus obtained from a specific AADL site in Algeria.

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HISTORICAL STRUCTURES AND TECHNICAL HERITAGE ON ELBE-VLTAVA WATERWAY

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ABSTRACT

The paper describes the past development of the Elbe-Vltava waterway (EVW) and focuses on the documentation and presentation of the historical structures which were built for the rivers' continuous navigability. Modern modifications of the waterway started at the beginning of the 19th century and focused mainly on regulatory work aimed at widening, straightening and deepening the fairway and removing the narrow fairway sections. In 1896, the Commission for Channelling the Vltava and the Elbe Rivers in Bohemia was established. The commission began implementing a plan to canalise the Elbe-Vltava waterway. On the EVW, a cascade of 34 barrages have been built, which are connected by their backwaters and ensure year-round navigability of the Vltava River from the Slapy Dam to the town of Mělník (92 km) and the Elbe River from the town of Chvaletice to the city of Ústí nad Labem (172 km). The last section of the Elbe River between Ústí nad Labem and the border with the Federal Republic of Germany (41 km) has so far been made navigable only by historical regulation works. Barrages on the EVW are typically composed of a weir structure, a navigation lock, a hydroelectric power plant producing renewable energy and a fish pass or sport whitewater canal. Most of these structures were built in the first half of the 20th century and represent a huge and unique technical heritage that still serves its purpose.The development of the EVW objects was documented in detail. The result is a software designed as a computer application with a web interface, which also serves for the presentation of technical heritage using original and modern technologies. Database operations enable the sharing of more information resources by competent organizations in the area of management, operation and maintenance of objects on the EVW. The system contains detailed descriptions of individual objects including their main technical parameters. For all the barrages were also systematically documented archival historical documents, maps, drawing documentation, photo gallery and for the most important barrages a description of the architectural design. The research also focused on mapping the development of regulatory adjustments of the Elbe River based on preserved historical documentation from the 19th and 20th centuries and the first aerial photographs since 1938. The presentation for the general public is complemented by an index of prominent personalities who contributed to the development of the EVW. There is also an explanatory dictionary of technical elements and objects on the EVW, including functional diagrams. Tourist attractions around the waterway are also included in the software.

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RELEVANCE OF THE ULTRASONIC PULSE VELOCITY TEST FOR STRENGTH ASSESSMENT OF HIGH STRENGTH CONCRETES

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ABSTRACT

The present paper addresses the ultrasonic pulse velocity (UPV) as a non-destructive testing device for assessing the compressive strength of high strength concrete using a UPV-strength correlation model. UPV-strength correlation models are developed and used for normal strength concrete assessment; however, questions are raised as to the sensitivity of the ultrasonic pulse velocity test when applied for the strength assessment of denser, higher strength concretes. This study is an appraisal of the relevance of this non-destructive testing device for high performances concrete strength assessment, aiming for a better knowledge of the applicability of this method as a way to improve the on-site non-destructive strength assessment of high strength concrete. In the study, a high strength concrete within a specified strength range was targeted. Cylindrical concrete specimens were fabricated, left to harden then subjected to UPV and compressive tests so that a correlation model could be built. The developed model was then used to estimate the strength of a second-high strength concrete made with the same type of aggregates. The estimated strength was compared to the real strength of this second HPC in order to assess the reliability of the developed model and hence of the ultrasonic pulse velocity testing. At a second stage, the proposed model was compared to existing models for high strength concrete assessment, as a procedure to consolidate or negate the observations made in the first part. The results highlight the lack of sensitivity of the UPV method used for the assessment of high strength concrete. indeed, each high strength concrete considered in this study, including those taken from the literature, varies within a particular strength range while the UPV measurements for all the high strength concretes considered vary narrowly within approximately the same range. This reveals that the UPV non-destructive testing method may not be fully reliable in estimating correctly the strength of a high strength concrete within a range different from that on which the model was built.

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THE FUTURE FOR CONVENTIONAL RESOURCES OF ROMANIA USED IN ENERGY PRODUCTION

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ABSTRACT

Humanity, as we know it, has always had a growing need for energy. The industrial revolution generated an excess in the exploitation of the Earth's natural resources. As a result, global warming, climate change and CO2 emissions have become topics frequently addressed in various political, economic and in today's press debates. Romania is no exception to this trend. Although the industrial revolution began a few decades later than in developed countries such as England, France and the USA, environmental consequences follow the same path. Therefore, it is necessary to raise awareness of the direction and implications of using the so-called conventional resources in energy production. Energy resources are the material basis of a country's energy policy, the premise of energy development studies. It is advisable to promote all energy sources and practices that are positive for the environment and to intensify efforts to manage the pollutant emissions generated by energy production. Even though some renewable energy sources have been exploited for a long time (for example, hydropower), it is essential to draw the attention of producers, consumers, governors and investors and other unconventional energy sources so that the electricity produced from renewable sources can grow in the near future. Governments will need to take measures in the area of taxation, subsidies and regulations, which will not only help them achieve their energy security and environmental goals, but will also contribute to promoting technical progress and economic development. What it intends to present is the real state and trends of the conventional resources used in energy production in Romania.

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STREET ARCHITECTURAL MODELS. RESEARCH ON IMPROVING READABILITY, ERGONOMICS AND SAFETY OF USE

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ABSTRACT

In the first decade of the new millennium, new urban furniture - tactile architectural models dedicated to the blind, began to appear in the spaces of Polish cities and towns. These facilities aroused great interest of tourists and city dwellers, enjoying special popularity among children. By 2017, this type of collection had over 70 objects, which placed Poland at the forefront of Europe. The new form of urban modeling dispelled spontaneously, without specific guidelines and regulations, which unfortunately led to the emergence and reproduction of many faulty solutions. In the years 2016 - 2018, the research team A. Kłopotowska, M. Kłopotowski conducted the first comprehensive research in Poland, based on analyzes of the whole set of models, available until mid-2017. This text is the substantive continuation of the author's 2017 publication entitled: Tactile architectural models as universal "urban furniture" (WMCAUS Conference, 2017). At that time, partial results of the research were presented, including: the reasons for street modeling career, the diversity of the Polish collection, problems arising from incorrect design, execution, sharing and use, and the reasons for faulty solutions. Currently, the author presents a report of the final stage of the team's research to date, consisting of the development of specific design and implementation guidelines as well as technical and operational guidelines that can improve the quality of such studies as universal urban furniture. The research results can be used as guidelines for the correct design of newly planned models, but also for the introduction of repair solutions for existing models.

MODELLING FLOODING ON BARZAVA SECTOR

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ABSTRACT

Recent years, the change climatic had led to increasing number of flooding in many areas. It is required to develop tools for flood prediction and prevention. This paper presents the modelling of the flood wave propagation on Barzava River, Gataia - Bocsa sector. Banat catchment area is situated in the western part and south-western part of Romania, and this catchment is situated in the western part and south-western part of Romania, limited to the north of Mureș River, to the south of Danube River, to the west of the border between Romania and Serbia and to the east bordering Mureș hydrographical basin. This hydrographical area covers a surface of 18.320 km2 and includes several river hydrographical basins, among which and Bârzava River basin. The modelling is based on the Saint-Venant equations and it has been used MIKE 11 software. Finally, the results of this study show simulation of the flow, making the comparison between the estimated and observed stage hydrograph.

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ANTHROPOGENIC IMPACT ASSESSMENT IN THE ARANCA BASIN AREA

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ABSTRACT

Rivers are most human influenced ecosystems on the earth, its serve for transportation, water supply and power generation, etc. and in the industrialized areas, the rivers are severely polluted. This paper establishes the ecological status of the aquatic ecosystem in the Aranca river basin, taking into account the biological quality elements, the chemical, physic-chemical indicators and the specific pollutants. The Aranca catchment drains an area of 1080 km^2, the main course has a length of 114 km and the length of the hydrographic network of the river basin is 328 km. The river basin is a zone of strongly alluvial wanderings, in which the groundwater is at very shallow depths. Water quality evaluation is an important issue in recent years, especially when freshwater is becoming a scarce resource in the future.

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PASSIVE COOLING STRATEGIES FOR HIGH THERMAL PERFORMANCE BUILDINGS IN HOT CLIMATE

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ABSTRACT

Urban development in many parts of the United Arab Emirates (UAE) has significant impacts on the environment. The use of glazed façades that exposed to the hot climate of the UAE, has increased in popularity. This modern architectural pattern increases the operational costs and energy consumption due to the higher solar gain. Thus, improving the ecological performance of building industry in the UAE and minimizing/preventing the negative impact of urban development on the natural environment are the main concerns for building engineers, developers and stakeholders in the country. These goals have been acknowledged by national and international architectural firms such as Foster & Partners who incorporated ecological and sustainable approaches in Masdar City in Abu Dhabi; where various concepts and techniques have been used to promote energy-efficiency in buildings. The use of passive cooling techniques including natural ventilation, thermal mass, shading devices, and responsive landscaping have been adopted to maintain the new vision of the country towards building sustainability. Other cooling techniques, such as green roofs, vegetated living walls and the use of Phase Change Materials (PCMs) as an air pre-cooling concept have also been practiced and examined in a number of projects across the country. This paper investigates different alternative passive strategies for reducing cooling load of contemporary buildings and construction design in extremely hot climate of UAE. Four techniques are investigated and examined in the study: natural ventilation, shading strategy and green walls. Additionally, as part of on-going research project, PCM based air pre-cooling technique is examined as new application for energy efficient in buildings. The study concludes that sustainable building practices in the UAE in terms of cooling load reduction have been acknowledged not only in the contemporary mega projects but also in the existing traditional buildings. The study demonstrates the potential benefits of passive cooling strategies not only to minimize the negative impact on the natural environment, but also to reduce the cooling load. The experimental results of the study show that a vegetative living wall reduces the peak air conditioning energy demand by up to 20%. Appling PCMs for Air pre-cooling drops the outlet air temperature and reduces the energy demand for air conditioning during the peak periods by up to 28 %. Additionally, these passive cooling techniques contribute directly to LEED and Estidama credits since they cover issues like sustainability, energy saving, air quality, and sound reduction.

EXTENDING THE ALGORITHMS OF DESIGN PROCEDURES FOR NEW STRUCTURES AND URBAN SPACES BY RESEARCH USING ARCHITECTURAL LAYOUT MODELS AND SOCIAL SURVEYS BASED ON THE EXAMPLE OF NEW INVESTMENT PROJECTS OF THE CITY OF ZABRZE

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ABSTRACT.

Upon the intense political and economical transformations of early 1990's, the economic and spatial redefinition became necessary for a number of cities in Poland. Zabrze – a typically industrial city, located in the centre of Upper Silesian conurbation, due to the restructuring of industry which mainly meant the fall and liquidation of mining and heavy industry correlated thereto - faced the necessity to change the functioning and – in consequence – the image based on new investment projects using the city material culture resources. The decision was made to transform Zabrze into a vibrant, post-industrial place, targeted at post-industrial tourism, developing academic and medical sciences centre with cardiology playing a special role therein. All components, recognised as the direction of the city sustained development, influenced the creation of the list of priority investment projects, which included: the reconstruction of Górnik Zabrze city stadium, revitalising the Main Key Heritage Drift and the erection of the new Hub to replace the present railway station. The investment decisions were subjected to consultation with the inhabitants of Zabrze. Furthermore, the publicity of city authorities intention related to the new investment projects and the population's approval, were to facilitate attracting strategic investors. The question was asked about the kind of advertising and visual techniques to be used to make the suggested new facilities most readable to the Zabrze community, so diversified by age, education and social origin. The choice fell on making several backlit architectural layout models of the new investment projects mentioned above, emphasising that close cooperation between the authors of the models and the designers of the new structures must be initiated, in order to enable up-to-date amendments and corrections to the approved solutions. At the same time the exhibition of the finished models in places available to the general public was assumed and later accomplished, so that the local community could easily become familiar with the suggested new projects. Thus, it took a few years to create the layout model of the new Hub, presented at several meeting, the model of the Main Key Heritage Drift with accompanying facilities located in a special glass-case at the Wolności Square in the centre of Zabrze and the layout model of the new football stadium exhibited in Platan shopping centre and other buildings in the city centre at various events and meetings. It was also the major element of Zabrze stand at Real Expo Fair in Munich. The wide range of meetings and consultations has brought about, without limitation, a diametrical change of the Hub concept, changes in the facade colour range and the stadium auditorium seating as well as change to the suggested landscaping of the area directly adjacent to the structure, acceptance of the formal-utility concept of the revitalised drift. The expansion of the communication platform between the city authorities and local community caused the increased interest in the possibility to affect the city policy and made the inhabitants aware of their shared responsibility for the development and future of Zabrze.

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UTILIZATION OF MODERN METHODS FOR CREATION OF DIGITAL MODEL OF HUMAN

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ABSTRACT

The aim of the paper is to describe the methodology of creating a digital model of human using an optical method. An important aspect is also the safety of the person being scanned, when scanning with laser scanner is dangerous for the eyesight. Therefore, the most suitable method is 3D optical scanning, which scans the surface of the scanned object using structured light and does not endanger the health of the person being scanned. This methodology consists of several main phases, such as preparing the scan for human movement, scanning in the shortest possible time, and processing the data obtained by scanning. The data processing itself is divided into other sub-phases, which describe the individual steps necessary to create a digital model. The paper describes obstacles that need to be eliminated or minimized during 3D scanning in order not to disrupt the integrity of the model and to create a digital model.

KEY FACTORS INFLUENCING GREY INFRASTRUCTURE DYNAMICS IN PERI-URBAN AREAS: A CASE STUDY FROM WESTERN ROMANIA

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ABSTRACT

The second half of the twentieth century and the beginning of the 21st century were noted through intensive and aggressive urbanization processes, which inevitably led to the formation of increasingly compact peri-urban areas. This strong competition for space at the urban-rural interface is a general of potential conflicts of interest arising among a variety of end-users. The peri-urban areas have developed in the immediate vicinity of the cities to the detriment of the green areas (grasslands, forests) without taking into account, in most cases, the principles of environmental protection and sustainable development. In general, urban sprawl is very visible in the extension of the city of Timisoara (western Romania) to the adjacent communes. This process came often in conflict with elements of green infrastructure from peri-urban areas. Giving that green infrastructure (GI) facilitates climate change adaptation and mitigation, improves health and quality of life, and favors biodiversity conservation it is important to understand very well which are the factors that negatively affect green infrastructure and threatening the quality and number of ecosystem services provided by GI. In analyzing this process, several factors that influenced gray infrastructure dynamics in peri-urban areas were identified. These factors are analyzed in this paper in order to understand how they can contribute to mitigating the reduction of life quality in peri-urban areas. The authors identified key factors like migration, politics, socio-economic development, real estate speculation, climate changes, education having an influence on green infrastructure dynamic. Based on the results of this analysis, the authors tried to identity potential solutions and measures for the preservation of the peri-urban areas in western part of Romania.

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IMPACT OF STEEL FIBRE REINFORCEMENT ON THE STRENGTH OF STEEL ANCHORS

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ABSTRACT

Steel fibers are being added more and more often to concrete mixes in order to increase strength parameters. The addition of scattered steel fibers is called fiber concrete. Fiber concrete is a substrate consisting of a binder, mineral aggregate, sand, water and special admixtures in the form of steel fibers added to the cement matrix. Dispersed admixtures change the behavior of the concrete mix, which is characterized by quasi plasticity. Fragile damage to concrete substrates is not observed even after initiation of scratches on the face of the concrete. In the era of admixtures, the nature of the fixings in this area changes. Non-structural fasteners designed with steel anchors should ensure, throughout the intended use, parameters relating to the load capacity of the fasteners, stability, serviceability, without changing the suitability of the use of the anchors. The existing literature has no extensive knowledge about the impact of external factors on pull-out strength, durability of steel anchors in concrete substrates with dispersed admixtures of steel fibers. External factors are characterized by combinations of assembly parameters, possible scratch initiation of concrete substrates, grain size and possible admixtures dispersed with steel or plastic fibers used to change the strength parameters of concrete substrates. The article defines the load capacity for pulling out steel anchors depending on the condition of the concrete substrate, crack initiation, drilled diameter, the number of admixtures dispersed with steel fibers in solid concrete substrates. Tests for the purposes of the article was carried out on concrete substrates, strength class C20/25 and three quantitative variants of dopants dispersed with steel fibers. Three diameters of steel anchors made of ordinary galvanized carbon steel were selected for testing, as commonly used for fastenings in modern construction.

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ILLUMINATION OF OBJECTS AND LIGHTING OF PUBLIC SPACES

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ABSTRACT

The purpose of the research presented in the work are qualitative analyzes regarding night illumination of public buildings and spaces in selected large cities. The research concerned both selected objects, a fragment or the whole city. The quality of illumination, direct and indirect effects of lighting spaces and objects, and the impact of lighting on users were examined. The functions of illumination it performs in the city space were also studied. The main results of research and observation include the fact that night illuminations of cities play an important role and are beneficial in various profit zones. The combination of LED and photovoltaic technology gives excellent economic results. Inhabitants and tourists are staying in public spaces in the evening, walking and using gastronomic services. They stay longer and are happy to come back or recommend such places to others. Lighting of objects and spaces plays an important role, e.g. functional, aesthetic and functional. It allows you to ensure safety, pleasure and attractiveness of use, and allows you to extend the use of space and objects, and shapes the space by highlighting and highlighting important objects, the dominant. The most important conclusions should be that lighting and photovoltaic technologies are constantly evolving, becoming more effective and cheaper. It is also important to use the latest lighting solutions for new projects and shape the space depending on the users' needs, using qualitative research of public space. Currently, there are trends in lighting buildings. There are probably no important objects without their night illumination. There are cities such as Budapest, Lion, Hong Kong, Opole, which have planned overall illumination of the whole or part of the city. Especially in the vicinity of the river or bay, water is an additional element enhancing the aesthetic effects in the form of reflection of lights.

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ART AND DESIGN ON THE CAMPUS OF THE SILESIAN UNIVERSITY OF TECHNOLOGY

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ABSTRACT

The aim of the research presented in the publication is a qualitative analysis of elements of small architecture in the campus of a research university of the Silesian University of Technology. The research was carried out during the implementation of the research project entitled: "Art. and Design in Public Space. " As part of the project, further objects are created in the field of education, art and design. Made: 3 Red Cubes - Sight - Influence of geometric solids on the perception of the surrounding space, 4 numbered BenchMan benches, Le Corbusier's Modulor with graphic information, Kinetic Sculpture. All spatial elements are to draw attention, provoke reflection, present the work of students and employees, and above all inspire and encourage the use of design in small architecture. Selected elements are modifiable, portable and can be further created, and the process of creative activities is open and possible to continue. The project is open and has a developmental character. Further spatial elements will be added. The main slogan of the project is: "Change the environment and inspire others." The main goal of the project is to give "Life in Space". During use, research is being conducted, including observation of user behavior, impact of given objects on their users. The main research results are the effects of qualitative research on the changed space. They showed that all the presented spatial elements change the existing space, make them think, inspire, introduce a factor of interest in this space, convey information about space. The creative process in this project is an open activity and enables further transformation and modification of this space. It is also a factor that introduces an element of creativity and attractiveness of space through constant changes and other aesthetic and functional possibilities of space. The most important conclusions include the fact that introducing minor changes to small architecture in public space using art and design gives great results in the form of activating public space, improving aesthetics and functionality.

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NAMELESS SETTLEMENTS OF SARAJEVO

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ABSTRACT

The transitional process from a socialist into a capitalist social system, started at the end of the twentieth century in Bosnia and Herzegovina, and the related transformation of the public into private land ownership, with the neglect and lack of adequate development programs and public opinion, produce today the urbo-architectural and, in general, identity crisis. Under the guise of overall well-being, but mostly in the service of short-term economic profit, attractive urban spaces are occupied, the existing physical structure is uncontrollably removed and new construction is carried out, almost as a rule, in disregard for the needs and interests of society/citizens. Transformations of urban space, generated by the vibrations of a transitional society, are most evident in the capital, Sarajevo. The building process is basically a multiplication of residential settlements, the construction of which is carried out on a case-by-case basis, with considerable pressure from investors, and with the decisions made witin in closed, narrow interest circles and (often) without consulting the profession/urban planners and the public/citizens. In such an environment, the public domain loses its primacy over the private, which is manifested in the alienation of people and the loss of their identification with the place. Such housing estates are deprived of central service functions in the field of social infrastructure and in the manner of "tried and tested" repetitive urbo-architectural models, which together negatively affect the quality of individual and social life. In other words, residential settlements without an identity are created. Although they have formal names, these settlements are nameless. They are non places. Architecture and building are always deeply connected with the ideological framework of a particular society, which means that the understanding of the function of space and the place of mankind in it, we have opened a central question, as the main goal of this paper: Is it really true that Sarajevo's construction of new settlements cannot be adapted to anything other than current, narrow sighted, urban policy? Or else: Is their fate sealed – that they will be permanently determined by the attribute of a settlement without a name? For the purpose of finding the answer, of possible ways of overcoming the crisis or at least mitigating its effects, we conducted a comparative analysis of housing planning in a socialist social system with current transition planning. The results of this analysis have shown that the new urban policy is intrinsic and creates new articulations of urban space without spatial identitiy, essentally a name. We have concluded that a crucial moment has arisen in which it is necessary to stop anarchic decision-making on (sporadic) transformations of the city space and to establish a system of compliance with procedures in designing and adopting programs that allocate new necessary functions within the existing physical structures. As urban decisions are currently being made (mostly) outside the realm of the public/citizens, ie. in closed circles and with the pressures of private investment, the need to change such practices is evident. This is only possible through dialogue, because when all those interested in the decision-making process are involved in the conversation, then change will happen. Only then will we be able to talk about urban politics dedicated to creating an environment in which a person, is placed in the center of building process, and where one is given the opportunity to personalize the space one inhabits, to identify with and name it – make it its own, personal and intimate.

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ASSESSING STRUCTURAL SAFETY OF AN ARCH DAM USING IN SITU VIBRATION TESTS

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ABSTRACT

Safety of large dams has always been a major concern for engineers throughout the world but also for public opinion, mass-media and politicians. This is usually based on the fact that the collapse of a large dam could result in huge consequences such as fatalities, economic and/or environmental losses. Nowadays, it is well known that an important factor adversely influencing the safety of such a complex structure like a dam is represented by ageing as a process and ageing related phenomena. Since some 85% of all existing large dams are built in the last 50 years, safety influenced by different decay processes became an important issue to be analysed by dam engineers. In this regard, in situ ambient vibration measurements used to identify the dynamic response characteristics of a large dam seems to represent an appealing non-destructive technique to assess the structural and material characteristics changes and thus to monitor the safety status of the structure. The paper presents the use of the above mentioned procedure by a Romanian team of dam specialists who developed a method combining experimental and analytical techniques for the assessment of the health status of large concrete dams. The Global Elastic Modulus Method (GEMM) was initially used for analysing buttress dams, than it was extended to assess arch dams's safety state. The most recent evaluation was made upon a 48 m height arch dam in Romania, Cincis dam, located in the central part of the country. The paper is structured into 3 main parts: a. introduction, explaining the concept of the hybrid model (the mathematical model bounded to a certain in situ measurement program and calibrated using the recorded data) and of the global elastic modulus (GEM) associated with the dam structure; b. experimental, presenting the used equipment, measuring scheme and the processing of the recorded data, ending with the results from spectral analyses; c. analytical, presenting the mathematical model developed for the dam structure and its calibration aiming to identify the natural response frequencies and the corresponding mode shapes of the analysed structure. Final conclusions and recommendations are made.

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PROBLEMS ASSOCIATED WITH THE REHABILITATION OF THE BOTTOM OUTLETS OF THE POIANA UZULUI DAM IN ROMANIA

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ABSTRACT

After some 30-40 years of uninterrupted operation, important hydraulic works are in serious need for rehab or retrofit interventions. Works of this type can be made difficult or even prevented by various unforeseen situations, unknown to the specialists, because they were not previously accompanied by events that affected the operation of the hydraulic systems nor the safety of the constructions and installations. The paper presents the experience of a group of specialists and the way in which aforementioned unforeseen problems were solved during the rehabilitation works of the bottom outlets of a large dam in Romania. Poiana Uzului dam is the highest buttress dam in Romania (80 m max. height, commissioned in 1972), creating a multipurpose storage reservoir of circa 88 hm^3 used for water supply for population and industry, hydroelectricity and flood protection. According to the national dam safety norms, the dam is ranked into the 1st class of importance, which corresponds to a design discharge value of $Q_{0.1\%}$ (maximum discharge value with an annual exceedance probability of 0.1%). According to the Romanian design standard STAS 4273-83, for the 1st class of importance the dam discharge capacity has to be also verified for a much higher value, $Q_{0.01\%}$. The dam was provided with 3 bottom outlets, each equipped with trash racks and 2 butterfly valves. The advanced wear of the bottom outlets equipment determined malfunctions of the service valves, as well as deterioration of the thrash racks, metal fragments posing serious threat upon the safe operation of the valves and of the outlets. Rehabilitation of the bottom outlets equipment was not possible with the complete emptying of the reservoir, since it represents the only source of water for a number of circa 150,000 inhabitants in about 7 localities in the neighbouring areas. However, the intervention was possible with partial emptying of the reservoir, using professional divers to perform repair works in very difficult conditions. The lower limit to which the reservoir was emptied was conditioned by a program of monitoring the water quality parameters, allowing uninterrupted supply of water for population consumption.

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A BRIEF REVIEW OF THE ROMANIAN ARTIFICIAL SNOW WATER RESERVOIRS AND THE ENGINEERING GUIDELINES THAT APPLY

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ABSTRACT

In the condition of the climate change, ski resorts, worldwide and Romania alike, face a growing number of problems with season reduction and, therefore, revenue drops. One of the most important aspects is that large investments in mountain ski resorts cannot be sustained without the quality of the slopes maintained. Due to this fact in recent years engineering has been called upon to aid the growing tourism problems. Thus, artificial snow production is one of the focus points of the mountainous resorts. With water resources being regulated and scarce in the exact season that it is needed, for this reason, recent years saw the implementation of new storage reservoirs to provide the water for the artificial snow and ice production. In Romania alone, with little to low investments in new ski resorts, the focus has been turned in local entertainment small resorts, some existing rather popular resorts being revitalized by implementing new artificial snow production facilities. Inevitably, the existing infrastructure for water supply, mostly from the drinking water network, cannot handle the add-in water demand. Large water storage reservoirs and additional hydrotechnical works were the answers that made the systems viable. The engineering problems consisted in placing the reservoirs at higher altitudes, providing solutions to prevent freezing, ensure water loss control, intake management and geo-condition adaptation. With the rising number of such reservoirs the need for proper ruling, standardization and permitting is very important, at the level of the central and local authorities and institutions. Thus, proper guidelines and/or technical norms are imperative to be developed for this type of engineering infrastructures, as a result of the experience gained in the last 10-15 years. This paper is aimed at identifying the engineering problems and layout of the guidelines together with the review of the most important water storage reservoirs for artificial snow in Romania from concept to their operational behaviour.

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POTENTIAL OF URBAN TRANSFORMATION OF THE CITY RADIAL ROUTE IN BRATISLAVA, SLOVAKIA

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The city, as a stratified urban structure, spread over time and in social coordinates, has its solid and spatial substance for the life of its inhabitants and visitors. The wider city center continues from the central city zone to the peripheral and often developing parts of the city. As a rule, ballast, uncoordinated and disarranged urban structures are usually increasing in this area. The urban explosion in the 20th century has caused oversized systems of housing estates, industrial zones, traffic lines and nodes in cities, forgetting quality, scale, functionality, and beauty. The transformation of these territories is first and foremost a question of a proper understanding of the compositional, social, ecological and economic issues and principles of the sites. Bratislava, due to the terrain morphology, developed further from the center along several main urban radial routes. The Bratislava Eastern Axis, formed by the Ružinov City Radial, binds to itself the entire transport structure of the Bratislava city part - Ružinov, its nodal spaces, major amenities (culture house, the marketplace, sports facilities, etc.), brownfield sites, parks and residential zones in a regular geometric grid. The urban and green changes in Ružinov have been studied, in relation to the main nodes and the main pedestrian lines, as well as the potential for optimal intensification and transformation of the territory, through strengthening the identity of the housing estates by involvement of the memorable locations such as lakes, marketplace, hospital or linear park of Andrej Hlinka. Such changes are shown in the case studies of Bratislava - Ružinov on its axis in the locality of the market place Miletičova, Papánkovo Square and industrial zone Pošne. Emphasis on pedestrian and public spaces, the vitality, and identity of urban areas, the strengthening of blue and green infrastructure and the ecological principles of residential courtyards are possible only in the context of a lively society of the housing estates, dialogue and implementation of transformations with residents and local governments.

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DEVELOPMENT OF A NEW URBAN COUNTRY ON THE DANUBE ARMS NEAR BRATISLAVA

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ABSTRACT

The importance of the watercourse for the city as a whole and for the waterfront urban structure is given historically, geomorphologically, ecologically, and urbanly. The context of the city and the water can significantly determinate the city, in the individual stages of its development shape and model its embankment, and then offer its benefits, but also alarm in the form of possible threats connected to current climate change. Bratislava is honored to be a city on the Danube and a city with the potential of waterfronts, promenades, bridges, bays, ports, but also industrial, sports, recreational and cultural use of urban structures in contact of the city's edge with the watercourse. Restoration of old arms of the Danube, the extension of the main river by the bypass arm southwards opens up amazing possibilities of return of the landscape - urban development of Bratislava and its background. Return scenario of the Danube arms, restoration of floodplain forests and the Danube meander landscape with sensitive urban development is ecologically modeled on the climate protection of the city against summer overheating and drying. The idea of the blue-green cover of Bratislava also offers the development of new housing sites, culture, sport, recreation and new forms of eco-management in the country. Case studies in localities of Bratislava - Rusovce, Jarovce, and Čunovo on the restored meanders of the river point to possibilities of construction of ecologically structured urbanization in the bays of the Danube arms with islands. Bratislava has the opportunity to develop its suburban development with parameters of the city's climate protection. At the same time, there is an opportunity to propose a concept of peri-urban landscape with the recreational forests and by creating transition zones in contact with the protected landscape. New urban structures have the potential of ship transportation by the proposed Danube bypass channel, also in bays and harbors can the new structure offer water sports and recreation on new waterfronts.

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THE BEAUTY OF CONTEMPORARY FAÇADE: TRADITION, TECHNIQUE, TECHNOLOGY

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ABSTRACT

The article focuses on the contemporary diversity of creating facades of public utility facilities. Approaches in which trends of tradition of place as well as technique and technology have a significant influence on the architectural image and the beauty of the façade are analysed and arranged. The elevation of the building plays an important functional and aesthetic role. It protects the interior against environmental conditions and at the same time is the characteristic feature of the building. The necessity of prestige, being distinguished in its surroundings and/or appearing in the consciousness of residents make the architects seek original, innovative and often beautiful solutions. The searches are multi-layered and depend on the architect's conception. They become visible when the relation between the architecture of the building and the urban context is considered. Because the geometry of the building and the material which is used in the façade influence the perception of the building in urban surroundings, buildings of rectilinear geometry in urban space were analysed. The nonconventional materials implemented on the elevation or used in a non-conventional form may be grouped in the following way: a. Traditionalism of the material: Due to the technique and/or technology, the formal image of the elevation changes, yet remaining the matter which originates from the historic record of the implemented material. For example, ceramics used in contemporary architecture do not always resemble classical brick, however, its formal distinctness does not change the essence of materiality. B. Transparency and transience of the image: In contemporary searches, it leads both to the impression of levity and/ or to the creation of an illusion, weightlessness of the building and creation of the impression of unity of the architecture with the surrounding landscape. c. Multilayering of contemporary shielding wall: helps in introducing 'additional' functions into the external wall. Except for the basic function, that being the protection of the interior against surrounding conditions, multimedia, transparency, and energy-efficiency are also implemented.The above relationships are described based on examples of architecture of contemporary Poland. Krzysztof Kieślowski Film School at the University of Silesia (arch. Baas arquitectura, Grupa 5 Architekci, Maleccy Biuro Projektowe, 2017), fitted in the historic frontage shows the new form of traditional material-brick. The impression of transparency of the building is shown on the complex, glass elevation of The Polin Museum in Warsaw (arch. Lahdelma& Mahlamäki, 2013) standing among residential blocks. In contrast, the multimedia façade of the Centre for the Meeting of Cultures in Lublin (arch. Bolesław Stelmach, Biuro Architectoniczne Stelmach i Partnerzy, 2015), relates to the function of the building and the space of the urban square where it is located. The suggested approach shows that architectural innovation is manifested by the search for solutions to contemporary multi-layered materiality of shielding walls.

EFFECT OF STAGE LIGHTING ON AUDIENCE'S EMOTIONS

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ABSTRACT

Lighting principles direct a visual progression of experiences within the theatre stage. Lighting design is shaped according to the preferences of using the necessary effect of light to create an atmosphere, according to the composition of the play and ordering the hierarchy of elements. It supports the composition as if it were part of the decor in stage lighting. Lighting fixtures that can meet the lighting needs on the stage should be placed in certain areas on the stage to complement the play. This study examines the effect of stage lighting on the audience's emotions. All emotions can basically be divided into eight core categories, which are; joy, fear, sadness, surprise, anger, anticipation, disgust and contempt. Lighting design also affects how the audience will react emotionally to the theatre. The influence of lighting in the 'Diary of Madman' theatre play by Tatbikat Theatre Company and sensory effects on the audience has been investigated in Istanbul, Turkey. The play consists of a single actor on a crane, so the light becomes an actor in its own right. A survey was prepared using visuals of particular influential scenes from the play. In this survey, 20 participants were asked to mark which emotion the light used in the scenes evoked on themselves after the play. Results gave information about the color of lights, combined lights, focal lights from different angles, strong or weak lights and how they influenced emotions. This study presents a unique perspective on stage lighting design and is expected to be useful for stage designers, lighting designers, and persons involved in the theatre business.

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STRENGTHENING OF CRACKED BRIDGE GIRDERS USING BOLTED RETROFIT PLATES

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ABSTRACT

Ageing and being subjected to repeated cyclic loadings are two main reasons that cause existing steel bridges to become structurally deficient. The Roads and Maritime Services (RMS) is responsible for the management of more than 5600 bridge structures including culverts within NSW, Australia, with an estimated replacement cost of $18.2 billion. Of these bridges, it is estimated that 12% are approaching 70 years of service life and 50% are more than 40 years old. These records imply that a significant number of existing bridges are nearing to end of their designed fatigue life. These ageing bridges will sooner become structurally deficient as they were never designed for the traffic loads or frequencies they are subjected to today. The increased weight and frequency of traffic has a serious impact on the fatigue life of steel bridges, and if appropriate retrofit methods are not implemented, then it inevitably becomes necessary to replace the bridge at great expense. This study examined the suitability of bolted retrofit plates to strengthen existing cracked steel bridge girders, focussing on the effects that the bolt spacing and retrofit plate thickness have on the development of composite action. This was achieved by carrying out a parametric study on various bolt spacing and plate thicknesses and examining their effects on girder stiffness and ultimate load carrying capacity. It was found that the bolt spacing of the retrofit plate has significant impact on the ultimate load carrying capacity of the cracked retrofitted girders, with a reduction of more than 8% when the spacing is reduced by 60%. The load carrying capacity can be seen to increase linearly with the bolt spacing for the range of plate lengths included in the study. It was also found that the thickness of the retrofit plate had a little effect on when composite action begins to develop within the girder, but a significant impact on the stiffness and ultimate load carrying capacity.

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SPATIAL ANALYSIS OF COMMERCIAL SERVICES IN POLISH TOWNS AND RURAL AREAS

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ABSTRACT

Trade is the subject of interest of many areas of science, such as geography, economics, marketing, sociology or urban planning. In many countries in Europe and the USA studies of trade usually focus on location of commercial outlets in urban space, accessibility (time, cost) of trade for customer, selection of assortment offer and innovations in trade. Recent decade of spatial studies on trade in Poland concerns mainly new large-selling area formats and importance of trade in development of suburbanisation process and appropriation of public space by new trade formats. The aim of the article is to identify the mains rightnesses of the locations of commercial and service buildings in Polish towns and rural areas and to determine the percentage of population living in areas with difficult access to the trade. Conducted statistical and spatial analysis with the use of information obtained from Database of Topographic Objects is a method of diagnosis of accessibility that has not been applied before for its entire area of Poland and constitute the introduction for further in-depth studies in this sphere. Trade is one of the most important sectors of national economy in Poland and an essential market component both on regional and local scale. It is also a vital element of expanded distribution system and thus it affects the quality of people's life while satisfying their consumer needs in the sphere of buying goods in convenient time, place and conditions guaranteeing high quality of provided services. The city remains a natural environment of commercial activity ([1]) as development processes constantly proceed there, new consumer needs occur and new trade forms (e.g. large selling area super and hypermarkets as well as shopping malls) emerge there. Commercial activity depends on other city functions, including communication as well as social and economic functions, thus it directly affects the shaping of majority of functional elements in the city and conditions of its competitiveness as the centre in settlement system. Distribution of commercial outlets in a given area determines availability of goods and creates conditions for efficient provision of services for residents. The paper is a statistical and spatial analysis of commercial services in Poland.

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[1] *In this case, commercial activity represents trade in institutional approach, i.e. all commercial enterprises the activity of which consists exclusively or primarily in purchase of goods for the purpose of their further resale. It takes place in retail and wholesale outlets. More on the subject in: M. Sławińska, Handel we współczesnej gospodarce. Kompendium wiedzy o handle [Trade on contemporary economy. Compendium of knowledge about trade], publisher: PWN, Warsaw, pp.14-15.*

THE IMPACT OF RETAIL CHAINS ON THE STRUCTURE OF SMALL TOWNS AND RURAL AREAS IN POLAND

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ABSTRACT

Retail trade and services are becoming the most dynamically developing sector of non-agricultural activity in Polish rural areas. State-owned and cooperative stores have been closed down and they were replaced mostly by private stores. There are more and more commercial outlets of various formats, including supermarket chains, discount stores and integrated chains. Despite growing number of modern retail trade formats, traditional small-format, often referred to as local market is also really important. Retail chains in small towns and rural areas are mainly located in the zones of influence of larger cities. They affect many changes of spatial, social and economic character. Small towns and rural areas more and more frequently start to compete for further retail trade investments while noticing lots of benefits and costs of this process. The aim of the article is to show the scale of new retail investment in small towns and rural areas in Poland. Research devoted to this field is important from the point of view of choosing the location of new investments related to discount chains and of the strategy for the development of small towns and rural areas. Identification of consequences of the operation of discount chains in chosen rural areas and in small towns can impact the verification of the policy adopted by local authorities in relation to spatial planning and forming the functional structure. The aim of the paper was to identify the changes in small towns and rural areas under the influence of the modern trade, especially retail chains. The aim of the research was to identify the impact of retail chains on the spatial and functional conditions in small towns and rural areas in Poland.

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REINFORCING OF SAND WITH 3D PRINTED FIBERS – REVIEW OF PROPERTIES, FABRICATION OF FIBERS AND INITIAL TESTING PROGRAMME

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ABSTRACT

Fiber reinforcement is an effective method of soil improvement that presents an alternative solution to other more common methods of ground reinforcement such as mechanical stabilization by geosynthetics (geogrids, geotextiles, geocomposites, etc.). Research activities in this area are being carried out, but the main disadvantage of currently used fibers is their uniform cross-section and usually smooth surface given by available production methods. This study presents an alternative way of fabrication of synthetic fibers – utilization of fused deposition modelling (3D printing). With the rapid development in commercially available 3D printing techniques, it is now possible to refine the shape and dimensions of 3D printed objects to a tenth of a millimeter. The review of the basic index and mechanical properties of fiber-reinforced soils is presented in the first part of the paper. The second part is devoted to the description of the production process of fibers including the suitability analysis of materials used for 3D printing. Finally, the initial testing programme of fiber-reinforced non-cohesive soil is presented. The preformed laboratory test confirmed that the inclusion of 3D printed fibers led to a significant increase in shear strength. Examination of samples after tests did not reveal breakage of fibers, thus the fibers pull-out was the governing failure mode.

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ANALYSIS AND POLICY RECOMMENDATIONS FOR PUBLIC PARTICIPATION IN URBAN REGENERATION PROJECTS IN CHINA

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ABSTRACT

Urban regeneration projects mainly include demolitions and renovations to existing buildings, physical improvements of the deteriorating districts and the optimization of the industrial structure, which directly relate to public interests. Public participation mechanisms are widely used in urban regeneration projects to promote legitimacy and democracy of decision-makings. Public participation process of urban regeneration projects in china has been institutionalized and legal and political measures are taken by government these years. However, the implementation of public participation process in urban regeneration projects doesn't achieve expected outcomes in China and there are some barriers for promoting the public participation process in urban regeneration in practice. This article aims to make up for the gap between theory and practice by synthesizing main problems and countermeasures for public participation by reviewing the relevant literatures and referring to the recent cases of urban regeneration projects in China. Firstly, this study analysed the development of public participation process in urban regeneration projects in China and presented the current public participation mechanisms. Secondly, major problems in participation process and the analysis of such problems are presented: (1) It's still doubtable whether citizens are fully rational characters when making decisions on complex issues; (2) It's still questionable whether adequate staff and other necessary resources (e.g. illustrating material) are supported by proper channels; (3) It's still unknown whether there are a set of rules to answer the questions of participants selection, process facilitation, times and resources organization, etc; (4) It remains insufficient in terms of participation depth in the "participatory ladder" and rationality in the participatory mechanism. Finally, the study proposes suggestions accordingly for such issues to make the process of public participation more practicable.

THE PROBLEMS OF MANAGING MUNICIPAL HOUSING RESOURCES IN POLAND AND THE CZECH REPUBLIC

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ABSTRACT

The paper discusses the problems of managing municipal housing resources in Poland and the Czech Republic in terms of the issues that accompany municipal resources management. The scope of research includes the specification of the size of housing resources in both countries, a presentation of the general conditions of municipal housing management and conducting detailed analyses in selected cities (Wrocław, Poland, Hradec Kralove, Czech Republic), with respect to rent arrears and decapitalisation of the housing tissue. The study analyses the deficiencies in adapting residential premises to current housing standards. It was determined that the average age of buildings with municipal and social apartments in Wroclaw in 2018 was 100 years, and the average degree of wear was 44.26%. A vast majority of residential buildings that belong to municipal housing resources was built before World War II. The situation is similar in Hradec Kralove. The apartments require renovation and reconstruction works. They are mostly occupied by the poorest group of residents, which generates additional problems with rent arrears. Although the rent rates in apartments owned by the city Wrocław are very low, below 3% of the replacement value for the Lower Silesian Voivodeship, a significant part of residents still have permanent rent arrears. Research revealed that a significant majority of buildings owned by the analysed municipalities require renovation works due to their age, general state of repair and the necessity to adjust them to the currently binding technical and construction regulations.

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THE ROLE OF CONTEMPORARY LANDSCAPE ARCHITECTURE IN THE PUBLIC SPACE IN TERM OF SHAPING THE ARCHITECTURE EDUCATION AND RECREATION-SELECTED EXAMPLES FROM CHINA

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ABSTRACT

On the basis of fully respecting the original historical cultural and natural conditions of the original site, contemporary Landscape Architecture can help to transfer a site into comprehensive functional public space. Apart from offering social activity in the areas, landscape architecture serves a space more leisure and recreation, it can also reshape the public places in a better and sustainable way. Through three different case studies during the transformation from the abandoned site into public space during urban and rural regeneration from China, the paper focus on the research of regeneration of the site in order to provide limited public space recreation but also combining the education and entertainment for local people. It is obvious that contemporary Landscape Architecture increasing the public space more colour and vitality through various forms and techniques. This paper attempts to present the results of the analysis of three different modern landscape design built on the abandoned public areas to clarify that contemporary landscape architecture effectively promote the integration of education and entertainment in order to create an open space along with the ecological sustainable development.; identification and assessment of the relationship between landscape Architecture and the surrounding environment; assessment of the diversity and attractiveness of the public space created and assessment of landscape architecture in a the beneficial solutions.

ANALYSIS OF TECHNICAL, ORGANIZATIONAL AND LEGAL SOLUTIONS USED IN THE AREAS OF FLOOD RETENTION: A CASE STUDY OF POLDER GOLINA LOCATED ON THE WARTA RIVER (WESTERN POLAND)

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ABSTRACT

The paper presents technical, organizational, legal and economic conditions regarding the development of the area of flood retention. Floodplains located within the Golina polder, which is the largest dry river basin reservoir of the Warta River, were considered as the research object. Polder Golina with the Jeziorsko reservoir is an important element of flood protection of the city of Poznań. Floods that took place in 1997 and 2010 caused significant losses in this area in building, communal, economic and agricultural infrastructure. They also generated a dispute between the local population and the authorities responsible for water management on how to develop these areas. After the flood in 2010, there was a proposal (from the administration authorities responsible for flood protection) to buy the entire area and change the way it was used only as a flood retention area. It is suggested that the surrounding population be displaced to other areas within the commune. The analyzes carried out by the authors indicate that the solution proposed by flood protection administrative bodies is characterized by very low economic efficiency. The use of modern construction solutions, adapted conditions for temporary flooding of built-up areas in conjunction with legal regulations would save significant public funds allocated for the purchase of this area.

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A STUDY ON PUBLIC SERVICE AREAS IN ANKARA GÜLTEPE NEIGHBORHOOD

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ABSTRACT

The industrialization movements in our country in the 1950's caused to the rapid increase of the population in the cities. Unhealthy and illegal constructions have increased to meet the needs of the population, which has increased as a result of rapid urbanization. This situation has caused infrastructure problems, inadequacy of the spaces necessary for the development of the individual and society, and a decline in the quality of life. In order to eliminate such problems in our country, urban transformation projects are implemented with the basic aim of creating an urban environment a healthy and high quality of life for residents by reducing disaster risk in cities. Public service areas are needed for the development of the individual and society in urban areas. There are legally defined standards in our country for the adequate and accessible level in cities of functions such as educational facilities, health facilities, administrative and religious facilities, cultural and sports facilities, green areas and play garden. The first settlement in Gultepe Neighborhood, located on Altındag Hill, started in the 1930s. Since it has a sloping land structure, the settlement is reserved as a green area in the urban plans. However, due to its proximity to the Ulus trade center, it has caused low-income people from the rural areas to prefer this place for unplanned and illegal settlements. The area, which has become a completely slum settlement over time, was included in the scope of urban transformation by the 2000s. In the survey conducted on the public living in Ankara Gultepe Neighborhood where urban transformation was applied, the adequacy and accessibility of public services areas were asked and the results were evaluated.

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PLANNING AND IMPLEMENTATION PROBLEMS IN IZMIT COASTLINE

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ABSTRACT

Throughout the history, coastal strips have also brought a city-specific identity due to their great importance in terms of their location. Rapid urbanization around the world has also affected the coastal cities and caused some changes in city identities. As in some coastal cities, various coastal arrangement studies in Izmit city caused many problems, especially on the city morphology and the city skyline. Izmit's being in a position with railway, seaway and highway connections played an important role in the rapid development of its industry. In this context, it will be emphasized that some coastal arrangements made in the city throughout the historical process have lost their identity as a coastal city and transformed it into an industrial city. As a result of the loss of the feature of being a coastal city, the changing use of the coasts of the city residents and their satisfaction has been examined. In this study, a survey was applied to 100 people living in the city and using the coastline. Participants were asked questions such as accessibility to the city center, street furniture, green areas and parking areas, public transportation and transportation to the area, pedestrian roads and the adequacy of bicycle roads. The graphic results obtained in line with the answers given were evaluated.

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HOUSING CONDITIONS OF ELDERLY PEOPLE IN POLAND

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ABSTRACT

The aim of the study is to determine the actual housing conditions of retired persons in terms of their place of residence, households of the elderly, type of buildings where they live and their willingness to move to a different apartment, adapted to the needs connected with movement limitations of the elderly. Research was conducted on a group of people in post-working age who live in a region of Lower Silesia in Poland. The main tool used was public opinion survey. The conducted analyses revealed that in rural areas, retired persons live in multi-generation families, while in towns – with their spouses or alone. Country dwellers prefer to spend their old age where they have lived before, while city inhabitants are much more willing to move from their apartments to flats adapted to the special needs of the elderly. This applies to all age groups of respondents.

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A COMPLETE MORPHODYNAMIC STUDY TO FACE A RIVER ENGINEERING ISSUE

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ABSTRACT

Waterways play an important role in the economy of the surrounding territories, as for example in agriculture or industry. Moreover, in the lower course they often represent a key way of communication, and they can also be home to inland touristic ports, giving a substantial contribution to the tourism economy of the coast. The profitable use of these structures need a substantial stability of the riverbed over time, limiting as much as possible sedimentation phenomena near the docks, which could cause a reduction of navigability and hence a limit in the use of the docks themselves. Nevertheless, rivers are natural environments in constant evolution and they frequently show a change in their planimetric geometry. In fact, the stream tends to form meanders as one possible adjustment to natural or anthropogenic imposed conditions like for example water discharge or introduced sediment load. In this sense, an artificial alteration of the river course could cause a response by the river itself, involving both short and longer time scales, ranging from days up to hundreds of years. These observations suggest that the cause of a current situation could date back to the past, as a consequence of an incorrect management of the river. Hence, an in-depth study of past events results as essential to a better understanding of a present state. On the other hand, it is clear that any intervention could be the disturbance which triggers the morphodynamic instability of the river, and therefore it could have unexpected consequences even after several years. These must be predicted in order to avoid uncomfortable or dangerous situations in the future. Thus, any intervention on a watercourse must be preceded by an accurate analysis of its possible effects both in the short term and over years. This kind of investigation can be carried out by means of specific numerical models, whose computational domain can be easily modified to take into account for any possible engineering work. In particular, even if tridimensional models are more suitable to describe local phenomena, bidimensional models are still very useful in describing the general evolution of the river with reduced computational effort. This kind of models usually combines a hydrodynamic and a sediment transport module, in order to describe changes in bottom height, due to erosion and deposition phenomena. In the present study an engineering issue close to the mouth of the Tagliamento River in the Northern Adriatic coast (Italy) has been considered, where the riverside of a touristic marina is undergoing a depositional phenomenon, which prevents for a correct use of the dock and requires continuous dredging operations. This issue has been addressed with a complete and integrated approach, including an in-depth historical analysis and numerical simulations to support planning choices. The historical reconstruction was aimed to identify the cause, which triggered this depositional trend. Once the origin of the phenomenon has been understood, some hypotheses have been made to mitigate it, and the numerical simulations have been directed to identify the best possible engineering solution among those considered.

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WAVE FORECASTING DEPENDENT FROM BOTTOM ROUGHNESS: THE CASE OF THE MARANO AND GRADO LAGOON

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ABSTRACT

Wind waves govern the nearshore dynamics in combination with tidal and current flows, leading to the sediment resuspension mechanism in coastal lagoons, sheltered estuarine basins, and shallow lakes. In these contexts, where depth limits both current velocities and the relative bottom shear stresses, locally generated waves trigger the main morphological processes. In this sense, the comprehension and evaluation of wind wave dynamics on finite depth represent a key point for the correct management of important eco-systems, such as estuarine and lagoon mudflats, salt marshes, and shallow lakes. Numerical modelling is a very valid tool to investigate wave hydrodynamics, especially where the complexity of the phenomena is such that it cannot be described by more simplified approaches. However, the required computational effort can be significant and a comparison with experimental and analytical results is always needed to calibrate and validate models. In the absence of measured data, especially of wave motion, it is often necessary to proceed with a wave prediction system. The forecasting growth curves offer the possibility to estimate the wave characteristics more rapidly than a complete numerical approach, but still providing reliable values. In fact, the SMB (Sverdrup–Munk–Bretschneider, 1973) method is widely recognized to be the most convenient and robust approach to use for computing wave heights and periods in deep water when a limited amount of data and time are available. Similarly, in shallow water contexts, the curves of Bretschneider (1973) and Young and Verhagen (1996) have become a widespread key reference for many applications. The domains are above all coastal areas, lagoons or lakes characterized by quite uniform bottoms and shallow depths. The interaction with the bottom plays a crucial role in determining the wave components, but there is still an ongoing debate as to how the roughness can be involved in the forecasting equations. The recent study by Pascolo et al. (2019) suggests the possibility of making the equations dependent on the bed roughness, presenting a new set of forecasting equations. These curves have been validated through an application to a real shallow lake, comparing the obtained wave heights and periods to both experimental and numerical data. This application considered a single measuring point in which the characteristics of the wave motion were obtained in the hypothesis of fully developed conditions. The present study is a first attempt to extend the application of the new curves introduced by Pascolo et al. (2019) to a bi-dimensional domain, reconstructing the wave parameters on any of its points. The chosen context is the Marano and Grado lagoon, in the northern Adriatic Sea, Italy, which is characterized by extensive tidal flats with an almost uniform bathymetry. This condition is exploited in order to obtain an estimate of the wave motion in a simplified way. The results obtained are compared to those deriving from a complete numerical application and those calculated applying the Young and Verhagen curves. The comparison confirms the validity of the equations and the possibility of applying them in large and complex domains.

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SEARCHING THE THEATRICAL ARCHITECTURE OF THE FUTURE IN THE PROJECTS OF LVIV ARCHITECTURE SCHOOL

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ABSTRACT

It would seem that at the beginning of the 21st century everything what had been predicted by the leading researchers of Lviv architecture school in the field of theatrical architecture was supposed to be implemented in Lviv as well as in the whole Ukraine. V. Proskuryakov, Yu. Bohdanova, B. Goy, I. Gumennyk, S. Ivanov-Kostetskyi, Z. Klymko, I. Kopylyak, R. Kubai, Yu. Filipchuk, K. Yanchuk and others. A whole series of the buildings has been designed; there were traditional theatrical buildings based on the prototypes as well as the projects of adjusting already existing historical spaces with the purpose of performing activity, moreover, modern views on the graphic solutions to cultural and entertainment institutions with traditional scenography were suggested. Among them, there are city halls, community halls, and landscape theatres, theatrical halls in club buildings, experimental theatres and studios. The designing activity was done in a historical, modern and futuristic style and was directed at arranging the environment for constructing theatrical space, developing mobile theatres in landscape environment, relocatable, detachable, touring and studio theatres. Everything what has been tested in Lviv during the last 17 years in experimental, competition and applied designing can be grouped based on five main directions: **a.** Designing performed on the existing buildings. Among the most interesting ones, it is worth mentioning the designing of the concept of space arrangement in the assembly hall of the former research institute of radio-electric equipment for theatrically-performing needs of a leisure centre “Mi100” in Lviv and the project of renovating the assembly hall of the 1st building at Lviv Polytechnic National University with extending its theatrical function. As a part of the measures towards historical reconstruction, the projects of theatrical equipment in the defensive buildings of Lviv and Lutsk have been suggested. **b.** Direction has been created by the theatre projects for rock concerts and exhibitions which were designed in the natural landscapes. **c.** Direction should include the experiments with theatres-studios. For example, the design of a new television studio “Tonis” in Kyiv is arranged in a way of a modern analogue of a historical main stage. **d.** One should include designing theatrical buildings for national communities: a theatre for the Jewish community and working out the concept of the project of a Polish theatre in Lviv. And, finally, **d.** One - conceptual design which has grown from the ideas of a worldwide-known architect and scenographer F. Kiesler and a stage artist Ye. Lysyk, which have been implemented into the projects of the theatres of kinetic projections and scenographic solutions to the pavilions at Prague Quadrennials. It seems that the mentioned above ideas and particular projects are not very much different from the ideas which were being generated by the school on the verge of the 20th and the 21st centuries, however, it only seems like that at first glance. During the recent years, the artistic palette of the theatrical activity has hardly noticeably been revived in Ukraine which has been reflected positively on the quality and genre variety of works of Lviv architecture school.

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FINANCIAL MANAGEMENT OF CONSTRUCTION COMPANIES

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ABSTRACT

The objective of financial management of construction companies is to generate profits and ensure financial stability. Financial stability is ensured by managing the amount of long-term and current assets, the amount of equity and external capital. Therefore, in order to ensure the objective of financial management, it is necessary to comply with the basic financial rules. In the framework of nationwide analyses of economic indicators by industry, there are results published on the website of the Ministry of Industry and Trade, which, however, apply to all construction companies. For this reason, the authors of the article focused on individual categories of construction companies (small, medium and large), which are given by the turnover, assets and number of employees. For these subcategories it was examined whether they fulfilled all or part of the basic financial rules, including the following: golden rule of risk equalization: the ratio of own and external resources should be in the ratio of 1: 1, golden balance rule: fixed assets to be covered by long-term resources; golden pari rule: fixed assets to be covered by equity. The research also monitored the structure of assets, i.e. the ratio between long-term and current assets. The research was based on elementary methods of financial analysis (vertical and horizontal method). The outputs of the contribution will be further used for the next step of the research, which is focused on tax optimization of individual categories of construction companies in relation to financial management of fixed assets.

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ANALYSIS OF LAMINATED GLASS BENDING BEHAVIOUR WITH EVA INTERLAYER: FEM AND EXPERIMENTAL RESULTS

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ABSTRACT

Since many years the use of laminated glass (LG) is increasing due to its ability of guaranteeing robustness requirements as well as architectural features. Further, it is also to be emphasized the improving of the post-breaking characteristics of the glass with the consequent improvement of the safety features. The core of the LG is the presence between the glass layers of one or more interlayers made with different polymers, the most adopted of which are PVB, SGP, EVA and XLAB. Actually, the designer can evaluate the maximum stress in LG structures referring to the methods proposed in international standards. The main goal of these methods is to evaluate the maximum stress acting in each layer of LG as that arising in a beam subjected to pure bending (equal to the overall one acting on the LG beam) but characterized by a thickness suitably modified. The latter thickness depends on the original one, on the thickness and mechanical characteristics of the interlayer, on the boundary conditions of the beam and on the load acting on the beam. Recent experimental results published by some of the authors show that the results obtained by the methods above referred can be affected by a significant error especially when the glass layers possess different thickness. Consequently, the paper is devoted to the FEM analysis of the kinematical and mechanical behaviour of LG beam subjected to pure bending. The analysis starts from the results obtained by an experimental campaign on suitable specimens with different interlayer thickness. In particular, aim of the paper is to investigate the role of polymer thickness on the overall mechanical behaviour and that of the stacking sequence with respect to the bending action. Specifically, the experimental results are utilized as benchmark for the correct validation of the FEM model created in ANSYS workbench code. The numerical analysis has been conducted both considering EVA as linear and nonlinear material in order to evaluate also the influence of the nonlinearity on the overall behaviour. A convergence analysis has been conducted to ensure a sufficient element number to capture correct stress field. The selected LG specimens are composed of two glass layers of different thickness bonded by a polymer layer constituted by Ethylene-vinyl acetate (EVA). The experimental behaviour of the analysed specimens is deduced by applying Electronic Speckle-Pattern Interferometry (ESPI) technique; actually, among optical methods ESPI (handled by phase-stepping technique) is very effective to obtain a full-field displacement map and to numerically achieve the relevant strains. The longitudinal strain, numerically obtained, is the basis for the validation of the FEM model. Once the model is validated a suitable FEM analysis is performed in order to check the stresses acting on the specimen. The obtained results, in terms of both stresses and displacements, show the role of the interlayer thickness as well as that of the stacking sequence in the structural behaviour of LG beams opening new approach to the design and optimization of such elements.

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FIRE SAFETY ASSESSMENT METHODS FOR FIRE PROTECTION COATINGS

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ABSTRACT

Fire durability of intumescent coatings is the ability to maintain their fire retardant properties under fire conditions (under the influence of real fire temperature conditions). Intumescent fire retardant coatings appeared with the development of steel constructions in the second half of 20th century and in recent decades have gained enormous popularity. Although the intumescent fire retardant coatings have been used as passive fire protection for a long time, much about them remain unknown, e.g. their behavior under the influence of different fire temperature regimes, as well as how their fire retardant properties change during operation. In the work the peculiarities of application of intumescent fire protection coatings in single-storey buildings on a steel frame are considered, taking into account the peculiarities of fire load. In this study the fire hazard assessment of single-storey buildings on a steel frame with sandwich panels as enclosing structures is made. The analysis of fire load has been also made. Numerical experiments on estimation of the indoor fire temperature regime have been carried out. For estimation of the influence of fire temperature modes on fire resistance of steel structures the software complex "Fire Dynamics Simulator" (FDS), which implements a field mathematical model, was used. Various fire temperature modes (temperature-time dependencies) were obtained. Modeling of fire temperature modes was performed without taking into account active fire protection systems. The most critical and unfavorable in consequences fire scenarios have been chosen by experts and used further to solve the thermotechnical problem. The estimation of changes in the intumescence coefficient and heat conductivity coefficient of water-based and solvent-based fire protective coatings under different fire temperature regimes, obtained by modeling and under the influence of the standard temperature regime, was made. For experiments authors used a test installation according to GOST R 53295-2009 "Fireproofing for steel structures. General requirements. Method for determination of fire protection efficiency". Testing time was equal to 30 min. Heating time of steel plates 100x100 with the thickness of 2, 3, 4, 5 mm under the influence of various heat fluxes was also estimated in the simulation. The values of thermal flows were equal to: 30 kW/m2, 35 kW/m2, 40 kW/m2, 45 kW/m2, 50 kW/m2. The research was carried out for different coating thicknesses: 500 μm, 1000 μm, 1500 μm, 2000 μm. The testing time was equal to 30 minutes. Heating of steel structures with non-stationary heat influence at standard temperature mode (according to ISO 834) and in conditions of fire temperature modes was estimated in numerical experiments within the results of modeling. Equivalent fire duration with bearing-capacity failure for steel structures was estimated. Computing complex "ANSYS mechanical" was applied for modeling of heating of steel structures; it allows to carry out thermotechnical calculation for the structure.

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SYNERGISM OF PHYSICAL AND CHEMICAL PROCESSES IN FIRE RETARDANT INTUMISCENT PAINTS

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ABSTRACT

The effect of the main components of intumescent paints on fire protection properties and the creation of synergy effects have not been studied much. It is known that one of the effective ways to protect steel structures in case of fire are thin-layer polymer coatings that can grow many times when heated. The basis of intumescent fire protection paints is a polymeric binder and fillers, stabilizers of the foamed coal layer. At a fire the structure of the covering is bloated, and a fine-meshed layer of the covering with low thermal conductivity is formed, as a result of which heating of metal constructions slows down dramatically. In accordance with theoretical and experimental studies of the structure of foamcoke flame retardant combustible coatings synergistic effect can be distinguished which is caused by the work of all ingredients and functional contribution of each of them in the process of thermolytic synthesis of intumescent fire retardant coatings. It is known that an important part of the formulation of intumescent fire retardant coatings is binder (resin). Binders are solid or liquid polymers that dissolve or disperse in a solvent or water. As the binder dries, a paint film is formed. The drying process can be physical or chemical. Typically, binder drying and polymerisation are mixed processes. The physical process refers to the drying of the binder without a chemical reaction, e.g. it can be the result of evaporation of solvents. In the case of chemical drying, hardening is achieved by a chemical reaction. The coating can be formed, for example, by oxygen in the air or by a reaction with a hardener. Tests on different types of binders have shown that acrylate-based film formers are inferior to vinyl acetate copolymers and their modifications. The main fire retardants are ammonium polyphosphate, melamine, pentaerythritol and their compounds, which have a complex of properties that create a synergistic effect due to the energy stability of triazine nuclei and the ability to form polyfunctional reactive chemical compounds. Melamine melting point is clearly indicated by the endothermic peak at 340°C. After melting in the temperature range of 350-430°C melamine transforms into melem, and at 430-500°C melem transforms into melon. Melon is resistant to heating to 740 °C. Thus, melamine and products of its transformation are quite long-lasting and, therefore, can react with aldehydes, forming melaminoaldehyde oligomers. High temperature of synthesis, naturally, should favor the formation of spatially cross-linked structures - melaminoaldehyde resins with complex composition. Similar processes take place in intumescent systems, where instead of melamine urea or dicyandiamide is used. Ammonium polyphosphate (PFA) is the main fire retardant in fire protection paint. When PFA is heated to temperatures around 250-280°C (depending on the degree of polymerisation), endothermic decomposition with the formation of polyphosphoric acid and the release of ammonia.

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MODIFICATION OF THE LEVENBERG - MARQUARDT ALGORITHM FOR SOLVING COMPLEX COMPUTATIONAL CONSTRUCTION PROBLEMS

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ABSTRACT

Systems of nonlinear algebraic equations have a special place in solving modeling and calculation problems in various areas of construction Sciences. These are tasks for calculating building structures, calculating distributed loads, mass and heat transfer tasks, calculating engineering networks, and many other computational and optimization tasks related to the construction industry. As is known, there are a sufficient number of fundamentally different methods for solving systems of nonlinear algebraic equations, which is related to the specifics of the systems, their degree of nonlinearity and conditionality. Non-linear ill-conditioned systems are particularly difficult; an erroneous choice of the method for solving such a system can lead to significantly distorted or simply incorrect results, which is absolutely unacceptable when performing the calculated stages of solving construction problems. In this paper, we propose to use a modification of the well – known Levenberg-Marquardt method developed by the authors, based on the regularization of the Jacobi matrix used in the classical Newton method, to solve complex, ill-conditioned systems of nonlinear equations. The modified method allows solving poorly defined systems and can significantly reduce the amount of calculations needed to ensure the required accuracy by reducing the number of iterative procedures. The paper presents a detailed description of the algorithm, given the solution of the model problem and, as an example the task of modeling and optimization of the port berthing facilities – mooring wall of massive masonry with various add-ons. When composing mathematical equations, the method of limit States was used, which is generally accepted for calculating such port hydraulic structures. The choice of the optimum scheme was carried out by minimizing the cost of structure during limit conditions the reliability of structures when using existing construction materials. The most significant geometric dimensions of the structure were selected using independent parameters to be optimized.

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3D MODELING OF CONSTRUCTION OBJECTS BASED ON THE INTEGRATED AUTOCAD SYSTEM

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ABSTRACT

Wide implementation of computer modeling of three-dimensional construction objects allows us to solve many technical, logistical and design problems. The development of a detailed electronic three-dimensional plan is a valuable virtual base that allows you to create, display and use for engineering purposes models of various types of engineering, telecommunications and computer networks, plan their construction, modernization and replacement. Connecting external databases to the electronic model allows you get a full specification of buildings, networks and any other objects, display a time record of repairs, replacements, etc. in addition, the 3D model allows you to enter the color differentiation of objects, which can give additional information, for example, the allocation of dangerous equipment (fire, explosive, etc.) in red or other color on the three-dimensional plan of the building. AutoCAD was selected to build a 3D model of the branched multi-storey building of one of the buildings of a modern University, which allows you to get accurate 3D models, has the means of obtaining sections and sections, and also provides a fairly realistic visualization. To obtain a 3D model of the University buildings, all the work was divided into the following stages: building two-dimensional electronic plans of each floor; building three-dimensional models of each floor; combining floor models into a common 3D model of the building. Models of buildings were created on separate layers, which makes it easy to turn off a particular layer, and to study the internal structure of buildings. The 3D model has real dimensions and is easily scaled. Engineering networks and other equipment items can be attached to the model elements in the future, and other tasks will also be solved, such as the location of fire-fighting equipment, escape routes, emergency exits, etc. When creating 3D models, we used the color differentiation of objects. We describe a mechanism for programmatically selecting objects by color in the AutoCAD environment, as well as a program that implements this selection mechanism using a data file with sequential access as an external database.

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THE TRANSFORMATION OF THE LOWER LUSATIAN LANDSCAPE IN THE CONTEXT OF CLIMATE AND ENERGY CHANGE

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ABSTRACT

The subject of the article is the process of transformation of the landscape of Lower Lusatia – German's second-largest lignite mining region – shown in the context of contemporary development trends and energy and climate policy. The experience of the last few decades has shown a variety of objectives, directions of development and activities leading to the formation of a new image and landscape identity of the region. The transformation of the landscape of Lower Lusatia is a process of change that is linked to industrial heritage, the tourist potential of the renewed landscape and the energy value based on lignite mining and the acquisition of renewable energy sources. The combination of these three processes is the basis and determinant of creating the current identity of the region. It is also an area of often conflicting interests resulting from various environmental, social and economic conditions. A factor that has a decisive influence on the development of the region is the climate and energy policy implemented in Germany, taking into account environmental objectives, economic needs and social interests to varying degrees. Limiting the adverse consequences of climate threats has now become one of the key strategic actions of the region, reflected both in planning documents and political decisions, as well as in the real landscape. The aim of the article is to show the possibilities and limitations of modern climate and energy policy and to determine the extent of its impact on the landscape, spatial and social transformation of the Lower Lusatia region. The research is also an attempt to answer the question whether the implementation of the adopted energy goals will be sufficient to change the landscape of the region in a sustainable way and sufficient for its development and improvement of living conditions of its inhabitants.

STUDY ON URBAN WIND PATTERNS FOR DEVELOPMENTS IN WUHAN CHINA

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ABSTRACT

This paper reports a project with the purpose to develop design guidance on urban wind fields for Chinese city. The project assesses“super-block”developments in Wuhan China at first, then redesigns a super-block using Transit-Oriented Development (TOD) guidelines and draws wind performance comparisons.The project addresses wind Patterns for three major criteria: pedestrian comfort, air quality, and building ventilation potential. Computational Fluid Dynamics (CFD) software was used to model velocity, PMV comfort, pressure and air age patterns for summer and winter conditions. Super-blocks with isolated towers have poor urban quality on many measures, while residents drive more and use much more energy than in traditional housing. TOD guidelines solve these problems but no discussion of urban wind patterns, air pollution, pedestrian comfort, or building ventilation which been found important during the period of Corona Virus Disease 2019 (COVID-19) in Wuhan China. Our target was to generate TOD urban form that equaled or exceeded super-block wind performance. Results were inconclusive for pedestrian comfort and other indices and modeling are needed. Other parameters depend significantly on orientation and wind direction, therefore sometimes TOD was better than towers and sometimes not. The general method of the project is in six parts: 1) Assess five existing super-block designs for wind performance and characterize three performance metrics; 2) Draw conclusions about performance. Select one site for redesign; 3) Using TOD guidelines, design a new neighborhood at the same density on the selected site; 4) Evaluate wind performance of the new design; 5) Select wind design strategies to improve performance and redesign the TOD neighborhood; 6) Compare wind performance of TOD neighborhood and super-block. The study indicates the value of wind field analysis for improving urban designs for multi-building sites or for development rules. We were generally able to make performance improvements for development schemes, even during the special period.

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ENERGY PERFORMANCE OF TWO 18th CENTURY BLOCKS IN LISBON POMBALINE QUARTER

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ABSTRACT

The 1758 Lisbon Pombaline Quarter reconstruction plan consists of a homogeneous urban fabric, structured by rectangular shaped residential blocks, built with a system that matches heavy mass construction elements with a light timber structure, called "Gaiola". Although Pombaline architecture and construction generate consensus among authors about its importance as a historical fact and exceptional construction quality, this kind of buildings experienced several modifications over time with severe consequences to their built fabric properties and architectural elements. However, if we take into consideration both constructive and architectural inherent features of the 18th century Pombaline block, it has the potential to hold and achieve high-energy performances if considered as a “single” unit. In this way, this paper intends to analyse and compare the energy performance of two block units replicating the "original" 18th century Pombaline design and constructive features. The method involves the conception of a Building Energy Model of two case studies with different volume, form and orientation, loaded with energy parameters related to Pombaline construction, and subsequently simulated with EnergyPlus dynamic analysis software. In order to calculate the energy demands for heating and cooling, we set the indoor temperature value between 18ºC and 25ºC. The results show that due to its architectural features, Block T presents a better overall performance compared with Block H, demanding 8% less energy and displaying less time in thermal discomfort. Finally, the blocks east side and the highest story registered the worst energy performance in both case studies.

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NUMERICAL STUDY OF THE USE OF TYRE-DERIVED-AGGREGATE (TDA) IN THE BACKFILL ABOVE FLEXIBLE PVC PIPELINE

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ABSTRACT

Tyre Derived Aggregates (TDA), produced by shredding scrap car tyres, show many interesting features, such as: durability, low bulk density, thermal insulation, good drainage properties or ability to damp vibrations, which makes them a useful material for civil engineering. One of the possible applications is partial filling of excavations with TDA during the construction of underground pipelines in order to decrease the load applied on the pipe. The article presents the results of a multivariate numerical study of 2D FEM models of a flexible PVC pipe - soil system, in which the presence of a mixture of sand and TDA (tyre chips - 40% by weight) (STCh) in the backfill was simulated. The models differed in the thickness of the STCh layer (t = 0 – 0.9 m) and inclination of the excavation walls (a trench with vertical walls or open excavations with 3:1 and 1:1 slopes). The main goal of the numerical analyses, performed by means of the Z_Soil.PC program, were to investigate the effect of the presence of the softer STCh layer in the backfill zone on the pipe deformation (relative deflection δ/D) and internal forces in the pipe wall. The soil was simulated with the use of either the Hardening Soil Small (HSS) or Coulomb-Mohr (CM) constitutive model with the parameters' values estimated based on results of laboratory tests (published by researchers from Wollongong University). The PVC pipe was modelled as linear elastic. The results of the analyses show that, due to enhanced arching, STCh layer of the optimum thickness t = 0.55 m can effectively reduce δ/D when used in the backfill of the trench. It can also decrease the difference between the maximum and minimum bending moment in the pipe wall, leading to less ovalization of the pipe cross-section. This positive effect diminishes if the width of excavation is larger, as the model is gradually transforming towards the positive projecting conduit type. The CM model gives underestimated values of the pipe deformation and internal forces. Though, in the case of lack of all the HSS parameters' values it is better to use the CM model with $E = E_{50}$ than $E = E_{ur}$ as it gives better approximation of pipe behaviour.

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THE CHALLENGES OF BIOCLIMATIC ARCHITECTURE IN ROMANIA

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ABSTRACT

Bioclimatic architecture is an architecture style, new as terminology in the history of architecture, but old in its principles, that can be found in history in the vernacular architecture since the first types of houses appeared. Nowadays, due to the need of eco-friendly ways of building and due to the need of green energy consumption, it emerged in different architectural styles that aim to develop the built space in different manners. Green, Passive, Solar and Bioclimatic Architecture. Each one of them is depending on the natural factors, but from all of them, Bioclimatic Architecture uses all the natural resources in the site through the volume of the construction in passive ways, using no energy. First bioclimatic models appeared in hot climate, where they successfully responded to the only needs of cooling the interior air by solar protection and by natural ventilation, and also using the thermal inertia for providing warm air during the cold summer nights. The main problem appears in the temperate climate where, during the winter, it appears the need of active systems for obtaining a warm indoor temperature against the sub-zero outside temperature. This paper aims to highlight the particularities of Romanian temperate climate that influences the bioclimatic model, and to mark the limit where the passive bioclimatic principles stops, and from where the active systems begin.

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THE CHARACTER OF URBAN SPACES THROUGH ITS ECOLOGICAL VALUE

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ABSTRACT

Nowadays, the identity and the quality of urban spaces discover a new sense, frequently, it is about new functions, that haven't been embedded before. Regarding to fast-moving urbanization of European settlements, the urbanists and landscape architects very closely and attentively working with landscape massive and with space between houses. The modulation of these structures needs an increasingly stricter and more prudent approach; for example, it is about proportion between green and paved areas, their value and functions considering on a larger scale (macro and micro climate optimization by means of extended analyzes of land and vegetation structures evaluation, their historical, dendrological, cultural and environmental value and stability). Also, as an important aspect, need to consider the psychological factors of perception of urban and landscape structure. Using this aspect can be optimize processes taking place in the structure of the settlements, with what influencing vitality and identity of urban spaces, not only for the locals but also for visitors by creating optimal conditions: comfort, relaxation, genius loci (the spirit of the city), aesthetic value. Properly fitting landscape structure into the prepared urban space can contribute to ecological and tourism sustainability. Assessment of selected Slovak Danube settlement and their areas from the point of a vision of an «Ecocity» (in terms of planning sustainable settlements), quality of landscape as an object of perception and as an object of genius loci. Assessment of the selected cities and their areas will used sets of indicators. The evaluation of Danube cities and their selected sites gives us the possibility of a broader understanding of the local landscape specifics and the nature elements of the city. It create the bases for vision and principles preparation for the unique and effective using city landscape and surrounding region for the eco-tourism and better living conditions for inhabitants.

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RESEARCH CONCERNING THE IMPACT OF GEOMETRICAL CHARACTERISTICS OF NATURAL QUARRY AGGREGATES USED IN THE COMPOSITION OF ASPHALT CONCRETE

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ABSTRACT

The paper presents studies and laboratory tests concerning the influence of the way the natural quarry aggregates are processed upon the composition of an asphaltic concrete with a maximum grain size of 16 mm (BA 16). The research included the realization of grading curves on certain aggregates, curves lately compared to the maximum density line. This approach aims at classifying certain aspects concerning some of the physical-mechanical characteristics of the asphalt concretes determined through static and dynamic laboratory tests. The research resulted from the fact that in Romania, the elementary gradings on granular fractions from the same source, entering the composition of a certain asphalt mix, differ most of the times depending on the manipulation and the processing manner, respectively. This finding is based on the experience of the laboratory testing, where different values concerning the volume weight, apparent volume weight, voids and rigidity module were obtained on the same asphalt mix dosage prepared according to the prescription in two separate samples. Thus, in order to emphasize the impact of the processing manner (crushing) of the natural aggregates, the authors determined the percentage distribution on intermediate granular fractions of the gradings entering the composition of an asphalt concrete. Since the Romanian Standard for asphalt mixtures stipulates a large grading envelope between the standard sizes corresponding to each grading, the authors considered that there is no uniform distribution ratio depending on the size of the grains entering its composition. The study started from different research methods found in the specialized literature dealing with the calibration of the optimal grading curve. The results of the laboratory tests performed on the asphalt mixture confirm the importance of the particle size analysis in obtaining high quality physical-mechanical characteristics.

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THE IMPACT OF SAMPLE COMPACTION TEMPERATURES ON THE CHARACTERISTICS OF BITUMINOUS CONCRETE

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ABSTRACT

The compaction of bituminous layers is the operation that determines the asphalt mixtures to reduce their air voids until the desired density is obtained, at the suitable temperature and with specific equipment, in order to reach the physical-mechanical characteristics designed in well-controlled laboratory conditions. The realization of these objectives can be slightly altered by a number of factors which can intervene during the construction, such as: temperatures in the technological process (production, transportation, laying and compaction), weather conditions (atmospheric temperature, wind, humidity, transport distance), type of compactor (certain types of single device or complex compaction equipment), thickness of the layer, alteration of the mixture during laying, etc. Most of the research concerning the compaction deals with identifying the factors affecting the site compaction and the way they can influence the realization of the designed density, starting from the premise that the reference results offered by the laboratory are those obtained in standardized conditions. The research presented in the paper aims at emphasizing the way different preparation and compaction temperatures influence the physical-mechanical characteristics of a laboratory prepared asphalt concrete. It started from the question whether these characteristics are significantly influenced by temperature variation or if they range between “acceptable” tolerances. For clarification, the authors prepared asphalt concrete samples for the wearing course, according to the Romanian technical standards, at different preparation and compaction temperatures, in laboratory-controlled conditions. The determined physical-mechanical characteristics were: density, voids, water absorption, Marshall stability, water sensitivity, dynamic flow and rigidity. The results obtained confirm that, for most of the determined characteristics, the temperatures used significantly influence the values obtained. Also, the paper presents a comparative study between the results obtained in the mentioned conditions in the case of three different bitumen dosages, that is 4,8; 5,2 and 5,7% binder by the weight of the asphalt mix. It was found that the variation of the binder content introduces an additional altering factor as to the preparation and compaction temperature.

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FINITE ELEMENT MODEL CALIBRATION OF SANDWICH STRUCTURE BASED ON MIXED NUMERICAL EXPERIMENTAL TECHNIQUE

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ABSTRACT

In this paper, a new finite element (FE) model calibration method for sandwich structure based on the Mixed Numerical Experimental Technique (MNET) is proposed. The general idea of the MNET is that instead of measuring the property of interest, indirect procedures measure a number of related quantities and derive the unknown property from the experimental values of these quantities. In the MNET, a numerical model is built to relate the physical property of interest to the measured quantities. Then the inverse problem is used to derive a number of model parameters from the response of system to a particular input. The inverse problem is solved by minimizing the error function that expresses the difference between the numerical model response and the experimentally measured one. In this study, instead of the direct minimisation of the response discrepancy, the experiment design and the response surface method is proposed to solve the inverse problem. The structure considered in this study is a sandwich panel composed of two laminated carbon fibre reinforced plastic (CFRP) face sheets and aluminium alloy pyramidal truss core. Finite element model of the sandwich panel is built by using the commercial FE software ABAQUS. Four independent engineering constants of a single transversally isotropic layer of CFRP face sheets and two engineering constants of the aluminium core are unknown parameters in finite element model and need to be identified for model calibration purposes. The modal frequencies of the sandwich panel is considered the response of the system to be compared between measured and simulated data. Experimental eigenfrequencies and corresponding mode shapes of the sandwich panel are measured by using a POLYTEC PSV-400-B Scanning Laser Vibrometer. Numerical eigenfrequencies are obtained by performing finite element calculations in sample points derived by Latin Hypercube experiment design. Each sample point represents a unique engineering constant configuration in the FE model of the sandwich panel. By taking the unknown parameters as inputs and the calculated eigenfrequencies as outputs, response functions in the mathematical form describing the relationship between them are obtained by means of response surface method. The genetic algorithm (GA) is employed to solve the minimisation of the response discrepancy where the response functions instead of FE calculations are used to obtain the numerical modal frequencies. Robustness and efficiency of the proposed FE model calibration method is assessed by comparing the experimental eigenfrequencies with the numerically ones calculated in the point of optima (using the calibrated engineering constants). A good agreement between them is observed indicating a successful FE model calibration.

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BIM TECHNOLOGY AND CHANGES IN TRADITIONAL DESIGN PROCESS, RELIABILITY OF DATA FROM RELATED REGISTERS

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ABSTRACT

With the new technology of creating building design, many changes of traditional processes have to be set in order to reach project documentation and project design itself in higher quality level. As a traditional project documentation is changing in “digital twin” of building work, the way of building work design changes too. Building design and project documentation do not serve only for the building construction, maintenance and operation. Project documentation is the output, also the input – both at the same time - in connection with further building legislation, landscape planning, etc. BIM model, nowadays the highest quality of project documentation, should communicate with many related registers. Important basic information is as an input for the project design, afterwards information from the project design should be reflected as an output for the enlisting in related registers. Due to the absence of efficient digitization of the construction industry, the relevancy, correctness and reliability of information in the related registers is not very high in the Czech Republic, at this time. Digitization of construction industry and implementation of BIM technology promises many benefits. The magnitude of these benefits depends on how the data exchange is modified in the construction process during the whole building lifecycle. This paper reveals possibilities of basic principles of the new way of design using BIM technology, connections of BIM model data and related registers and their data exchange in the environment of Czech Republic´s legislation. The more correctly processed the model of the building work, the better and more reliable information for future designs.

MECHANICAL PROPERTIES ANALYSIS OF POLYPROPYLENE BIOCOMPOSITES REINFORCED WITH CELLULOSE AND SOFT WOOD FIBRES USING RESPONSE SURFACE METHODOLOGY

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ABSTRACT

During the last decade, biocomposite materials, such as Polypropylene biocomposites, are studied extensively for application in various fields. One of application cases are an innovative and eco-friendly polymer matrix composites reinforced by natural fibers. These materials can offer several advantages as cost-effectiveness, mechanical properties, low weight and recyclability of the material. Biocomposite has been widely used in several engineering fields as the construction material or nonstructural components such as window, door, decor and etc in recent years. The use of biocomposites in the development of next generation materials with required properties is of great interest, because the materials created possess improved mechanical properties and offer new possibilities of their application. The current study presents an experimental investigation of the hybrid biocomposites based on polypropylene HP400R reinforced with man-made cellulose fibres such as rayon tire cord yarn (Cordenka) and Soft wood fibres (WEHO 500) on the mechanical properties. The problem has been solved by the method of planning of the experiment and response surface method. The solution of the problem is divided into several stages: the choice of design parameters, the construction of the experiment plan for the selected parameters, the execution of the experiment and the determination of the general form of the regression equation according to the results of experiments. The experiments were designed according to Full Factorial design (FFD). FFD of experiment is the most popular designs owing to their simplicity and relatively low cost. It is very useful for preliminary studies or in initial optimization steps. The plan of experiments is formulated for 2 design variables, namely, Softwood fibres (WEHO 500) and PET fibres, and 9 experiment points. The 10%, 20% and 30% by weight man-made cellulose fibres such as rayon tire cord yarn (Cordenka) and Soft wood fibres (WEHO 500) were added to the polypropylene matrix. Composite specimens were produced by making use by an injection moulding method. The static mechanical properties of the manufactured test specimens were measured in a tensile test according to EN ISO 527. The result values represent the averaged results of the measurements performed on 10 samples for each type of manufactured composite. Subsequently in the points of plan of experiment the results of testing were obtained. In the next stage the experimental data obtained by the testing in the points of plan of experiments were used in order to build the approximating functions. After selection of equation of regression the parametric studies were carried out to scrutinize the influence of design parameters on the mechanical properties such as tensile strength and tensile modulus. The results showed the addition of the two types of filler improved mechanical properties. The maximum tensile modulus achieves for the composite reinforced with highest filling ratio of Cordenka and WEHO 500.

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EXAMPLES OF EVEN LIFTING OF STRUCTURAL ELEMENTS OF EXISTING BUILDINGS

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ABSTRACT

One of the issues occurring in engineering practice is the necessity to change the location of the entire building or part of it. Rectification is carried out in the case of vertically deflected structures. If the vertical position of the structure elements must be changed, the decision to dismantle a fragment of the structure and then to rebuild it in a new location is most often made. An alternative to this procedure is even lifting with hydraulic jacks. The article presents two cases of even lifting. In the first case, after the raw state of the building was completed, the concept of land development around the building has changed. It involved in particular elevating the ground level by 0.8 m. As a consequence, the entrance to the building would be below the surrounding land. It was decided to raise the above-ground part of the building evenly by 0.80 m in order to avoid this. The lifting of the above-ground part of the building was designed and executed by detaching the building apart at the level of the floor and then lifting it evenly by 0.8 m. For this purpose, eighteen hydraulic jacks were used, installed into the bearing walls in the previously made openings. The height of the openings was 0.6 m and the width was about 0.5 m. A reinforcement in the form of 160-type channels running on both sides of the walls was installed on the walls above the openings at the level of + 0.74 m. The lifting of the above-ground part of the building consisted in forcing the displacement of pistons of hydraulic jacks. The piston extension range of the jacks was limited to 200 mm, therefore parallelepiped elements were periodically installed under the jacks. At the end of the lifting process, these elements formed 600 mm high stacks. After the lifting was completed, the jacks were removed and the lifted part of the structure rested on temporary 800 mm long supports. Then a monolithic reinforced concrete ceiling was made, which separated new technical spaces in the basement floor. In the second case, the roof truss was raised by 0.8 m in the residential building in use. The usable area of the attic was enlarged as a result of the works and the number of poles limiting the freedom of interior design was reduced. In both cases, a system of hydraulic jacks was used to move the structure vertically. With the presented procedure, no damage was caused to both, the building elements that were lifted and those unmoved. In addition, the even lifting of parts of the building allowed to avoid the troublesome dismantling and then restoration in a new location.

REMOVAL OF DEFLECTION AND RECONSTRUCTION OF FOUNDATIONS OF THE HISTORIC MUSEUM BUILDING

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ABSTRACT

The displacements and forces were examined in the temporary supports of a historic building, on which the structure rested during the complex renovation. The renovation consisted in lifting the above-ground part of the structure and removing its deflection and then reconstructing the foundations. The building subject to renovation and investigations dates back to 1902. It is a historical structure and serves as a museum. The building is partially cellared, has two above-ground floors and has a rectangular projection with 10.3 m and 10.7 m long sides. Its height above the ground level is 7.2 m. The cellar walls are solid brick and the walls of the above-ground floors are made of wooden logs. The building was vertically deflected by 31 mm/m. 27 hydraulic jacks were installed in order to remove the deflection in the foundation and cellar walls. The jacks were placed in the axes of the walls. With their help, the building was torn apart in a horizontal plane running horizontally at the ground level and then straightened. After the rectification, the weight of the building was transferred to a new system of supports transferring the load directly to the ground. The jacks located in the walls' axes were dismounted. This made it possible to demolish old stone foundations which were in very poor technical condition. New reinforced concrete benches and foundation walls made of concrete blocks were made in their place. The straightened building was rested on newly constructed foundations. The forces and displacements in the jacks were continuously measured during the rectification. The article presents these measurements and establishes the relationships between the forces in the jacks and the displacements of the elevated building. The scope of the renovation and innovative structural solutions applied in the construction of foundations are also presented. The renovation of the leaning object allowed to avoid demolition of the historic building and its re-assembly. Moreover, with the presented procedure, no damage was caused to the building elements that were lifted. The measurements of forces and displacements made it possible to determine the parameters of the straightened structure.

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ASSESSMENT OF CONCRETE CARBONATION THROUGH DURABILITY INDICATORS

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ABSTRACT

Reinforced concrete (RC) structures are prone to steel corrosion that affects their service life. The two main deterioration mechanisms, involved in the destruction of the steel-concrete self-protection are the carbonation and the penetration of chlorides. Understanding the behavior of these degrading phenomena is of paramount importance to enhance the field of predicting the service life of RC structures. In this investigation, cylindrical specimens (150×100 mm2) and cubic specimens (100×100 mm2) from three different concrete mixtures were prepared. Concrete porosity was determined before carbonation while permeability and compressive strength were determined before and after carbonation. The relationship between concrete porosity (durability indicator) and accelerated carbonation depth was tested. The results showed good correlations. Moreover, the test results showed that concrete oxygen permeability and compressive strength were considerably influenced by carbonation. The effect of carbonation reaction was positively for concrete compressive strength but negatively for the concrete penetrability properties.

DEFINING CRITERIA FOR THE SELECTION OF MEASURES TO INCREASE ENERGY EFFICIENCY IN PUBLIC BUILDINGS

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ABSTRACT

Buildings, although one of the largest energy consumers in the world, also represent the potential to reduce energy consumption, dependence on fossil fuels and carbon dioxide emissions, through the implementation of energy efficiency measures. Improvement of energy efficiency of existing buildings requires a dedicated, serious and detailed approach as users are often guided by economic logic, which greatly influences investments and interventions, causing some negative side effects (comfort reduction, use of energy-intensive materials, etc.). Therefore, it is very important to rely on methods that provide detailed and affordable cost, technical and environmental analysis. Energy efficiency methods are often based on simple methods such as research, estimation of energy consumption, preliminary design, estimation of energy savings and financial cost-effectiveness. Analysis are often hampered by heterogeneity and insufficient reference data (Aste & Pero, 2013). For example, in energy audits of buildings, annual energy consumption and cost-effectiveness are considered for analysis. For a more detailed assessment, a calculation tool based on the calculation of the energy consumption of particular facility and the estimation of energy savings after the proposed energy efficiency measure, is being used. The proposed measures generally represent a classic scenario of energy efficiency measures. In the analysis, factors such as comparison of the share of fossil fuels and renewable energy sources (RES), the estimation of cost-effectiveness of the use of renewable energy technologies or the aspect of embodied energy in materials and life cycle assessment in buildings, are rarely considered. In addition to applying of energy efficiency methodology, which is consisted of technical and empirical steps based on the research and verification of architectural and energy data of an existing building, the paper defines the criteria for the evaluation of scenarios (functional groups of measures) for increasing energy efficiency of the building, which include in addition to energy and economic parameters, and the environmental aspect. Six criteria have been defined for evaluation of energy efficiency scenarios, related to: annual energy consumption, total annual primary energy, share of RES in primary energy, direct and indirect CO_2 emissions, embodied energy in thermal insulation materials and investment per scenario. For each criteria is given an expression for its calculation. Defined criteria are calculated for six scenarios of increasing the energy efficiency of the Mechanical Engineering Faculty University of Sarajevo. Based on the calculated different values of criteria of considered aspects, it is possible to identify in more detail way critical points, advantages and disadvantages of different combinations of energy efficiency measures, which can further serve to identify the best strategy necessary for evaluation of energy performance of the building before and after the intervention.

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STUDY ON THE ECONOMIC PROFITABILITY OF THE PRESSURE CONTROL DEVICES IN WATER SUPPLY NETWORKS

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ABSTRACT

Water consumption worldwide has increased considerably in recent decades and has a growing trend due to population growth in the coming years. Migration of the population from rural areas to urban areas will lead to problems arising from water insufficiency in crowded areas. In urban areas that have an infrastructure with a certain percentage of rehabilitation, a problem of water distribution networks is represented by water losses. One of the major causes of water loss is due to improper pressure control in the network. The need for optimal control of pressure in water supply networks is due to multiple implications on the efficient functioning of the entire water supply system. Currently, pressure control in networks uses, on a large scale, pressure reducing valves (PRV), but pumps as turbine (PAT) have recently been used, devices that are efficient from a functionally point of view, compared to PRVs. To determine which is the most economic profitability and efficient solution, based on the information on the functional parameters of the two devices that provide pressure control in the water supply networks, the article proposes a study on the costs of implementation, the reduction of water losses and a possible electricity generation, for each of the two variants (PRV or PAT). The study emphasizes, on the one hand, that the use of PRV in water supply networks ensures the reduction of water losses and implicitly the consumption of energy but does not provide the opportunity to convert the potential energy of water into electricity and on the other, highlights the potential of PATs, to improve the sustainability of water distribution networks by reducing water losses and generating electricity. The main conclusion of the paper is that PATs, as a pressure control device in water supply networks, is the economical and sustainable solution for the modernization and rehabilitation of water supply systems.

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INDUSTRY AS A DETERMINIG FACTOR OF SUSTAINABLE DEVELOPMENT OF SETTLEMENTS BY THE DANUBE

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ABSTRACT

The success of a city has always been largely determined by its ability to provide jobs for its inhabitants. The essential in this process is its location - determining the relationship of a city and main transport routes. A special category in this context present port cities. Thanks to their strategic location, port cities have become the focus of trade, crafts and production. The water transport network was a key impulse for the development of industrial towns of the 19th and 20th centuries, allowing these areas to boom their industry sector. With its downturn and the shift of economic focus to the tertiary and quaternary sectors by the end of 20th century, much of the industrial heritage today remains unused and it has been deteriorating. Saving this industrial heritage today present a great opportunity for new developments that could be driven by a more sustainable direction and more sensitive urban development interventions. Within the European context, the most significant element has been the Danube - a strong geographical determinant that has influenced industrial development. Its catchment area reaches the territory of eighteen states and directly flows through ten or forms the state border. It thus becomes the most international river in the world with significant potential, economic, cultural and natural as well. The most important current discussions on sustainable urban development deal with restructuring industrial areas and reworking the Danube riverbank. Researches approaches this complex issue by analysing the changing relationships among the river, city and industry. This paper focuses on case studies of three cities from different countries (Komárno - Slovakia, Óbuda - Hungary, Galati - Romania), which combine similar social, economic and political developments. Paper introduces natural development and transformation of industrial sites in relation to the Danube and their impact on urban development, while mapping its further potential. The similarity of the port cities by the Danube is not accidental. Historical developments and specific events have had an impact on the position of city ports and shipyards, whether preserved in the form of industrial heritage, stagnant or functioning industry, continue to have a high share of urban development. These sites are advantageous not only for their geographical location, but also for their tangible and intangible cultural heritage. In the discussion, paper combines findings of the overall transformation of settlements in a post-socialist context with industrialization tendencies and local specific factors such as peripheral and historical events. The article deals with the importance of temporary or permanent urban and architectural solutions for improving the attractiveness of the river environment, promoting historical industrial identity, enhancing ecological mobility and, in particular, integrating the whole Danube region into everyday life. Finally, current needs of finding environmental solutions for industry and transport in the context of sustainable urban development are discussed. The environmental program of industrial and commercial development based on strategic planning of urban development is the foundation of the prosperity of the urban society.

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MODELING OF CITY COLLECTORS AS THIN-WALLED BEAMS ON AN ELASTIC SUBGRADE

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ABSTRACT

In the construction of municipalities and agglomerations, it is often necessary to build utility tunnels and other linking underground structural systems. These systems enable the connection of individual buildings to different types of media. For the purposes of the static analysis, the tunnel structure can be considered to be a thin-walled beam on an elastic subgrade. The subsoil is modeled by the Winkler subsoil model, characterized by the subsoil stiffness coefficient – k (N/m^3). The article deals with the analysis of thin-walled beam loaded by bending and torsion. Two differential equations are presented. The first is a differential equation of bending of thin-walled beam on elastic subsoil whose unknown function is deflection line – $w(x)$. The second is a differential equation of twisting the thin-walled beam on a elastic subsoil, where the theory of cross-section deplanation is also incorporated. When twisting, the function of rotation along the longitudinal axis is unknown - $\psi(x)$. The solution of differential equations is in closed form. The initial parameter method is chosen as the numerical method. The program solution is using the transfer matrix method. The UNO program for the solution of thin-walled beams on an elastic subsoil was created by the author of the article in the programming language Fortran. In the conclusion, an example of a tunnel as a thin-walled beam on an elastic subgrade has been presented. A solution of a beam using the theory of thin-walled beams has been compared with the solution of plate-wall finite elements - FEM. The beam has a U-shaped cross-section. The bottom wall in contact with the subsoil is 1000mm, the vertical wall is 500mm high. The length of the beam is 12.0m. The results of individual graphs are shown in the paper: deflection $w(x)$, bending moment M and transverse forces V. In the part of the beam torsion there are graphs of the following values: torsion angle about longitudinal axis $\psi(x)$, bimoment B, torque T. In the finite element modeling (FEM), shell-shaped finite elements were used. These were quadrilateral elements with 6 parameters in the node. The deformations and stresses in selected sections are compared.

ECO-EFFICIENT FALSE CEILING PLATES MADE FROM PLASTER WITH WOOD AND PLASTIC RESIDUES

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ABSTRACT

Large amounts of different types of waste are generated each day in the world. Most of them do not receive a proper management at the end of its useful life. In that sense, and trying to apply eco-efficiency criteria, the construction sector has recently been working on the design of new building materials that incorporate some types of residues. Those new construction materials improve some of the properties given by traditional options such as thermal conductivity or lightness. However, it does not exist many researches in which new building products are generated. Subsequently, this paper aims at generating new gypsum plaster false ceiling plates by incorporating two different types of residues: wood waste from the demolition of traditional wooden slabs and polycarbonate (plastic) waste from crushed rejected CDs and DVDs. The flexural strength of the developed plates are tested using the procedure described by UNE-EN 14246. Furthermore, the thermal conductivity of the new pieces is obtained following the method defined by ASTM D5930-09. The results show that, for all the scenarios under study, when wood and plastic waste is added to the plates the lightness and the thermal conductivity of the pieces improved. In addition, in some scenarios, the incorporation of polycarbonate waste is linked to an improvement on the mechanical behaviour of the pieces compared to the reference plate. On the other hand, when wood waste is added to the mixtures the flexural behaviour of the plates decreases but always achieving the minimum requirements made by the standards. Finally, it must be said that adding waste to the plasters the amount of gypsum powder used to generate the plates decreases considerably, which represents a significant improvement in the eco-efficiency of new products.

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A CASE STUDY MODERN HERITAGE BUILDING: BASE ISOLATION SEISMIC RETROFIT FOR PRESERVATION OF ITS ARCHITECTURAL DISTINGUISHING FEATURES

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ABSTRACT

Italy is a country characterized by an architectural heritage of inestimable value. This also applies to several buildings erected in the second half of the 20th century, designed by eminent architects and structural engineers, some of which are now also included in modern heritage listings. At the same time, these over 60 years-old buildings were designed before the issue of coordinate national Technical Standards, and may require important structural rehabilitation interventions. One of the most interesting architectural expressions of the early 1960s in Florence, i.e. the building now housing the Automobile Club and a B&B Hotel, is examined in this paper as representative case study of that period. Designed by the Florentine Architect Giorgio Valentino Gori, it was built between 1959 and 1961 with a reinforced concrete and steel structure, which is distinguished by the presence of "trestles" that mark the volume used as offices, to which double cantilevered beams supporting the upper floor of the hotel are connected. The original design documentation was collected through careful record research, including site images and related technical development documents. A simulated project was carried out for the structural members not detailed in the original design drawings. A detailed on-site survey was also developed on the building, to evaluate the correlation of the geometrical dimensions of the exposed elements to the design ones. A seismic assessment analysis carried out on the structure highlighted strength deficiencies in several members, for which stress state checks were not passed starting from the normative basic design earthquake level. In order to improve the seismic performance of the building without altering its architectural appearance, characterized by large windows in the façades, free internal spaces and elegant proportions of the main structural members, a base isolation retrofit hypothesis is developed in this study. Due to the irregularities in plan and height of the building, Double Concave Sliding Surface (DCSS) devices are adopted for the isolation system. The architectural and structural characteristics of the building, the results of the time-history assessment analyses in current and retrofitted conditions, and the technical installation details of the DCSS isolators and the plants crossing the isolation plan, are discussed in the paper.

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RESEARCH OF DEFORMATIVE PROPERTIES OF CONCRETE TAKING INTO ACCOUNT THE DESCENDING BRANCH OF DEFORMATION

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ABSTRACT

In recent years due to the introduction of computer technology in the process of calculating and conducting experiments the ability of researchers in the knowledge of various, accurate processes, including the nature of the work of concrete on the downstream branch of deformation significantly expanded. Modern methods of measurement allow to fix, for example, deformation, to an accuracy of 0,0001 mm, which allows deeper penetration into the essence of the phenomenon of destruction. Widespread are so-called 'hard' test machines in which the change in load is followed by a change in deformation in contrast to the traditional experiment when the load increases continuously up to a destructive value. Such machines allowed for the first time to show the exact type of the curve of 'stress – deformation' with the construction of a descending branch (plot of the diagram, going after the point of maximum load). An experiment was conducted to study the deformation of concrete simultaneously on two different presses with a hard loading mode and by increasing the loading. The analysis of the deformation of concrete prisms on these presses is carried out. A complete diagram of deformation of concrete has been constructed taking into account the descending area of concrete deformation. Comparing of the received data with the normative confirms the adequacy of the data received.

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NANOMODIFIED RAPID HARDENING CONCRETES

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ABSTRACT

One of the priority areas of modern construction production is the introduction of high-performance high-speed concrete with improved technological and construction-technical properties for the design, erection and repair of engineering structures. Modern studies have made it possible to view concrete from the nanoscale point of view as a material characterized by a complex hetero-scale structure of hydrated cement phases and mineral additives. The properties of concrete are determined by the type, size and nature of the interaction of the components of each structural level, which creates the possibility of nanotechnological regulation of the processes of structure formation and control of operational characteristics. Nanotechnology covers the area of science and technology relating to elements smaller than 100 nm, in construction this area expands to 200 nm and associated nano-interactions (phenomena). The main task of nanomodification is to provide managed structure with more nanoscale hydration products. Typical nanowires in Portland cement systems are micro- and nanosilica SiO_2, nanoglosses, TiO_2, Al_2O_3, Fe_2O_3, $CaCO_3$, carbon nanomaterials (carbon nanotubes and nanofibers). The introduction of C-S-H nanoparticles is the most effective way of accelerating the hydration of cement compared to other nanowires, by ensuring the growth of hydration products without an energy barrier in the pore space between the cement grains. The presented studies are devoted to the study of the nanomodification efficiency of concrete with a complex additive containing a polycarboxylate superplasticizer and synthesized nanoscale C-S-H particles. Based on the analysis of the results of early and design strength of nanomodified concrete, it is established that it is characterized by rapid strength gain and high durability after 28 days. The construction and technical properties of nanomodified concretes were investigated after 1 and 28 days of curing.

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PLANNING OF RATIONAL TIMES FOR THE CONSTRUCTION EQUIPMENT REPLACEMENT

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ABSTRACT

Construction organizations (contractors) perform works using process equipment subject to significant physical wear. It is caused by complicated operating conditions: the equipment is used to cut pieces of metal and mix solid and granular compounds of mortars exerting a heavy load on the working parts. This study report results of developing and using an analytical model and a computer tool used to plan the rational times for construction equipment replacement. Physical wear and breakdowns of construction equipment disrupt production processes and cause unexpected production pauses leading to loss of contractor's profit. In the article, the algorithm of equipment replacement planning is described. Computer model for a decision-making on the rational times for construction equipment replacement is developed using Visual Basic for Applications (VBA). The offered algorithm for decision-making on construction equipment replacement is based on the following assumptions: decision on equipment replacement is made at the end of the year; the amount of expenses for the general period is calculated by adding the expenses of each year. If during the relevant year the equipment is not replaced, the amount is composed only of loss of profit (depending on the equipment age). If during the year the equipment is replaced, the amount, in addition to the loss of profit for the current year, includes the cost of new equipment, reduced by the value of the liquidation value of the used equipment. The offered VBA macro for Excel has a benefit of showing several options. Decision-makers can consider the best options and choose one of them. A benefit of the offered algorithm implies obtaining several alternative plans of the rational times for equipment replacement. The use of this algorithm and the computer model is justified if the effect of the decisions made is higher than the additional expenses related to information collection (on the loss of contractor's profit and market value of the new and worn equipment).

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THE PARADOX OF THE BEAUTIFUL OR THE PARADOX OF ART

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ABSTRACT

The paradox inherent in many works of art of the twentieth century. It was obvious especially in the beginning of the XXst century, when distorted reality, expression of complicated meaning, nontraditional approach to reality broke down the stereotypes of life established by centuries and expressed their essence through an enigmatic message. Interest in paradox in works of art testifies to the corresponding psycho-emotional state of society, it reflects reality in its artistic colors, as well as clearly demonstrates the specific perception of the reality of ethnic group, the way of demonstrating the spiritual world and the level of understanding of being. The purpose of the work is to trace the influence of art as a manipulative factor in the presentation of reality and the influence of the subjective creative view of the artist on the change of aesthetic categories that have emerged in society as classical. Extreme architectural work of the 21st century is in the birth of a new paradox, which as in poetry, provokes thoughts and fantasy. The human genius in his work is over-saturated with established criteria of beauty and dictates new ones, which are the basis of powerful aggression. However, the most striking feature of the architecture of the first half of 21st century is its epatage. Torn and broken facades of houses, exposed structures and plumbing pipes, combination of bright colors testify to the birth of demonstrative silent protest. Mixed emotions of aggression, hatred, joy and satisfaction are combined into one architectural canvas, which shows the state of the artist and the state of society. The paradox is opposite to truth, but with the help of a paradox, the architect opens himself - and perhaps even us - to a speculative dimension for the measure of the real one. Crooked House in Sopot in Poland, Upside down House in Szymbark, Poland, Cinema theater Le Kinemax Poiters at Futuroscope Amusement Park in Poitiers, France, Stone House, Guimaraes, Portugal and more are just a few works that vividly demonstrate a change in aesthetic trend, defying classical understanding of "beautiful and ugly". The beginning of the 21st century is characterized by propaganda of epatage and exclusivity. Such moods may not be long-lasting, but they are a barometer indicating changes in art. Skill and professionalism are today only the basis for creativity; The art of the 21st century wants to surprise and to shock, the art looks for the original and the exceptional, it focuses on the single, not the general, it actively uses the achievements of science, which is based on the logic and laws of physics.

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EFFECT STUDY OF STEEL FIBERS IN SELF-COMPACTING CONCRETE

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ABSTRACT

The development of self-compacting concrete (SCC), has been one of the most important discovery in the construction industry. Knowing that by incorporating fiber, crack resistance and ductility improves. In this study, self-compacting concrete (SCC) is formulated with japanese method and reinforced with different temor of steel fibers. The contribution focuses on studying the effects of these steel fibers on both the fresh hard SCC properties, so rheological properties were determined using the slump flow tests, modified slump flow tests, L-box, sieve stability and wet density percentage, and hardened ones (The mechanical properties include compressive strength, tensile strength test at 7, 14, 28 days). The results show that the fresh SCC characteristics are affected above 1% of steel fibers, but an increase of the flexural strength of the hardened SCC reinforced by steel fibers fibers also delay cracking of concrete.

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LAND COVER CHANGE AND FLOOD RISK IN A PERI-URBAN ENVIRONMENT OF THE METROPOLITAN AREA OF ROME (ITALY): APPLICATION OF BMP TO URBAN RUNOFF CONTROL

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ABSTRACT

Land-use/land-cover change (LULCC) is the most important factor in causing ecosystems services (ES) loss. In Mediterranean basins, coastal areas historically suffer from great anthropic pressure and this is mainly due to the rapid development of the surrounding artificial landscapes, where socio-economic factors lead to alterations in the nearby environment, affecting the quality of natural and agricultural systems. These changes influence runoff, and municipal authorities often cannot estimate the impact of complex land cover transitions. In such context, the great urban and industrial development of the towns surrounding the city of Rome (Italy) represents a paradigmatic case study because has caused an irreversible and rapid soil loss. In this paper, soil sealed evolution in a watershed located in a peri-urban environment during the last fifty years has been studied in terms of land use change (LUC) and the consequential flood risk. To this aim, we determine the number and location of Best Management Practices (BMPs) to reduce the runoff volume at the outlet of the study area. Combining a high resolution data set, developed in GIS environment, with the employment of a hydrological/hydraulic model we then identify the best placement of BMPs to reduce hydraulic risk due to soil sealing.

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INFLUENCE OF SUSTAINABLE CONSTRUCTION ASPECTS AND QUALITY OF PUBLIC SPACE ON THE PRICE OF HOUSES IN THE CZECH REPUBLIC

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ABSTRACT

Construction industry produces 25 to 30 % of greenhouse gases and consume 40 % of globally required energy. The construction industry and buildings contributes significantly to climate change. Also buildings are cornerstone to public space and affect its quality. One of the approaches to reduce greenhouse gas production (especially carbon dioxide) is construction and operation of buildings according to the principles of sustainability. Houses are mostly not certified (environmental certification programs as LEED or BREEAM) because it is uneconomical to certify. However, houses can fulfill sustainable construction aspects like using natural or recycled materials, design of energy efficient buildings, using of alternative energy sources, connection to public transport, etc. Influence of using basic sustainable principles and quality of public space as a important part of sustainability to a price was tested through database. The database consists of 98 samples of houses sold over year 2017 in Brno - venkov district. Significant price settings factors were identified. Due to the number of variables, testing by multivariate regression analysis was performed on submodels, individual variables could be correctly identified. Tested database confirmed basic price setting factors for houses such as technical condition of house, distance from city of Brno, as well as useable area of house and factor of liquidity. Influence of sustainable principles like using of renewable energy, low energy demand, solar panels for hot water or photovoltaic panels was rejected. Some kind of sustainable principle was detected at 10 % of samples. Material base, especially using natural materials like timber, was not found as price setting factor. One of the submodels was focused to social part of sustainability given to location and public space. Possibility of using public transportation or car park close to house were not confirmed as price setting factors affecting the price. Also danger of flooding, index of criminality and noise level were considered and were rejected as price affecting. This paper presents results aimed at exploring the importance of the basic aspects of sustainable construction and quality of public space on the price of houses in database of 98 houses in Brno - venkov district, Czech Republic.

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TOURIST POTENTIAL OF THE HISTORICAL INDUSTRIAL CITY: CASE OF BORYSLAV, UKRAINE

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ABSTRACT

The cities formed on the basics of the development of mining industry in the 2nd half of the 19-th − early 20-th centuries are considered to be an extremely interesting realm for urban planning as well as for an architectural research. Their life cycle was mainly driven by the rapid (sometimes short-lived) development of industrial production, which led to the specific spatial, planning and functional structuring of the urban environment. Such cities have often faced with the problem of their degradation and decline as a result of the depletion of natural resources. The cityof Boryslavsituated in Western Ukraine is uniquely located in the industrial oil, gas and ozoceritefields. The purpose of the article is to trace the formation of architectural and urban features of the environment of Boryslav, to analyze the post-industrial transformations at different historical stages in the XX − XXI centuries, to outline the directions of creating the program of the future city. Forming the city of Boryslav in the early 20-th century as the centre of world oil industry has had both the positive and negative sides. On the one hand, mining has contributed to rapid territorial and demographic development and thispromoted construction of high-quality public and residential buildings. However, these building solutions were mostly local and aimed at solving tactical social problems without taking into account the complex of strategic social, architectural-urban planning and infrastructure problems. The subsequent decline of industrial development in the interwar and Soviet periods led to the “continuation of the present" – the maintenance of the vitality of the urban organism according to the primary scheme and the logic of its emergence with ideological corrections at each of the historical stages. Today's existing industrial past has also not been a key to Boryslav's successful development, although the objective reasons can be an integral part of this process. So, there arisesthe question ofthe ways of city furtherdevelopment. Therefore, the proposed study is not only of historical interest but also of considerable practical importance in determining the prospects for urban development. Consideration of the city as an artefact of industrial civilization makes it possible to comprehend it from the point of view of the value of industrial heritage as a potential tourist object and, at the same time, as a comfortable space for the life of its inhabitants.

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CLIMATE CHANGE IMPACT ON ARCHITECTURE IN POLISH COASTAL CITIES - CASE STUDY OF SZCZECIN

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ABSTRACT

The article presents the issues of the impact of climate change on the architecture of Baltic cities with the example of Szczecin. Although measures are being taken to prevent further warming, the scale of changes requires action in various areas, including urban planning. In the temperate climate of Poland, the projected temperature increase by the end of the 21st century will have been 2-4 degrees Celsius (according to the latest IPCC reports on the effects of global warming). Therefore, the sea level may rise by 60-120cm. The cities of the Baltic Sea region are facing a significant challenge. In the future, they will face a high intensity of extreme weather events and changes in precipitation levels. The rising sea level forces the search for an alternative way of building. One of the cities in Poland where changes will be experienced is Szczecin. Some positive effects of climate change will also appear, such as longer tourist and vegetation seasons in Poland of up to 4-6 months and increase in the attractiveness of Polish tourist cities. What is more, the country must also be prepared to accommodate the larger population resulting from climate migration. The article presents examples of designs and developments of floating architecture which can become inspiring in the face of climate change challenges. A discussion on the pros and cons of such solutions was conducted. The authors put forward a thesis that some architectural solutions may prove useful for the upcoming problem, but they require prior improvement and adaptation to Polish climate and economic conditions.

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RESIDENTS' EVALUATION ON "GENTRIFICATION CAUSED BY GUESTHOUSES" IN CENTRAL AREA OF KYOTO CITY: CASE STUDY OF THE SHUTOKU DISTRICT IN KYOTO CITY

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ABSTRACT

The purpose of this paper is to clarify that the residents' evaluation on the "tourism-gentrification caused by guesthouses" in the central area of Kyoto city, Japan. The guesthouse is a type of rental accommodations for tourists which used by Airbnb etc. The "tourism-gentrification caused by guesthouses" is defined as a phenomenon in which traditional local communities are destroyed as a result of reinvestment and destination due to the rapid increase in the number of guesthouses as part of tourism-gentrification. That becomes a social problem in Kyoto city, where is one of the world's famous tourist destinations. The residents' evaluation suggests the possibility of coexistence with residents and guesthouses. Especially, this paper clarified three results by multiscale analysis method. First, hotels and guesthouses are analysed by GIS analysis in the central area of Kyoto city. As a result, this analysis clarified the population decline which had occurred from 2015 to 2019. Especially, it was found that the number of guesthouses had increased more rapidly than hotels and ryokans from 2015 to 2019 in the central area of Kyoto city. Besides, it is clarified that the rapid increase in the number of guesthouses has caused a decrease in the number of households in each neighbourhood association. Secondly, the residents' evaluations are analysed by a questionnaire survey as a case study of the Shutoku district in the Shimogyo ward of Kyoto city. As a result, this analysis clarified that the residents evaluated negatively by the decreasing population. The result suggests that "tourism-gentrification caused by guesthouses" was occurred in the central area of Kyoto city. However, this analysis also clarified that residents do not want uniform regulations for guesthouse: there is a possibility that residents and guesthouses can coexist if methods such as "resident managers" are realized. Thirdly, residents' requests for guesthouses are analysed proceedings of townscape consultation which are operated by the Shutoku townscape council. As a result, this analysis clarified the needs of residents for guesthouses. Especially, it was found that residents and the owner of the guesthouse discussed not only "Stay of managers in the counter for 24 hours" but also "Installation of smoking rooms to prevent fire" and "Conclusion of an agreement on the management" in most guesthouses. Besides, it is clarified that they discussed "Installation of illuminated signboards that are easy to find", "Design of windows that consider privacy of neighbour" and so on, according to the characteristics of the neighbourhood association. The major conclusion of this paper is to clarify the possibility that residents and guesthouses can coexist by some rules, though the residents evaluated negatively on the "tourism-gentrification caused by guesthouses" in the central area of Kyoto city. The rules are "Stay of managers in the counter", "Conclusion of an agreement on the management", and so on.

STATIC LOAD TEST IMPERFECTIONS INFLUENCE ON CONTINOUS Q-S CURVES

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ABSTRACT

Static load test is the most reliable method of indicating the actual pile bearing capacity. Within the pile load increments the settlement is measured and set of points Q-s (load – settlement) is plotted. The way of executing the pile load test and their interpretation are far from optimal and have many different approaches. Usually the pile test does not allow to evaluate the bearing capacities within measured range and extrapolation of results within Q-S curves is necessary. None of the present interpretation models include the influence of imperfections in pile load test. The paper presents the results of calculations with model, that takes into account the occurrence of imperfections during the test execution. Analysis is based on modified Meyer-Kowalow curve model, proposed by Meyer and Wasiluk. Analysis is based on the field test obtained on many construction sites for piles in different technologies, few of them loaded up to the failure. Model considered in the paper allows to extract statistically imperfections in collected set of points. Imperfections should be understood as mechanical changes of pile and pile-soil interaction. All phenomenon are gathered within one imperfection. The imperfections are due to changing soil and pile skin, when the soil body bends according to Kirchhoff's principle. Calculations indicates the influence of imperfections on pile limit load and other parameters of Q-s curves according to the basic model do exists. Performed analysis based on approximately 65 piles defines three main groups, first with relatively small influence of imperfections, second with changes of limit load for the entire pile and pile toe without the large change of pile character (ratio of skin friction and pile toe resistance) and the third with significant change in limit loads and pile bearing capacity components ratio (skin and toe). Values measured during the pile load test can be corrected within extract imperfections. Presented model in many cases determines more critical values for designers than basic models suggest.

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UTILIZATION OF UNDERGROUND WALLS IN URBAN AREAS

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ABSTRACT

The paper deals with the solution of the problem of foundation of buildings in confined spaces of urban development. The most commonly used solutions are underground walls, which provide space for the construction pit during the construction of underground parts of buildings. The task was to create a model of the underground (lining) wall and compare the obtained results with the inclinometric measurements on the realized objects. The obtained results are presented in a graphical form with recommendations of the implementation procedure.

ENHANCING SUSTAINABILITY BENEFITS THROUGH GREEN RETROFITTING OF HEALTHCARE BUILDINGS

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ABSTRACT

Green retrofitting practices have critical importance in both the construction industry (CI) and healthcare industry (HI) due to the adverse effects of the existing healthcare buildings on both the environment and public health. Ironically, existing healthcare buildings consume critical amounts of energy, produce wastes, and CO2 emissions, which have considerable diverse harmful impacts on the health and well-being of the society as well as the environment. Especially, given the main goals of healthcare, green retrofitting is crucial to provide a healthy future for patients and staff of healthcare buildings. There is a sensitive link between providing sustainable healthcare buildings with improving health of the patients. Therefore, green retrofitting of healthcare buildings (GRHB) can be seen as one of the significant contributors that have a critical role in reducing the harmful impacts of the existing healthcare buildings. Nowadays, due to coronavirus pandemic, nations will focus on the physical conditions of their healthcare buildings more than ever for strengthening their infrastructure with appropriate retrofitting approaches. Therefore, the worldwide concerns put the prominence of the importance of patient safety and strong health infrastructure on the agenda of nations. Improvements in the health infrastructure are inevitable for the future, and with regarding this motivation, we looked at the benefits of GRHB in the first place. In the existing literature, there is a lack of comprehensive review associated with the GRHB. This paper focuses on conducting a systematic literature review to investigate the benefits of GRHB with selected academic studies. After the identification of healthcare and green retrofitting specific studies, the benefits of GRHB were determined by frequency analysis and classified under four dimensions, which are environmental, economic, social, and functional. Results demonstrated that reduced energy consumption, reduced costs, and improved energy performance of the building are the three major benefits. In terms of healthcare perspective, the critical outcomes of this study as the main benefits differ from other types of green retrofitting projects which are improved infection control and improved recovery rate. The results of this systematic review will enhance the understanding of the importance of GRHB and its benefits, which will be useful for academics, green building professionals as well as healthcare building providers.

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MUSIC VENUE ARCHITECTURE: CONCEPT & PLACE IN CONTEMPORARY TRENDS - DESIGNER'S OWN EXPERIENCE

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ABSTRACT

The subject of this abstract are buildings intended for music and their role in urban space. In brief, buildings whose basic function is music in the form of concerts - philharmonic buildings, or in the form of a performance – meaning both listening and watching the show itself. The third function is to provide the need for meetings and providing an air of nobility. Nowadays, the latter function is becoming more and more important. It is not only accompanied by the phenomenon of identification and prestige of the event itself but also the identification of the place. It combines cultural and culture-forming ideas with a center-creating dimension of architecture and music, building the identity of the place. This is due to the fact that sound constitutes an important element of identity - on a par with architecture. The sound used to create architecture gives the overall and final picture of an opera theater or philharmonic building. The dualism of the thought of architecture and music in creating this concept determines the functionality of the venue, creating the value of the place, which is an important element of the quality of urban space. This brief thought shows versatility as a fundamental part of these buildings. The growing value of the site itself is derived from the oldest concepts of the city, forgotten in the pursuit of "modernity" in the twentieth century, only nowadays going through a process of revival. Jan Gehl, an urban planner, and humanist reminds opus of this when he speaks of a "city for people", or of the spaces between buildings. This statement has many a time been reflected in shaping public space in the context of the architecture of buildings for music. Examples are the Oslo Opera House designed by Snohetta, in which the public space is created by a surface of the huge roof, connecting it with the surroundings of the Opera House. Similarly, a canopy surface was used by Jean Nouvel to create the public space in the Philharmonie de Paris building. In the NOSPR building, the seat of the Polish National Radio Symphony Orchestra, the city space penetrates deeply into the interior. The subject of this abstract are contemporary trends and designer's own experience in creating buildings for music.

MODERNIZING THE EXPLOITATION AND MAINTENANCE OF THE LAND IMPROVEMENT WORKS: CASE STUDY OF MIXED BILATERAL REGULATION SYSTEMS FOR SOIL MOISTURE BY SUB-IRRIGATION IN THE TOWN OF ALMAŞ, ARAD COUNTY

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ABSTRACT

On lands in which the elevation of the groundwater levels does not determine the secondary salinization of the soils, the drainage system network could be used with double role: for irrigation during the drought, for drainage during the surplus periods. In this way, the irrigation water is spread in the soil by infiltration from the drains and then by suction and capillary phenomena raises the humidity to the optimum value in the area of the active soil layer of agricultural crops. This irrigation process, which has its starting area under the surface of the soil, is called sub irrigation. In this paper will be presented the methods of calculation of the main technical elements on which we consider that influences the proper functioning of the networks with reversible role. If the problem of lowering the water level under the influence of drainage networks has been and is still analysed in the literature, it should be pointed out that raising the water level under the influence of drainage networks has been and continues to be exfiltration of drainage networks, is less addressed.

ANALYSIS ON FLEXURAL STRENGTH OF BEAM ELEMENTS REINFORCED WITH GFRP BARS

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ABSTRACT

The durability of reinforced concrete structures is associated with the strength of both concrete and reinforcement against aggressive environmental factors. Once a crack or local damage to the cover occur in the structure, traditional methods of protecting the reinforcement are no longer functional and the sensitive steel reinforcement is exposed to corrosion and deterioration. Therefore, composite reinforcement made with fibre-reinforced polymer (FRP) can be a suitable alternative to traditional reinforcing steel due to its mechanical and physical properties - high corrosion resistance, high tensile strength, electrical and electromagnetic neutrality. The FRP reinforcement is made of continuous fibres immersed in a polymeric resin. The function of the fibres is to provide adequate strength and stiffness of the composite. Whereas the resin is responsible for bonding the fibres with an appropriate distance between them, protecting their surface against damage and transferring stresses to them. For the purposes of this paper, an analysis of the flexural strength of concrete elements reinforced with FRP bars with varying reinforcement ratios was conducted. The tests were performed on eight beam elements reinforced with glass fibre-reinforced polymer (GFRP) bars. The beams with dimensions of 0.15x0.2x2.5 m were subjected to 4-point bending. The aim of this study was to assess the influence of the reinforcement ratio on the flexural strength of concrete beams reinforced with composite bars and to verify the failure mechanisms against the guidelines presented in the standard ACI 440.1R-06. The reinforcement ratio has a significant impact on the failure mechanism and the flexural strength of beam elements reinforced with GFRP bars. An increase in the reinforcement ratio results in an improvement in the flexural strength of the specimen and is likely to change the failure mechanism - from rebar rupture to concrete crushing. The guidelines of ACI 440.1R-06 correctly estimate the flexural strength of beam elements reinforced with GFRP bars.

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RENEWABLE ENERGY, THE ENGINE OF THE DEVELOPMENT OF ALL ACTIVITIES

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ABSTRACT

The paper focuses on the future of energy not only for humanity as a whole, but for Europe and for Romania in particular. Some relevant statistical data are presented and for Romania some recommendations are made. From the forecasts so far, it is concluded that in 2100, Europe's population will have decreased by approx. 100 million. However, we do not know if migration was included in these calculations. Another finding is that, in terms of providing energy from renewable sources, the European Union is lagging behind in a significant percentage compared to the rest of the world. There were also major imbalances between the member countries of the European Union. The study shows that the focus is on informing the population about the energy economy, and the specialists analyze the efficiency of the equipment, installations and technologies used, in order to be as efficient as possible from the point of view of energy consumption. I have noticed that in Romania, renewable energies have been used since ancient times (eg: water mills, thermal baths, glaciers, production of coal, etc.), at present the situation is unstable - even without a coherent and sustainable national program, we are concerned about the future, in which we have big hopes. Therefore, knowing that the renewable energies are viable, due to the reduction of the carbon footprint, they are permanently existing (although they have cyclical variations), they do not have negative effects. In the near future, they must gain special attention from all the decision makers, legislative and tehnical. And what is very important and which must be taken into account in the preparation of the source, the use and exploitation of renewable energies, their transport and storage is the protection of the environment. The legislative system must intervene to ensure the proper and well-conducted conduct of the operations described above.

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URBAN TRANSFORMATIONS AND BUILDINGS TYPOLOGY CHANGES IN AREAS OF MILITARY CONFLICT

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ABSTRACT

During the period of protracted military conflicts, significant changes are taking place in the social, humanitarian and infrastructural spheres for civilians, who find themselves in the area of military confrontation. The military conflict in eastern Ukraine began in spring 2014. Despite various efforts at the international level, a peaceful settlement of the conflict has not yet taken place. In cases of prolonged conflicts, a buffer zone is formed along the line of contact, the so-called "gray zone". It is a kind of parallel reality of human existence in very difficult, extreme and dangerous conditions. The purpose of this article is to show how military conflict determines the direction of urban transformation, and influences the change in the typology of public buildings and structures in the "gray zone". The article uses a comprehensive approach based on statistical analysis, urban planning and typological analysis of open source materials. In 2014, after the signing of the Minsk Protocol, the term “gray zone” was introduced. This buffer zone corresponds to the length of the collision line and is 457 km, on either side of which there is a 30 km neutral territory. According to the Memorandum, the Cabinet of Ministers approved a list of settlements located in the "gray zone". Weapons were separated from the demarcation line (from 8 km to 120 km) on both sides. In the "gray zone" in Donetsk and Luhansk regions, there are estimated to be 350,000 people living under these difficult conditions, who face a variety of daily problems, because social settlement mechanisms are poorly functioning there. In addition, there is a significant loss of housing and infrastructure (approximately 10,000 infrastructure damage has been sustained). The most devastated settlements are located on the collision line as they are strategic points in the distribution of spheres of influence between the parties of the conflict. Within the "gray zone" are urban transformations, which are associated with the emergence of new functions: military and humanitarian. The military function is reflected in the command and observation point equipment, firing points and boundaries of the defence line, control facilities, fortifications and more. Humanitarian one envisages the emergence of territories where social, medical and humanitarian relief facilities are located. For that purpose, surviving public buildings (schools, hospitals, etc.) often change their function. Thus, it can be argued that in conditions of military confrontation, there is an "adaptation" of the existing urban situation to new needs and "re-profile" the typology of buildings, demonstrating the importance of ensuring their "flexible planning".

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INFLUENCE OF ACCELERATING ADMIXTURE DOSAGE ON THE PROPERTIES OF MORTARS WITH BLAST FURNACE CEMENT

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ABSTRACT

In the current reality, technological, economic and ecological aspects force the use of material modifications of concrete. Manufacturers of large and small size precast elements and executors of monolithic constructions tend to reduce as much as possible the time it takes for the concrete to achieve appropriate early strength. This is due to the shortening of the production cycle or formwork rental time and total construction time. Both admixtures and thermal curing of concrete are used for this purpose. However, thermal curing of concrete - the most effective method of accelerating the setting and hardening of concrete is energy-intensive. For technological reasons, it is beneficial to double the effect of such admixtures - accelerating and plasticizing. This improves the consistency of the concrete mix and makes it easier to handle. Ecological reasons force the use of cements containing as little Portland clinker as possible. Portland clinker in cements can be replaced by other main constituents - blast furnace slag, fly ash, pozzolana. The use of such components reduces the carbon footprint of cement. The first purpose of this article is to determine the effect of the content of accelerating admixture containing crystal seeds on the properties of cement mortars. The content of the accelerator has been established at 0%, 2%, 4%, 6%, 8% and 10% in relation to the mass of cement. The second aim of this article is to determine the influence of the elevated temperature of the preparation and curing of mortars containing crystal seeds on their properties. In the research, blast furnace cement - CEM III/A with 65% of ground granulated blast furnace slag (GGBFS) was used. The initial setting time of cement modified with admixtures, mortar consistency and properties of hardened mortars - density and mechanical properties - bending and compressive strength were examined. The strength was tested after 1-90 days. The tests were carried out at 20°C and 40°C. The maximum dosage of the tested admixture recommended by the manufacturer is 4%. It was shown that with an increase in the amount of admixture used, the time of the initial setting time is reduced up to the content of 6% of admixture according to cement mass. The highest bending and compressive strength was achieved by mortars containing 8% of the accelerating admixture, regardless of the test term. Due to the presence of secondary admixture components, which have plasticizing effect, the consistency of the mortars improved with the increase of admixture content. The density of fresh and hardened mortars is not dependent on the admixture dose. It has been noticed that the tested admixture can be thickened in order to increase its effectiveness in cooperation with blast furnace cements. The accelerating admixture containing crystal seeds is effective at 20°C. At 40°C the acceleration effect disappears and there is no shortening of the initial setting time or improvement of compression and bending strength.

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REAL-TIME MONITORING SYSTEM FOR HISTORIC BRICK AND TIMBER STRUCTURE

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ABSTRACT

Historical protection buildings are a special group of buildings in modern cities, which generally have historical significance, cultural and artistic or scientific value. Many historic buildings are traditional brick and timber structures and have been in service for more than several decades. With the deepening of urbanization, the external environment of historical buildings is becoming increasingly complex. The increase of surrounding building density, underground construction projects, traffic vibration load, etc. all aggravate the damage degree and speed of historical buildings. In view of these disadvantages, it is necessary to establish a monitoring system to achieve the protection purpose. In this paper, a safety monitoring system was applied on a historic brick and timber building in Shanghai to ensure its safety. By measuring the differential settlement, inclination, cracking and vibration acceleration of the structure, the changes of structural deformation and damage were analysed. Particularly, PS-InSAR (Persistent Scatterer Interferometric Synthetic Aperture Radar) was used to monitor the differential settlement and artificial corner reflectors were installed on the roof to improve the monitoring accuracy. Wireless communication technologies, ZigBee and GPRS, were used in the transmission of monitoring data except for differential settlement data. After months of continuous monitoring, the results show that the deformation and damage changes of the monitored building maintained in a small range, which means it could be considered to be safe under its present use conditions. The monitoring system is also proved to be efficient in reflecting the safety state of historic brick and timber buildings, which can be further applied.

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SPATIAL TYPOLOGIES STUDY OF SARAJEVO

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ABSTRACT

Spatial typologies in urbanism and architecture within the City of Sarajevo are inherently complex and differentiated. Throughout history of the city the architectural and urban typologies have been evolving and adapting to new circumstances, but in several historical periods the changes of typologies have been radical. From the fifteenth century Sarajevo was organized by oriental ottoman typological scheme, that shaped the city for several centuries: organic forms, human and intimate scale, commercial and residential areas quite strictly separated. During the nineteenth century a central-European urban and architectural typology dominated and morphed the city in radical new way. Introduction of larger scale buildings organized in blocks, with mixed functions. Usual typological transformation was taken over by process of replacement with completely new forms, yet the city seemed to inherently adapt to these new conditions owning this new typology. Introduction of modernist typologies within the realm of the city was also radical break from the past - functionalist dispersed buildings with open green areas again became a logical part of the city. New transitional period has brought about new challenges and generated buildings (commercial and residential) with questionable typologies. Current tendencies are lacking in many parameters that define a certain typology - a coherent idea and spatial logic. Can one city inherently possess the ability to adapt and transform such different variations of typologies and claim authenticity? Is there a typology most suited to this place? Ever since typological research was introduced to architectural theory by De Quincy in 1825, there was the notion of origins of typology, transformation and novelty/innovation. This paper will conduct a research of historical and current spatial typologies (architectural and urban schemes), in order to answer the question is typology inherent, borne out of a certain place or does the place affect, change the typology? Research would be about the correlation between a city (Sarajevo), capacity of space and relevant parameters of typologies (scale, forms, functions, adaptation).

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THE RENEGOTIATION ON PPP CONTRACTS AND SUBSIDY EFFICIENCY

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ABSTRACT

Since 2014, PPP has been developing rapidly in China and widely used in infrastructure construction such as transport, energy, sewage. The characteristics of long time, large investment and high complexity of PPP projects lead to the high incidence of renegotiation. However, experience at home and abroad indicates that most renegotiations are caused by the speculation of firms, in order to obtain subsidies to avoid taking risks and thus bring social welfare losses. Therefore, how to set reasonable renegotiation subsidy to improve project efficiency is an urgent problem in practice. This paper examines the impact of renegotiation subsidies on moral hazard and project efficiency. The problem of moral hazard refers to the fact that firms choose to make low level of efforts in advance (before risks occur) aiming at private profits. The paper firstly analyzes the intrinsic influence mechanism of renegotiation subsidy on the efficiency of PPP project by building a game model based on the incomplete contract theory and game theory, and then discusses the key factors affecting project efficiency, and finally puts forward corresponding policy recommendations. The research results show that: Moral hazard makes risk events more likely to occur, but enterprises can avoid bearing all the losses with the support of renegotiation subsidies, thereby increasing the incidence of moral hazard. Therefore, over subsidy will reduce the ex-ante efficiency, even if the ex-post efficiency still can be achieved. Controlling the renegotiation subsidy to a certain extent can avoid the occurrence of moral hazard, and achieve ex-post efficacy and financial efficiency at the same time. Optimizing policy variables such as private profit B, opportunity cost of re-tendering τ and legitimate profit of firms R-I can lower the requirement of government's negotiating power, making it easier to control the subsidy to the above scope. The research results can provide government with reference about renegotiation in decision making and provide theoretical support for the practice of PPP renegotiation.

THE USAGE OF ITERATIVE METHODS OF IMPLEMENTATION OF COMPLEX CIVIL ENGINEERING PROJECTS BASED ON STADIUM CANOPY LARGE-SCALE SPATIAL STRUCTURES

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ABSTRACT

The term iteration (from the Latin „iteratio" - repetition) deals with actions based on repeating a specific process as a method of achieving the desired objective. The iterative approach is used in computer science in creating programming algorithms. The iterative method is based on the assumption that a complicated program is created as the sum of individual iterations – separate steps that are increasingly detailed. The implementation of civil engineering projects is often indicated by computer science theorists as an example of not using the iterative methodology to solve complex problems. This is justified by the necessity to create a plan of realization for subsequent, different actions based on a previously prepared interdisciplinary design. However, there is an entire group of large-scale spatial structures whose characteristics point to the possibility of using iterative methodology both during the design phase as well in its implementation. Such facilities are oval stadium canopies based on using a repetitive spatial element in the construction structure, which in determining a clearly dominant architectural form constitutes a separate iteration also in the temporal sense. Testing the accuracy of the above-mentioned thesis is based on analyses of selected examples of stadium canopies as far as layout forms as well as the principles of the functioning of constructional structures, exceptional due to extensive span and force. It is necessary to conduct an analysis of the characteristic features of these facilities, their structures, as well as the relationship between the spatial shape with the algorithms used and types of repetitive components. Implementation methods based on prefabrication of the elements of the constructional structure as well as repetitive production and assembly schemes should also be tested. In the tested multi-scale spatial facilities with clearly defined, often rhythmical structures such as stadium canopies, there are algorithms made up of clear iterations Both singular as well as sequential iterations are used, the latter being a consequence of adapting the layout shape to the functional system of the stadium in case of facilities on the plan of an ellipse. In facilities based on the plan of a circle, there is an algorithm with one type of iteration with a scale resulting from the assumed constant constructional rhythm. The iterative approach is an immanent feature of designing and implementing large-scale oval stadium canopy spatial structures. The iterative method also concerns the process of constructional optimization of each individual element of the structure. Facilities created with the use of the iterative methodology are characterized by purity, honesty, and clarity of the synthetic architecture which corresponds in full to the thoroughly optimized construction. In addition, the postulate of unity of function, form, and construction in architecture is also fulfilled.

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THE USE OF STAINLESS STEEL IN STRUCTURES: COLUMNS UNDER COMPRESSION

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ABSTRACT

One of the principles of sustainable construction of buildings and bridges is to choose durable and long-term reliable materials and structures in order to reduce the costs of building maintenance, renovation and modernization. The use of reliable and durable materials guarantees quality long-term functioning of buildings and thus reduces the need for demolition and construction of new buildings. Until recently, the use of stainless steel for bridges has been limited by relatively high financial costs. The expansion of the application range of stainless steels, therefore, takes place gradually from architecturally prestigious buildings to the supporting elements of constructions. In the long term, the degradation processes of stainless steel load-bearing structures associated with the occurrence of fatigue cracks due to repeated loss of stability are not known in detail. Stainless steel differs from traditionally used carbon steel by technology of material processing, structural design, utilization of structural elements with optimized shape and construction technologies. The analysis of the limit states of load-bearing stainless steel structural members requires the inclusion of material non-linearity in the calculations of resistance and deformation. The analysis of slender columns under compression requires the inclusion of both material and geometric non-linearity, which increases demands on numerical analysis and scientific computing. The paper focuses on some aspects of the numerical analysis of the compressive force of columns with initial imperfections, which may have a significant influence on the results of the analysis of the safety and usability of load-bearing structures with slender elements. It is discussed that the analysis of the limit states of stainless steel load-bearing structural members is more demanding, both in terms of mathematical models and experimental research on the material properties of stainless steel, which are the basic input data for the probabilistic assessment of reliability. The increased accuracy of results of experimental research on material characteristics of stainless steels is discussed in connection with the properties of carbon steels and the application of existing methods of numerical analysis in stochastic computational models.

A MODIFICATION OF THE CROUT METHOD TO SIMPLIFY THE STRESS CALCULATION FOR CERTAIN BUILDING STRUCTURES

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ABSTRACT

This paper proposes a precise method of obtaining the stresses in certain models widely found in building to facilitate them in the early design phases. Stresses are obtained more quickly than with other usual procedures because they are deduced from a deflection that is calculated before than the real one. The method comes from earlier papers that proposed possible mechanical behaviours of models to justify the operations of three classical methods (Gauss, Crout, Cholesky) that solved the equation systems of conventional equilibrium analyses. Inspired by the above mechanical interpretations, the method suggests another structural response that can be justified qualitatively with the Cross´ philosophy. The deflection derived is obtained as a sum of partial deflections that are determined by progressively increasing the stiffness of the bars during the balancing process without varying the original stresses. The increased stiffness is achieved in such a way that the nodal movements of each partial deflection can be determined with few operations. Its calculation is described numerically and graphically when the model is a continuous beam and also in the case of other usual building structures. To date, the graphical version has been applied to study the behaviour of certain models as it requires a short calculation time and the results have been found to be very precise. As an example, the new deflection of a portico is calculated by freehand and compared with the exact result determined numerically. With this deflection, the stresses of the model are obtained by using modified Maney's equations. Based on this work, possible lines of research are suggested for developing further graphical methods that can be used to analyse other types of structure accurately.

THE FUTURE OF PUBLIC SPACES – TOWARDS INTERACTIVE USE OF ARTIFICIAL INTELLIGENCE IN URBAN INTERIORS

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ABSTRACT

The range of this study includes the analysis of the new interactive design trends observed in public spaces. Urban interiors keep evolving both in definition and meaning. Early theoretical analysis of public urban spaces was based mainly on the research on a human visual perception and overall esthetics. More pluralist approach can be observed in the second half of the 19th century when Henry Lefebvre created a philosophical term “spatial triad”. So called “Townscape” was also influenced by Hermann Helmholtz. In his work “Handbuch der Psychologischen Optik” he related to a the need to combine art, architecture and city into one. However, it is Camillo Sitte first who brought up the aesthetics of public spaces and malleable approach to city design and is being considered the pioneer of the urban analysis. Following the development of this area of art it is worth mentioning that the early theories either ruled out or diminished the human factor and the role of consumers in a particular space. A rapid increase in this field can only be observed in the span of the recent decades, during which the urban manifestos started including concepts like “place-making” or social participation in creation of urban genius loci. The urban tissue undergoes changes through active actions of designers cooperating with local citizens as well as bypassers. The interaction between human and space which allows the former to manipulate the latter is becoming more significant. The examples of such a shift include passive interactions like 3D mapping or design means actively engaging person, which are a core of this paper. The subject of this study includes a series of examples of contemporary design actions undertaken in urban spaces that are based on an interactive dialogue between the artifact and the viewer while significantly increasing the place’s attractiveness and aesthetic qualities. The author’s case study includes the history of interactive designs of kinetic facades; from a primal Institute of the Arab World from 1987 (by Jean Nouvel), through the sensorial spatial forms as main design components of a dutch group Studio Roosegaarde, to uniquely innovative attempts on use of the artificial intelligence conducted by such architects as the turkish group Ouchhh (urban sculpture Monolith), Berlin’s Onoformative agency as well as Carlo Ratti and his SENSEable City project. The use of AI is a new trend combining architecture and art. The gathering and analysis of data as well as its further processing works on both the internal level of architectural forms located in urban interiors, and the external level of complicated sensorial systems that gather data from the environment. The author examines the examples of interactive architectural structures in urban space while recognising the innovative direction of their development - the direction based on the pioneer solutions for the technological systems based on artificial intelligence. The definition of interactivity as a coupled effect between the human and the machine is still being developed based on new models of intelligent behavior in architecture.

DEMOGRAPHIC FACTOR AS A CRITERION FOR FORMING NETWORKS OF PUBLIC BUILDINGS IN UKRAINE

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ABSTRACT

The study of the developmental delays of temporal and spatial transformations of architecture and the architectural space is often based on a comprehensive fact analysis. Demographic factors, among others, determine trends of architecture development of public buildings and complexes and changes in the structure of their networks for the short-term. The authors consider fact analysis and trends at three levels to deal with current architecture issues of demographic indicators: the macro-level (global and European), the state level (meso-level), and the micro-level (the region, city, and district level). The demographic situation in Ukraine is objectively different from both the average global trends and the situation in European countries. Currently, there are depopulation signs of changes in Ukraine. The pace of urbanization is projected to be rapid for low-income countries. It was also revealed that public buildings and complexes and their networks are the most sensitive to demographic changes and, at the same time, are more open to the upcoming changes. These changes will include: increasing role and demand for public buildings and complexes under conditions of rapid urbanization; designing in conditions of dense existing development; development, expansion and new types of public buildings appearance following the needs of the population progressive link; the need to create and redistribute networks of public building and complex types depending on the quantitative meanings of demographic forecasts; the predominance of modernization, renovation, expansion and reconstruction of existing buildings in comparison with new construction; providing public buildings with more multifunctionality; public buildings architectural and typological improvement with maximum use in the engineering, construction and operation of modern architectural and engineering innovative practices and techniques..

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NUMERICAL PULL-OUT ANALYSIS OF PLAIN REINFORCING BAR FROM CONCRETE SAMPLE

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ABSTRACT

The paper presents results of 3D numerical modeling and calculations of a plain bar Ø16 mm concreted in the concrete cube during pull-out tests. The prepared geometry reflected real sample dimensions. The concrete cube is 160 × 160 × 160 mm. A reinforcing bar was axially positioned (concreted) inside the cube. The total length of steel reinforcement is 250 mm. Calculations were made for the length of active adhesion: 40, 80, and 120 mm. The remaining section excluded from adhesion by ϕ20 mm tube was implemented as a free space in the numerical model. The load was implemented to the model in the form of displacement applied to the lower end of the steel reinforcement (from the side excluded from adhesion). The mechanical parameters of the materials and interface elements for analysis were adopted based on the results obtained from the experimental tests previously carried out by the author. The non-linear numerical analysis using the Finite Element Method (FEM) included calculations in the scope of: - nonlinear statics, - the nonlinear material behavior of concrete and steel, - nonlinear interface (contact) behavior. As a result of numerical calculations, it was possible to trace the deformation state, stresses and cracking as well as their development along with the change of the strand displacement in the sample. During the test, there was a complex state of strain and stress in the sample. The increase of strains and stresses into the concrete sample occurred until the maximum value of the concrete-steel bond in accordance with the bond model was achieved. After exceeding the top, there was a constant decrease in strains and stresses in concrete with the increase in displacement of the bar (with extension). During the test, the concrete inside the cube cracked. The first cracks appeared at a slip of approximately 0.1 mm. Cracking and micro-cracking of concrete were initiated at the end of the excluded section (in the immediate vicinity of the void for tube) and with the increase in the value of slip spreads along the rod along the active length. When the maximum bond reached its further increase in rod extension, the image of internal cracking practically does not change.

FEM MODELLING OF CONCRETE-STEEL BOND TO SEVEN WIRE STRANDS – PURPOSE OF ANALYSIS, POSSIBILITIES AND RESTRICTIONS – STATE OF ART

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ABSTRACT

Nowadays, computational analysis of the concrete bond to reinforcing bars are the subject of independent research projects. Conducted laboratory tests do not provide complete descriptions of phenomenons occurring in a concrete sample when pulling out a reinforcing bar. The application of the Finite Element Method (FEM) for nonlinear contact concrete-steel analysis comes with help. The research using several scientific and commercial computing systems allows us to look deeper into the sample and obtain information about cracks development, stresses, and internal deformations. Interaction between reinforcement and concrete in reinforced and prestressed concrete structures is defined mainly by longitudinal and secondary by transverse cracking of concrete in the vicinity of the reinforcement. This behavior of materials can be modeled with a bond-slip mechanism where the relative slip of reinforcement and concrete is phenomenologically described. The behavior of the slip zone is then mapped with a zero thickness interface (contact) element. The constitutive laws of bond-slip adhesion are based mainly on the theory of total deformation, which expresses the pulling force as a function of total relative displacement. In the scope of modeling of regular reinforcement, the results of analysis are available for both smooth and ribbed bars. Thus far, there is no comprehensive solution for analysis of bond to seven-wire prestress strand in the scientific literature. The carried and discussed analysis, obtained with approximate methods for simplified geometry very well represent the issues related to the length of the prestressing force transmission (the compatibility of numerical results with experimental research is sufficient – macro scale). Interpretation on the micro-scale of a strain distribution or crackings of the nearest concrete cover of the prestressing strand is unsatisfactory – cannot be. Research problems result from the physical complexity of the phenomenon and what is equally important in the case of FEM computer analysis, limitations, and difficulties in modeling the actual seven-wire strand geometry in the computational system. The correct construction of the bond model requires consideration of physical phenomena occurring not only at the interface of the materials but also inside within each of them.

NUMERICAL PULL-OUT ANALYSIS OF SEVEN-WIRE PRESTRESSING STRAND FROM CONCRETE SAMPLE

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ABSTRACT

Detailed FEM analysis of the pull-out test of seven-wire prestressing strand form concrete sample is the purpose of the article. An effort made was to describe the phenomena occurring inside the sample during destructive tests. A 3D numerical model of a seven-wire prestressing strand concreted in the concrete cube was made. The assumption of the most trusted modeling of the strand geometry for numerical calculations was assumed. The mechanical parameters of the materials and interface elements for analysis were adopted based on the results obtained from the experimental tests previously carried out by the author. As a result of numerical calculations, it was possible to trace the deformation state, stresses and cracking as well as their development along with the change of the strand displacement in the sample. During the test, there was a complex state of strain and stress in the sample. The increase in deformations and stresses occurred throughout the duration of the test. In the initial phase, large increases in deformation and stress were recorded. At the final stage of research, slight increases in stress and strain were still recorded. The images of deformation and stress in the sample confirmed theoretical considerations and suppositions from experimental tests about its accumulation of the largest values in longitudinal concrete wedges in the closest cover of the strand. During the test, the concrete inside the cube cracked quickly. The first cracks appeared with a slip of approximately 0.05 mm. The concrete cracked in the zone of the nearest cover of the strand. Cracking causes destruction - cutting the longitudinal concrete wedges along the strand (the mechanism of cutting the longitudinal wedges from experimental tests has been confirmed). The applied pulling load in the form of displacement directed parallel to the axis of the strand and perpendicular to the surface of the concrete sample in combination with an irregular spirally twisted external wires of strand creates an internal state of stress causing the sample to torsion. The mechanism of twisting the strand during extraction observed during experimental research was also confirmed. The numerical analysis confirmed both destructive mechanisms from pull-out tests of 7ϕ5 mm strands from concrete samples.

DEVELOPMENTS IN TECHNOLOGY-BASED COURSES CONTENTS OF INTERIOR ARCHITECTURE DEPARTMENTS IN TURKEY

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ABSTRACT

The introduction of information technologies in space design disciplines begins with the use of the Computer Aided Design concept in those disciplines. Since the first example of CAD tool which was launched in 1963, the ability to design using computers has been a method adopted by architecture and space design disciplines and transferred to the educational context. There were changes and transformations in this method due to the needs created by the developing building technologies. The CAD technology, has been adopted to the space design education in order to support the courses. The CAD which was created for challenging the difficulties in the practicing area and speeding up the process, also takes place among the traditional methods of space design in the Interior Architecture discipline. The possibilities provided by those digitally created spatial mediums, have led to a rotational improvement in both education and practice. In addition, the reflections of technological developments in the social context in last decade on many areas of life have led to the necessity of reorganizing the educational contents. Academic studies conducted in recent years, are designed to include the last technological developments in today's educational contents and to reflect students' interests and commitment to these technologies in direct proportion. Bearing this in mind, the objective of this study is to read out the reflection of the developments mentioned above on the Interior Architecture discipline in Turkey by monitoring the developments in the context of the need of updating the educational contents. In order to meet the social developments and today's skills, space design education must follow the technological context in parallel. Based on these considerations, the studies of Turkey which were examined in this research have been conducted before could be explained as inadequate. In this context, to examine the curriculum of the Interior Architecture departments of Turkey and to monitor the updates mentioned before constitute the main focus of the study. CAD-based courses in the curriculum of the Interior Architecture departments were determined and the contents were examined. These analyses were achieved in the context of the methods, techniques and tools used in the courses, and after, the situation of the information-based courses were determined. It was concluded that these courses were transformed in direct proportion in line with the increasing needs in the educational context with the developing technology and updates should continue in the context of meeting today's skills.

REFLECTIONS OF MEMORY BOOM ON THE ARCHITECTURAL RESEARCHES IN TURKEY

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ABSTRACT

Memory is a notion studied by many different disciplines with its various points of views. Researchers, who examine memory and its sub-categories, discuss this notion through interactions of people within their individual; societal; cultural; and urban contexts. It is possible to observe a considerable increase of researches on the phenomenon of memory in the last two decades. These research increase is labelled in the literature as 'memory-boom'. The term "memory-boom" could be explained as the importance and attention given to the notion of memory in society and the academic world. An example of this 'memory-boom' can be seen in the increasing number of researches after the World War II and then The Holocaust. A similar rise was experienced after the 9/11 World Trade Centre attack. As a result of these incidents, which had a worldwide impact on masses, reasons behind memory-boom started to emerge in some researches. In this study, 'memory-boom' is discussed within the national context of Turkey. Notion of memory has been studied in many researches in Turkey, as in the literature of elsewhere. This study focuses on the rise of academic works in Turkey that examine relations between architectural buildings and memory within the field of architecture, as opposed to researches focusing solely on the concept of memory. The purposes of the study could be explained as twofold: 1) to understand reasons behind the increase of memory researches in Turkey and triggers or reasons that may be affecting these works, 2) to understand reasons of the memory-boom related to architecture and architectural buildings in Turkey. In this context, this study is constructed as a preliminary work, which has limited research universe that encompass academic dissertations in architecture and interior design disciplines, written between years of 2000-2020 in Turkey. Theses, which are archived at the "Council of Higher Education National Thesis Center" database, are examined within the scope of this study, to be able to demonstrate the relations between architecture and memory-boom. The study has a qualitative, interpretive conceptual framework and it relies on critical readings of the existing literature as a method. It is aimed to understand notable similarities and/or differences between triggering reasons of memory-boom in Turkey and related architectural studies. The study intends to contribute to the literature by drawing attention to the notion of "memory-boom" in national literature and to expand its place in academic works and researches.

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LIVEABILITY AND SENSE OF PLACE

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ABSTRACT

The liveability, which is a measurable component of the quality of life in urban space and the concepts of urban quality of life, is defined as the highest level of dignity and respect for human beings. Today as well as livability, many concepts referring to the relationship between place and human, stand out in terms of sustainability and urban space quality. Within the scope of this research, the concept of sense of place, which refers to the deep connection between human and place, has been disscussed, in the context of urban identity, attachment, dependence and their relationship between the urban's livability dimension. In the study Sense of Place scale was used that was developed by Jorgensen and Stedman (2001). The scale was adapted to Turkish by Akgül Yalçın (2012) with the "Back Translation" method. 54 people from BAIBU university employees participated in the study of the sense of place and its sub-dimensions with the urban livability. There was a high level of positive correlation between liveability and urban dependency (r=.79) and liveability and sense of place (r=.72). A moderately positive correlation was found between livability and urban identity (r: 0.62); livability and urban dependence (r=.53). Furthermore, there is a statistically significant differences between individual who scored low on livability and individual who scored high on livability with regard to sense of place ($F(2,54)=18,50$ $p<0,05$). It means that individuals who placed higher scores on livability scale, has greater feeling towards sense of place. In conclusion, the sense of place should also be processed with the concept of liveability and should be considered among the urban development plans with its sub-dimensions. It should also be used in the design of urban spaces. These results are further discussed in depth.

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NECESSITY OF SPORT FACILITIES IN URBAN AREAS: TRENDS AND DEVELOPMENT

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ABSTRACT

Urban development is often considered to cause greater level of anxiety and stress. However, urban environments with sport facilities can also be linked to greater level satisfaction and happiness. The key question needs to be addressed is that how city developer can integrate the sport facilities into fast-paced life of people who live in the cities. Firstly people need to understand the definition of sport facilities anf its effect to people's life. In general term, sport facilities can be defined as areas of stadiums, gymnasiums, arenas, swimming pools, fitness centres, ice rinks, billiards halls, bowling alleys and similar places where members of the society practice physical exercise or participate as spectators to a athletic competitions. Therefore; it is logical to say that city developer should provide opportunities for the local community to participate in sport and physical activity for health improvement and development of other skills. The present paper is an attempt to provide suggestions for city planners/developers why they need to consider to include sport facilities into urban development plans. According to the excessive review of literature, it can be concluded that the effects of the sports facilities on the development of the urban areas are determined by a wide range of factors such as sport culture, location, density, context and usage of the facilities. These results are further discussed and elaborated.

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HYDRAULIC CALCULATION OF FISH LADDERS, SEBESEL RIVER, ROMANIA

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ABSTRACT

Sebesel 1 hydropower development is located on the Sebesel river, in the outskirts of Borlova, Caraș-Severin county. The realization of the fish ladder will not influence the flow regime of surface or groundwater in the neighboring area. The fish ladder is dimensioned so as to allow the migration of the ichthyofauna upstream during the spawning period and the partial transit of the alluviums as well as the downstream provision of a servitude flow Q = 0.059 mc / s. The Sebeșel 1 hydroelectric power plant is a hydropower arrangement by shunt without accumulation lake. The plant has 2 (two) power groups equipped with Pelton turbines. The power delivered by MHC Sebesel 1 is 876.03 kW. The installed flow rate is 0.90 m3 / s; gross fall: 131 m; capture rate 814 mdMN. The fish ladders are of the technical ladder type with pools. The objectives of the studies were: to describe the qualitative and quantitative structure of benthic invertebrate and fish macro communities; assessment of the ecological status of the rivers in the areas of hydropower development; highlighting the presence of fish species of conservative interest and assessing the status of their populations. The methodology was carried out in accordance with the provisions of the Water Framework Directive, Annex V used took into account the following: Assessment of the status of aquatic communities; description of the structure of fish communities; assessment of the ecological status of the river sectors. The study led to obtaining some essential information for the exploitation and maintenance of the micro-hydroelectric plant as well as the fish ladder.

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COMPARISON OF THERMAL AND VIBRO-ACOUSTIC INSULATION PROPERTIES OF SELECTED INSULATION MATERIALS

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ABSTRACT

Residents of buildings are increasingly demanding that designers should take into account the comfort conditions in room in their structural design, in addition to building safety and functionality. Ensuring the rooms comfort is taking into account its various aspects. The paper concerns on thermal and vibro-acoustic aspects. The paper presents the results of analysis of material properties of different, chosen insulation materials. The material properties which were analysed are: heat transfer coefficient, thermal conductivity coefficient, thermal resistance, impact sounds reduction, dynamic stiffness, damping. The structural elements which connects thermal and vibro-acoustic comfort is the structure of interfloor and sometimes the floor on the ground. The article concerns mostly on that element that is why in the aspect of acoustic comfort only impact sounds level is considered and the acoustic insulation of vertical partitions is not taking into account. The interfloor consist mostly of three parts: supporting structure, floor structure and ceiling, but the floor and ceiling are the part of finishing components of the floor. Depending on destination the floors can be divided into: inter ceilings, floors above unheated surfaces (eg. the garages), roofs and ceilings over the crossing. Depending on function the interfloor must in turn satisfy the conditions of thermal, damp cavity and / or acoustic insulation. The purpose of this article is to find as many common material properties as possible to ensure rooms comfort. That is why parameters of insulation materials related to thermal comfort as well as acoustic and vibrational comfort of rooms have been described. Then the results of this analysis were synthesized in the form of conclusions.

A REVIEW OF VIBRATIONAL COMFORT CRITERIA

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ABSTRACT

The aim of this paper is to analyse various evaluation methods of human perception of vibrations which are coming to the building through the ground. Mainly three evaluation methods that are currently used in world literature have been investigated. The so-called base method - RMS mean square method and two methods defined in the ISO standard as additional methods supplementing the base method, i.e. the VDV vibration dose method and the maximum transient MTVV vibration method were analysed. An aspect connecting all evaluation methods of human perception of vibrations in buildings is to relate the results of analyses to the position of the human body. The human perception of vibrations differs from the direction in such a way that for frequencies below 4 Hz horizontal vibrations are more percept than vertical, while above this frequency the vertical vibrations are more noticeable. Information about the purpose of the room, the time of vibrations occurrence and their nature are contained in the value of the correction factor n, by which the curves of the vibration sensibility threshold should be multiplied to obtain curves which repetitive comfort level in a given measurement situation. In Poland, a pioneer in the development of guidelines relating to the human perception of vibration in buildings, and thus receiving vibration in a passive manner, was prof. Roman Ciesielski, who has already in 1966 attempt to develop criteria and principles in this field in a useful way. In this article a historical overview and a modern trend in the field of human perception of vibration is presented.

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ADVANCED COMPUTATIONAL MODELS FOR RADON TRANSPORT AT SOIL-BUILDING INTERFACE

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ABSTRACT

The aim of this paper is to develop advanced finite element models for numerical simulation of the radon transport from soil into living spaces. The main attempts are focused on developing simple, cost efficient and accessible methods to simulate the process of radon transport from sub-soils through porous, imperfect structural elements into the living spaces. Different Discrete Crack Models (DCM) are used, in this respect, to simulate flow through the actual gaps, removing in some cases the porous parts based on their low contribution to the exhalation rate. Equivalent Continuum Method (ECM) has been involved here in order to reduce the number of elements used to solve advection-diffusion equations by finite element method increasing in this way the computational efficiency of the models. ECM based on volume averaging method is proved to offer acceptable results in some particular cases. Furthermore, this approach creates a simple alternative to compute indoor average exhalation rates of radon with imperfect structural elements. Several computational examples are given here to validate the accuracy and computational efficiency of the proposed numerical models by comparing the results predicted by the ECM based on volume averaging strategy in conjunction with DCM models with those given by the ANSYS software using the continuity-based method and other results retrieved from the available literature.

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CONTEMPORARY HOTEL ARCHITECTURE IN THE MOUNTAIN LANDSCAPE OF THE SILESIAN BESKIDS

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ABSTRACT

The subject of the article is contemporary hotel architecture arising in the mountain areas of the Silesian Beskids. This area of southern Poland, located on the border with the Czech Republic and the Slovak Republic, has been for decades an attractive place for weekend and holiday recreation for residents of large Polish cities, especially the inhabitants of the Upper Silesian region. In XX. century, there was a rapid development of mass tourism. The most touristically developed and prepared to receive mass numbers of holidaymakers are villages located in the northern and central parts of the Silesian Beskids: Ustroń, Wisła, Brenna, Szczyrk. Numerous hotels and guesthouses have been created at the time and also in recent years to service holiday makers coming from big cities. The author presents the main trends of architecture of the holiday homes built there. The first of these trends is guest house and hotel architecture referring to the traditional local folk architecture. We come across various forms here: historicism, the neo-natural style, and less often the contemporary interpretation of old forms. The second trend is inter-war, modernist guesthouses. The third trend is large-scale holiday homes from the '70s and' 80s of the 20th century in the style of post-war socmodernism. In addition to these currents, in recent years' numerous facilities have been created in many tourist resorts that does not exhibit regional features, similar to suburban buildings in other regions. Some of them imitate local or foreign patterns. An example of that approach would be holiday houses in the "Alpine" or "Bavarian" style. As an example of searching for contemporary hotel architecture undertaking a dialogue with local construction and mountain landscape, the author presents his own project of the Three Nations Meeting House in the village of Istebna. The mission of the Meeting House was to allow and increase activities aimed at integrating the regions of Central Europe.

DOGBONE VS *LRPH*: ELASTIC AND LIMIT BEHAVIOUR

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ABSTRACT

In the last decades, earthquakes of great intensity occurred in succession, some of them with huge effects on the involved structures (e.g. Northridge 1994), showing several problems in buildings in terms of limit behaviour and capacity. Particularly, referring to steel structures, those events shown that various endured collapses were ascribable to brittle failures concentrated in the column-beam welded joint. This kind of behaviour is common in the welded connections due to the huge thermal treatment which affects locally the material during the manufacturing. About this matter, different studies have been conducted in order to protect the joints from brittle damage during dynamic actions, proposing suitable protecting techniques and appropriate devices, known as reduced beam sections (*RBS*). The most diffused is the dogbone (see, e.g., Plumier, 1997), which is standardized in *FEMA* and it consists in a local transversal dimension reduction of the section with the aim of decrease the limit resistance of the specific portion where it is applied. In this way, it is possible to avoid the joint exhibits a bending moment higher than the one of the reduced beam element, preventing brittle failures. An important feature of this kind of device is the possibility of choosing during the design process the optimal places for the occurring plastic hinges, moreover helping in the fulfilment of international prescriptions about the capacity design beam-column. Yet, the presence of a reduction of the transversal section of the element implies a non-neglectable variation of the stiffness of the whole element. Recently the authors proposed an innovative device (see, e.g., Benfratello et al. 2017, 2019, 2020) called Limited Resistance Rigid Perfectly Plastic Hinge (*LRPH*), identified by patent n. 102017000088597 at the Italian Ministry of Economic Development and covered by patent n. PCT/IB2018/055766 at the International Patent System. This device is composed by three different I-shape portions with different flange thicknesses and it possess the same features of the technologies already present in literature, with the additional feature of avoiding any alteration of the stiffness in the element where is placed. The present paper is devoted to the comparison of the efficacy of the two described devices: dogbone VS *LRPH*. In particular, the study of the behaviour of an optimal plane steel frame subjected to serviceability and limit conditions is performed. Linear dynamic analysis and non-linear static analysis (pushover) are developed, in order to compare the mechanical response and kinematical behaviour of the considered frame equipped with the dogbone devices as well as with the new proposed *LRPH*.

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IMPROVEMENT OF THE PRESSURIZATION STATION SPP 41 FROM THE IRRIGATION SYSTEM OF OGRADA, IALOMITA COUNTY, ROMANIA

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ABSTRACT

The water supply of the arrangement is made from the Danube through the I.M.Gheorghiu base station and is pumped into the CA Lunca Canal. The outlet of the floating station is on the Crcome arm of the Danube river at 221 + 650 km. The flow required for the Ialomiţa Călmăţui terrace is 110mc / sec. The 6.7 km long Lunca CA channel runs water through the Călmăţui-Gropeni meadow to the base of Mihai Bravu terrace to the north of Spiru Haret locality, from where through the SRPA1 Spiru Haret repacking station it is raised on the terrace and directed on the AC adduction channel. Terrace. This channel is dimensioned in 3 sections: -the first section with a length of 12.445 km crosses the area from the discharge basin of the SRPA1 Spiru Haret refueling station to DN21 Slobozia-Brăila, which it intersects south of the town of Inssuraţa.- the second section is between DN21 (km12 + 445) from the channel and the SRPA4 station at km30 + 835. - the third section with a length of 2690 m is between km30 + 835 and km33 + 525. From the main channel of adduction CA Terasa derives in the following channels: CD1 at km2 + 285, CD3 at km10 + 750, CD7 near the SRPA3A station and CD9 fed from the downstream end of the channel CA Terasa. The total length of the channels of adduction and distribution in the perimeter of Ialomiţa Călmăţui is 318,886km, the net surface of 137291 ha arranged for irrigation and is composed of 512 plots generally rectangular in shape. From the CD3 channel, the CD5 channel is formed stage 1 in length of 14.3km from which SRPA4 Bucşa is fed. This refueling station supplies 13.1km long CD5 channels and CD4B, CD4C. The latter channel feeds the SPP41 pressurizing station serving 1692 ha belonging to OUAI Ograda. The proposed works will be limited to the refurbishment and consolidation of the SPP41 pressure pumping station.

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ANCIENT CITY PROTECTION AND URBAN RENEWAL DEVELOPMENT IN QI COUNTY: SELECTED EXAMPLES

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ABSTRACT

Shanxi Province, in northern China, is rich in cultural heritage resources, because it was, historically, an important section of the ancient tea road. Many of its heritage towns have been meticulously protected. However, there exist some small historical towns whose precious heritages have not been protected and adaptively reused due to the local government's shortage of funds and technical resources. With respect to this situation, international cooperation is an effective way to solve such problems. "Demonstration Project in Ancient City Protection and Urban Renewal Development in Qi County" is a representative example of such projects. The Qi County government is collaborating with the French Development Agency to undertake this project to embrace the Qi County ancient city as a source for regional sustainable development. This paper discusses the historical evolution of this ancient city, the local features of its cultural heritage, the orientation of its development and the integration of its regional resources, etc. Three example projects have been analysed in this paper. The first is the protection and restoration of the "Qujia Courtyard". The second is the renewal of the "Cross Street", which encompasses the commercial streets in the centre of the ancient town. The third example is the "Changyuan River National Wetland Park", which is an important natural landscape in the Qi County region. Moreover, this paper focuses on how the local government uses the loans and technical support provided by the French Development Agency. The two sides solve a series of problems in the process of this demonstration project, such as concept conflict, positioning deviation and design accuracy. They finally achieve sustainability not only in the domain of heritage protection, restoration and adaptive reuse but also in urban public space transformation. Finally, this paper proposes a method for heritage protection with cultural localisation, value localisation, protection localisation and management localisation. Furthermore, it analyses the advantages which can result from international cooperation mode in the protection and inheritance of cultural heritage and natural heritage.

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TILTED ANGLE MEASUREMENT METHOD OF MODULAR UNIT BY COMPUTER VISION

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ABSTRACT

Modular buildings are constructed in an masonry way, so construction errors need to be managed finely for building skyscrapers. This study examined the use of Computer Vision to measure the horizontal angle tilt of modular device roofs during the manufacturing and field assembly stages. Camera calibration is used to construct 3D from the captured image, attaching an image consisting of a checkerboard pattern and eight circular targets around the checkerboard to the top plane of the modular unit and capturing the image. Checkerboard patterns were used for camera calibration, and image analysis performed 3D reconstruction by locating the center coordinates of the circular target. A miniature model experiment was conducted before it was applied to the actual modular unit. The experiment measured the target at a distance of 300mm, 400mm, 500mm for the eight tilted angles of 0.5°, 1°, 1.5°, 2°, 3°, 5°, 7° and 10°, depending on the image quantity (4,8,16,32,64,128 sheets that using for camera calibration) and distribution of concentration and distribution of the image data used for camera calibration. In sections with a tilted angle of 4 degrees or less, the error of the measurement angle using the concentrated image data was less than the error of the measurement angle using the dispersed image data. The result of the target at a distance of 400 mm, 500 mm, excluding 300 mm, showed a small error at a tilted angle of less than 3 degrees. The result of 300mm distance showed very large errors due to distortion of circular targets. Errors were reduced by the number of images for camera calibration, and the quantity of image data used for camera calibration from more than 32 sheets did not significantly affect the error. The error rate is less than 3% at all angles, and less than 0.04° at an angle of less than 1°

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IMPACT OF PROJECT OF MODERNIZATION OF RAILWAY ON IMPORTANCE OF OCCURRENCES

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ABSTRACT

The modernization of railways is very important part of the development of the railway infrastructure. Projects of modernization of railways bring with them, instead negative impacts in the form of the contemporary limitations of the operation on the railway and often quite big investment costs, a lot of positive impacts – benefits. Whereas benefits in the form of savings of operational costs, decrease of the transportation time or the mitigation of negative environmental impacts are commonly included into the economic analysis evaluating the economic efficiency of the project, benefits in the form of the increase of the safety and reliability of the railway, which are also connected with the realization of projects of the modernization of railways, currently are not being included into the economic analysis. The paper is focused on the presentation of the partial output of the research project, which is focused on the evaluation of the increase of the safety and the reliability of the railway due to the realization of projects of modernization of the railway infrastructure. The presented part of the research deals with the evaluation of the impact of the realization of the project of the modernization of railways on the safety and the reliability of the operation. It is focused on the empiric verification of the basic supposition that the realization of the project of the modernization of the railway, including also the modernization of the safety measures, will bring the decrease of the appearance of occurrences from the aspect of their number and their importance. From the methodological point of view the research comes out from the comparison of the state before the realization of the project of the modernization of the railway infrastructure and from the state after its realization. Concretely the research is focused on the change of the appearance of occurrences and their economic impacts including the impacts on health of people, operational costs or the amount of damages and impacts on the fluency of the traffic and possible delays due to the realized operation oriented on the increase of the safety and reliability of the railway. Results are expressed in monetary units and are found out and presented on two pilot projects of the modernization of the railway.

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AREAS OF INTEREST OF AGE-GENERATIONAL GROUPS AS A FACTOR OF SOCIAL MANAGEMENT OF SETTLEMENT STRUCTURES

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ABSTRACT

Social life, according to H. Garfinkel (Studies in Ethnomethodology), is carried out through the daily practice of accounting for social life as part of social life. Accounting for social life is one of the factors of social management. At the same time, sociology is an important link in the interaction of social management and social life accounting. One of the most important objects of accounting for social life (both sociology and social management) is the sphere of interests of the population. First of all, it is about identifying the leading areas of interest of different groups of people and the corresponding problems, themes, narratives, ideas and suggestions for possible improvements in social practice. The purpose of this study is to identify the leading areas of interest of the population not only in the whole region, but also in the main age-generational groups, which is an important condition (factor) of social management of settlement structures. This task is solved using the materials of the sociological survey "The youth of the Samara region 2018", conducted in the Samara region (Russia) in 2018 under the leadership of V. B. Zvonovsky. There are differences in the leading areas of interest between age and generational groups. All these features require attention and consideration in social management. If participation in political events in the country is a concern and problem mainly for political parties and organizations, then the organization of socio-economic and socio-cultural life in the region and in settlement structures is a common concern mainly for local authorities and management, for business structures and for the public, for public organizations and volunteers. Sociological materials on the Samara region show the priority importance of developing the local community in the fields of science and technology, recreation and entertainment, the natural world and ecology, improving places of work and study, and developing the education sector.

THE MORPHOLOGICAL DEVELOPMENT OF PLATEAU (PRAIA – CAPE VERDE), FROM SIXTEENTH CENTURY TO THE PRESENT

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ABSTRACT

An analysis of urban morphology of the historical nucleus (the Plateau) of Praia (Cape Verde) highlights the process of thinking and making a city expressed in António de Lencastre 's plan and its further development. For this, the processes of urban transformation occurring over time in the Plateau are shown. The methodology used for this urban analysis allowed an understanding of the intervention process on the Plateau through an interpretative analysis of morphological evolution obtained from: i) a detailed identification of cartography; ii) a comparative morphological analysis of urban development based on old and current cartography; iii) a vectorization of the maps through scale normalization (the letters were overlapped with the 2018 chart); iv) an identification of public buildings and public spaces; and v) a quantification of the elements of urban form. In the quantification of the elements of the urban form, the reading and interpretation of the different maps is synthesized through analytical drawings and tables.

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MEASURES AND MODEL OF THE CHURCHES OF SÃO MIGUEL (AZORES)

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ABSTRACT

The religious spaces are carriers of great symbolic importance, standing out in the urban fabric not only for their location, but also for their scale in relation to the surrounding buildings. We show the relevance of the religious space in the São Miguel island (Azores) urban fabric, where the church presents itself as an element of great importance. It is the generator of urban fabric, and it is usually strategically located as a landmark of the civic center of the localities. This study presents an analysis of the main façades of the parish churches of the island of S. Miguel built during the eighteenth and nineteenth centuries. It highlights the existence of a typology of façade, which is a consequence of the materials and building systems existing there at the time. This demonstration continues the studies carried out by Sousa (1986) with the concept of façade "Micaelense baroque ornamentation" and Caldas (2012) with the concept of "Micaelense baroque façade" and "Micaelense type façade". Methodologically, the investigation was carried out through the analysis of the elements that make up the façades of the parish churches, the study of old and current photography, and drawings made in CAD; and the systematization of façades by grouping them into categories and establishing a typology between the various churches of the eighteenth and nineteenth centuries.

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TERRITORIAL FRUGALITY

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ABSTRACT

During the urbanization process there were practices off frugality behavior related with contained use off resources, economic goods and services, normally co-related with long-term goals. The study intends the introduction of the concept of Territorial Frugality, based in literature review, characterizing its applicability to the territory, specifically to the urban space, using the Study case off Metropolitan Area off Lisbon. The study introduces frugality simultaneously as a catalyzer and a filter of public politics production, envisioning better use of resources, presenting new tools, as indicators and parameters, correlated with frugality practices of spatial planning and urbanism in Metropolitan Areas.

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DISRUPTING THE TRANSPORTATION SYSTEM: A SURVEY OF POSSIBLE BLOCKCHAIN APPLICATIONS IN PASSENGER MOBILITY

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ABSTRACT

Blockchain describes an innovative and disrupting IT solution including the special feature of resistance to post-manipulation. Its functionality is similar to the concept of bookkeeping and can eliminate or at least substantially reduce the risk of manipulation in one single place by means of decentralized and distributed data storage. Currently, this method is mainly used as a technical basis for so-called cryptocurrencies (e.g. Bitcoin, Ethereum, Litecoin, Monero). However, it is conceivable to apply the technology also to topics outside the financial sector, for example, in passenger mobility. Intelligent or smart contracts can be identified as an exemplary area of use in the field of mobility, where contracting is technically supported between service providers and customers. These contracts can be monitored in real-time and the service can be automatically enforced. The human factor is thereby eliminated as a potential source of error. Smart contracts can theoretically be used when several parties jointly create a complex transport service in order to meet a customer's mobility needs. Through the employment of blockchain or distributed-ledger technology, the transaction costs (and as such the operational risk) of these contracting parties is substantially reduced and the process is carried out in a standardized and trustworthy manner. This paper evaluates different deployment scenarios of blockchain and distributed-ledger technology in the area of passenger transport. Based on design science research (DSR), in a first step, potential fields of application are identified by means of incorporating creative methods (e.g. brainstorming). These preliminary findings are then concretized and modelled in a broad stakeholder process, systemized and constantly evaluated in a multidimensional manner (including economic, technical, socioeconomic and ecological aspects).

Corresponding Author: Georg Hauger

THE HUMAN, THE BUILT ENVIRONMENT AND THE TECHNOLOGY: IDENTIFYING KEY CONFIGURATIONS FOR A USER-FRIENDLY WAYFINDING SYSTEM AT TRANSPORTATION HUBS

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ABSTRACT

Neither an entirely analogue nor an entirely digital wayfinding system can meet all user requirements for navigation and orientation in a complex transportation hub (such as a railway station, a metro station or an airport). This paper presents considerations on a holistic, barrier-free and user-friendly wayfinding system at transportation hubs by describing wayfinding elements provided through humans, the environment and technologies. For each of the three mentioned categories (humans, environment and technologies) a detailed set of wayfinding elements (morphological field) is compiled. Environmental elements, for example, address signs, plans or landmarks while technology-based elements consider any form of wayfinding support on mobile devices (such as smart phones, tablets or watches). Human-related support in wayfinding represents classic forms of personal information or personal assistance by passengers or employees. In order to integrate the user perspective and the complexity of user requirements, an additional set of user groups (such as people with vision impairments, people with hearing impairments or people with mobility impairments) and their wayfinding-specific requirements is composed. In order to intersect the identified wayfinding elements and the user-specific wayfinding requirements, a General Morphological Analysis is conducted. This methodological approach represents a multi-dimensional, non-quantified method for delineating key configurations of wayfinding elements that cover the widest range of user-specific requirements in orientation and navigation at transportation hubs. Based on the morphological analysis, recommendations for a holistic, barrier-free and user-friendly wayfinding system at transportation hubs are formulated. The elaborated recommendations form the basis for a feasible implementation strategy of future wayfinding systems at transportation hubs.

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COMPOSING A CONCEPTUAL FRAMEWORK FOR AN INCLUSIVE MOBILITY SYSTEM

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ABSTRACT

This paper addresses the question how a future mobility system can be available and accessible to all groups of our society and how such an inclusive mobility system must therefore be designed and organised. The discussed research question is based on the Seven Principles of Universal Design, the UN Convention on the Rights of Persons with Disabilities as well as on the following UN goals on sustainable development: a. Goal #9: Industry, Innovation and Infrastructure, b. Goal #10: Reduced Inequalities, c. Goal #11: Sustainable Cities and Communities. By making use of an Innovation Helix Framework, these theoretical principles on inclusion and inclusive design are transferred to the interdisciplinary concerns of transportation system planning and the future design of an inclusive mobility system. The Innovation Helix Framework combines interactions between the following sectors (helixes): academia (university), industry, government and society. This broad methodological approach allows to include and identify technology driven aspects, innovative solutions as well as non-technological aspects that constitute an inclusive mobility system. From a transportation system planning point of view, a detailed set of mobility and accessibility requirements for people with disabilities is elaborated and described. By assigning the mobility requirements of people with disabilities to the specified sectors, eight key components for the future design and organisation of an inclusive mobility system are derived. These components form the conceptual and universal framework for an innovative and inclusive mobility system. The retrieved conceptual framework may subsequently be used to create a roadmap towards an inclusive mobility system in the context of automated driving.

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ART IN THE PUBLIC SPACE. DIFFERENT ASPECTS OF ARTISTICT ACTIVITIES IN ARCHITECTURE

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ABSTRACT

Background: Artistic activity in the public space of the city has many important functions and, what is important, is universal. Everyone, regardless of status, views or beliefs, has unlimited access to it. Both residents and visitors to a given place can read and interpret the message that various manifestations of artistic activity carry with them. Art evokes important social feelings - it helps to identify with the place, remember them as a distinguishing element. Objects with specific features become a landmark in the area. Artists who create art in public space raise important topics related to various areas of life, gain new fields of expression, a wider audience and therefore reach more recipients. The themes realized by the authors of murals often refer to historical events, commemorate important social events, perform a propaganda function because they reach a mass audience. The paintings often depict images of famous people: musicians, footballers, writers etc.; tell various stories, refer to ecology, human rights, they are also a form of advertising etc. Purpose: The work discusses selected examples of murals and on this basis shows that artistic activities are becoming an important element complementing the urban landscape. Murals appear in neglected city districts, in housing estates and high-rise buildings areas, they often decorate empty walls of buildings, they are an element of space revitalization - they increase the aesthetic value of the surroundings and have a positive impact on the quality of life of the inhabitants. They change the face of difficult, neglected, forgotten and dangerous spaces. They help to improve the spatial and social situation, and thus lead to a better quality of life for residents. The article is based on literature research and own observation in the public space in the cities. The main goal of the research is to determine whether and to what extent art manifests itself in modern cities and what is its significance for social perception. The analysis showed that newly emerging murals still perform socially engaged functions and have an impact on improving space.

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THE MODEL FOR THE DESCRIPTION OF THE DYNAMIC BEHAVIOUR OF THE PROJECT PROCESSING

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ABSTRACT

The paper deals with the problem of many projects – the difference between designed activities processing and real project implementation. The reason is the rework of many activities that is omitted in the project proposal. The consequences are the project delay and the budget overrun. The reason for the described problems is the low quality of same processed activities and the changes in project goals. This research work is focused on the development of the dynamic model that describes the project processing. The model is based on the system dynamics methodology. The main stocks are the amount of the activities expressed as the number of man-months. The changes in the stocks are influenced by the flows. The main flow is processing rate and reworking rate that influence the project dynamics. The auxiliary subsystem deals with human resources. The number of workers has the relationship to all flows of the system. The model can be used for the simulation of the dynamic behaviour of the complex projects. The outputs from the designed model are compared with model that is based on standard approach. It means the project model includes only unprocessed activities and processed activities with one processing flow. This model does not include rework activities. The results of the simulations present the difference in time according to the quality rate and the change rate. It can help to understand the key reasons for the project delay and consequently for the budget overrun.

A HISTORIC-GEOGRAPHICAL APPROACH TO POST-EARTHQUAKE URBAN SPACE ANALYSIS: DUZCE CASE

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ABSTRACT

Cities, as our living spaces, are constantly in motion and changing. Interpreting this change over urban space in the context of urban morphology as a method is based in the last century. As a result of the interactions of many disciplines, urban morphology has emerged as a new field of study which aims to analyze the changes that a city or a part of the city has undergone by examining the existing texture. In particular, this method analyzes the changes that occur due to economic and social conditions or disasters. In this research, the quarters in center of Düzce, in which almost all buildings were collapsed at 1999 Düzce earthquakes, were chosen as a study area. The change of the neighborhoods' urban tissue has been investigated morphologically via the historical-geographical approach, introduced by Conzen. This approach aims to explain the morphological structure and character of settlements through a systematic analysis of the constituent elements and its transition over time. In this research the traces of the post-earthquake transition of the urban tissue were followed based on past spatial data and current maps, zoning plans belonging to Düzce city. The data obtained were analyzed by Arc GIS software and interpreted. The formation and transition process of the urban tissue was detected on the parcels-building blocks, streets, building footprints and landuse changes. In addition, socio-economic history of the city has been revealed and interpreted with the morphological structure of the city. The research was revealed the transition of the urban tissue from the traditional to the new modern setting by the impact of planning. The streets are the most resilient elements which sustain ın the neighborhood. Also, the blocks are identical to the former base map. But footprints of the buildings are bigger and storeys are much more than the former neighborhood. The character of the built environment has been changed by the morphological transformation and also the sense of place has been lost. The new urban tissue expresses the differentiation of society. Generally, gated communities are seen in the new setting.

EFFECT OF POROSITY ON DENSITY AND COMPRESSIVE STRENGTH OF CELLULAR CONCRETE

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ABSTRACT

Concrete is one of the most used materials in civil engineering. Today, buildings demand the use of lightweight materials. Cellular concrete is an alternative material to reduce weight in construction. Cellular concrete is defined by ACI as a lightweight concrete with density between 400 and 1800 kg/ m^3 with empty spaces created from a foaming agent in the mixture (Amran et al, 2015). This concrete is known for its low density, high workability, low thermal and acoustic conductivity and high fire resistance. In hardened state, properties of concrete such as density, compressive strength, permeability, shrinkage and thermoacoustic isolation are intimately related to its porosity and pore size distribution (Narayanan and Ramamurthy, 2000). The porosity of the foamed concrete is totally dependent on the pore structure of the matrix and it can be established an interval of variation between 28 to 90%. Difference in pore structure is largely due to the foam type and foam stability (Feneuil, 2019). The pore structure of foam concrete consists of gel pores, capillary pores as well as air-voids (air entrained and entrapped pores). The morphology of the hardened cement depends on the bubble size distribution and on the evolution of the bubbles during mixing and until cement hardening (Feneuil, 2019). Difference in pore structure is largely due to the foam type and foam stability. Given the importance of porosity for the evaluation of the performance of a cellular concrete, the present work aims to determine mathematical relationships between porosity and density and compressive strength, considering the effect of the type of foaming reagent used and the water/cement ratio.

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NUMERICAL VERIFICATION OF THE USE OF GFRP REINFORCEMENT IN THE CEILING SLAB OF A GARAGE HOUSE

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ABSTRACT

One of the major advantages of fibre reinforced polymers (FRPs) is their high tensile strength and low weight to strength ratio. Compared to steel reinforcement, this is one of the main and decisive features that could determine the choice of materials used in the design. Since there is no corrosion for this type of reinforcement, it is very suitable for concrete structures in aggressive environments. This point, along with others, gives concrete structures reinforced with FRPs significant advantages over conventional concrete structures with steel reinforcement. Different material properties and behaviour of FRP when compared to steel reinforcement result in the need of the modification of established design procedures, especially in the area of the ultimate strain, because FRP reinforcement has a different σ-ε diagram than the steel reinforcement. The experimental verification of new design procedures is necessarily needed. This paper summarizes the results of practical design and calculations of resistance of alternatively steel and GFRP reinforced concrete ceiling slab of a garage house and experimental results on beam specimens reinforced with GFRP reinforcement tested under four-point test. It was necessary to adjust the conventional procedures in calculating the required area of GFRP reinforcement in order to avoid brittle failure of cross-section (rupture of reinforcement). This is ensured by abiding the balance reinforcement level. Another fact to be considered is the creep rupture phenomenon causing immediate rupture of GFRP reinforcement under high level of sustained loading. The reduction of GFRP strength according to long-term loading results in rising required area of reinforcement. Finally, the serviceability limit state is checked. According to low modulus of elasticity of GFRP reinforcement, the deflection should be the limitation factor for the amount of reinforcement designed.

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COMPARISON OF COMPOSITE, STEEL AND REINFORCED CONCRETE COLUMNS

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ABSTRACT

Architects now often require the use of slender load-bearing structures, but they must be sufficiently resistant to all loadings. The use of the composite steel-concrete columns is possible to use the main advantages of the individual materials. The most commonly used composite is steel-concrete. Depending on the amount, shape, location and utilization rate of steel or concrete, the composite columns are closer to steel or reinforced concrete columns. The composite steel-concrete structures utilize high compressive strength of concrete and high tensile resistance of structural steel. The steel-concrete connection is therefore highly efficient, and by combining it is possible to produce relatively lightweight structures with wide use in high-rise buildings and bridges. The composite steel-concrete columns have a high strength with a relatively small cross-sectional area. Composite efficiency also depends on the type of composite steel-concrete column. The most commonly used type is a steel tube filled with concrete. In the case of a steel tube filled with concrete, it is possible to use the confining of the concrete with a steel tube, which prevents lateral deformation of the concrete and at the same time the concrete core prevents compression of the steel tube. These two effects increase the total resistance of the composite steel-concrete column. Other types are partially or fully concrete-encased steel section. The use of a fully concrete-encased steel cross-section increases the fire resistance of the cross-section as the steel profile is protected by concrete against the effects of fire. The criterion for selecting the appropriate shape and type of the steel part of the cross-section of columns should be taken into account the design of the global structural system of the object. Several European standards are needed to design composite steel-concrete structures. In addition to the standard EN 1994-1-1 Design of composite steel and concrete structures, it is also necessary to use standards EN 1992-1-1 Design of concrete structures and EN 1993-1-1 Design of steel structures.

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INFLUENCE OF THE RESPONSE SPECTRUM TYPE ON THE VALUES OF SEISMIC FORCES IN A REINFORCED CONCRETE BUILDING USING FEA CALCULATIONS

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ABSTRACT

Poland is not a seismic active area. Under the terms of Eurocode 8, it qualifies for low seismicity region. This does not mean that there is no seismic shocks in Poland. In 2004, two intense earthquakes occurred in Poland. However, there are areas with strong induced seismicity. It is associated with the occurrence of mining tremors. In Poland, mining tremors occur mainly in three mining areas: Legnica-Glogow Cooperfield District (LGCD), Upper Silesian Coal Basin (USCB), Belachtow Brown Coal District (BBCD). In these areas mining tremors can cause structural damages in the buildings. It's very important to precisely describe the additional seismic forces in new designing buildings as well as in existing structures which weren't design for such influences. In Poland, the response spectrum method was adopted as the basic one when designing buildings located in areas of mining tremors. The article adopts a multi-family residential building with reinforced concrete structure. It's a ten-story building with reinforced concrete shear walls and reinforced concrete floors. Calculations were made using the finite element method. 3D FEA model was build. The calculation were made using Diana FEA software and using built in response spectrum analysis. Three reference acceleration response spectra in accordance with applicable standards were used for calculations. The ultimate limit state (ULS) and service limit state (SLS) of the adopted model were analyzed. A significant influence of the spectrum curve on the dynamic response of the analyzed computational models was observed in the calculations. The results can be used by structural engineers in the designing process of the structures located in the mining tremors areas.

INFLUENCE OF TRAIN TYPE ON PERCEPTION OF VIBRATIONS BY HUMANS IN THE BUILDINGS

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ABSTRACT

Influence of railway on humans in the buildings close to the railway lines became a serious problem in the modern cities. Public transport by railway is one of the most popular and economic. In Poland there are two main codes in Poland to verify the level of the influence of vibrations on the building's structure as well as on the humans in the buildings. In this paper a case study of the single family residential building close to the one of the main railway line is analyzed. It is masonry house without basement. It's founded on the reinforced concrete wall footing. In the building monolithic reinforced concrete ceiling were made. The wooden rafter roof was made in the building. The in situ tests were made according to the polish codes. The acceleration sensors were located in the characteristic points of the structure. To measure the influence on the building structure the three axis sensors were located on the ground level at the corner of the house closest to the railway line. Also, the three axis sensors were located at the center of the ceilings to analyze the influence of the vibrations on the humans in the buildings. The sample of the records was 1024Hz. The influence of the train type as well as the speed of train were analyzed. The result are presented in the form of graphs of RMS accelerations in one-third octave bands as well as values of the values of the WODL ratio. The WODL is the recorded RMS acceleration to threshold of perception described in RMS acceleration.

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THE IMPACT OF THE BARRIER DEPTH ON VIBRATION REDUCTION ON THE GROUND

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ABSTRACT

The barriers in the ground are increasingly used to reduce the vibrations from surrounding environment. In Poland there is a significant increase of railway lines in the cities as well as on the outer of the cities. It is closely related to the growing popularity of rail transport and its economical. The barriers give the opportunity to isolate single buildings as well as the groups of buildings along the railway lines. However, there are still doubts and inaccuracies in designing such structures. In the paper the numerical calculations were made to describe the impact of the barrier depth to the reduction of vibrations behind the barrier. The calculations were made using finite element method. The 2D plain strain model was used. The soil parameters were estimated by in situ field tests. Before the calculations were made the in situ test of the vibrations of the surface were measured to verify the FEA model. Four depths of the barrier were analyzed: 5, 10, 15 and 20m below the ground. The calculations were made in time domain. The direct integration method to solve the equation of motion was used. The sweep function with the frequencies of 1 up to 100Hz was used as the excitation. The force was offset from the barrier in the distance of 5, 10, 15 and 20m. The surface accelerations were calculated behind the barrier. The calculated accelerations were referred to accelerations calculated on the surface of the model without any barrier. The reduction of the acceleration is the effectiveness of the barrier. The conclusions were formulated based on calculations described above. The conclusion can be used in the design process in similar cases.

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AN OPERATIVE MAP FOR NEW VISIONS OVER ANCIENT ISSUES: HOUSING AS A SHELTER

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ABSTRACT

The major theme of the investigation enquires about the immutable elements of architecture. Permanences and constants throughout different periods of architecture production is subject of study. The theme addressed in this paper refers to the essential values in architecture. More specifically the paper analyses the case of housing. The investigation inquires the possibility of architectonic interpretation of essential attributes of design becoming a subject of synthesis and creation of new visions over the times. Despite all the contextual and cultural changes which may differentiate distinct buildings, the architectural practice can be described as lying at the cultural and contextual root, rather than providing a direct response to procedures and standards. The overall practice of architecture embraces a synthesis of a wide range of elements interpreted in different perspectives throughout history. The practice shapes specific responses transforming and adapting places, spaces, techniques and materials to different contexts. We intend to explore the responses to the basic need of shelter. From the ancestral organization around the fire site, to contemporary typologies, a certain number of constants can be identified. The responses to basic needs of protection have been shaped over time with new forms and types of organization. The paper development will focus on the development of final proposals of architectural designs. Analyzing the themes approached, the perspective establishes a connection between the implicit theory and architectonic practice. The appraisal of proposals will be assessed, assuming that thinking and doing establish a dialectical relation. This investigation points to reveal the relation within the inner core of the architectural design. The housing selection of study cases is organized in two groups. The first one is involved with ancient buildings. Cases from Portuguese traditional architecture are studied. The second group of buildings approaches housing from the Portuguese context. The 20th century is the selected historical period. Once identified the character of the design, it is possible to clarify the architectonic immutable elements and establish the link to new visions of ancient issues. Considering that the development of an architectural design is involved in a nonlinear process, the boundaries of each scheme will be determined by the specificity of context and form. This process enables to trace the evolution of the design scheme and the final proposal. It is also expected a contribution to the enlargement of the range of level of self-reflective practice.

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WOODEN CONSTRUCTION AS A HOUSING ESTATE DESIGN MODEL

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ABSTRACT

The program challengers “Timber in the city” Urban Habitat Competition entrance to imagine new possibilities for the future and urban living in New York in the district Queens – the relationship between the individual dwelling and the collective aggregation of units; the use of timber and wood be leveraged to create living spaces that are connected to natural systems. In the article presents the main principles of the residential flats which are founded upon a concept that reflects the construction of boxes, that fit harmoniously together - inspired by traditional Japanese art of joining wood consisting of minimal participation of mechanical connectors. Enabling the construction of a single modular segment consisting of both columns and beams, merged together. This universal system design would support recommended natural insulation of adobe wall. Locations of the windows and door openings are not restricted, allowing for an ambient lightening of apartments. The exterior finish can be flexible, depending on the context of the environment in which the building is made. In alignment with the competition's needs, we decided to finish the brick with natural bricks as reference to the traditional, distinctive facades of New York tenements houses. The article shows contemporary challenges in the design of housing estates with the use of wooden construction. The design of the residential part, started with the elaboration of functional and spatial systems of apartments, based on established modular system. Following with putting the blocks together, creating a heavily fragmented piece. The free spaces between apartments are meant to be a featuring characteristic, designing an open space – with the intention of development of neighborly relations and bonding local community. The system has been developed on recurrent, modular apartments that are universal and flexible enough to replicate – anywhere, with consideration given to the immediate surroundings. This flexibility of the system and freedom of shaping a building's piece enables the avoidance of monotony, despite the recurrence. The conclusions may be useful for architects, urban designers, academics in the field of architecture and urbanism.

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POSSIBILITIES OF ACHIEVING THE NZEB BUILDING STANDARD (NEARLY ZERO ENERGY BUILDING) AND THE PASSIVE BUILDING STANDARD FOR NEWLY DESIGNED BUILDINGS IN POLAND

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ABSTRACT

For some time, a trend has been noticeable in the construction sector to reduce energy consumption. It is manifested by the tightening regulations of thermal protection of buildings, an increasing number of low-energy and even passive buildings, new technologies available on the construction market, or the new name of the "nearly zero energy" (NZEB) building standard. It is true that the definition of NZEB buildings appeared already ten years ago in the Energy Performance Directive No. 2010/31 / EU, but despite the fact that to some extent this type of buildings should already be the standard of construction, very few people know what is meant by NZEB and how it differs from the passive standard. The nZEB standard for newly designed buildings applies from January 1, 2021 to all European countries. Parameters for nZEB buildings are determined individually by each European country. In Poland, the requirements specifying the standard for nearly zero-energy buildings are included in the Technical and Construction Conditions. These requirements are very difficult to meet. The requirements apply to the thermal insulation of the external casing of buildings. This can be achieved by using appropriate materials and construction technologies, as well as by minimizing thermal bridges. The second requirement for nZEB buildings in Polish regulations concerns the Primary Energy indicator. This requirement can only be achieved through the use of appropriate energy sources, a very large extent Renewable Energy Sources. The article presents the possibilities of achieving the standard of newly designed buildings with "almost zero energy consumption" thanks to the use of appropriate materials, technologies, installations as well as heat and cold sources. The article also describes the standard of passive buildings, as well as the standard of passive buildings, has been compared with the Polish standard of buildings "nearly zero energy building" (NZEB).

IT SYSTEM FOR SUPPORTING THE DECISION-MAKING PROCESS IN INTEGRATED CONTROL SYSTEMS FOR ENERGY-EFFICIENT BUILDINGS

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ABSTRACT

Within an interdisciplinary scientific cooperation, a programming solution has been developed that allows collection, processing and analysis of measuring data coming from buildings, that use energy-saving construction technologies in order to minimize energy consumption and maximize the thermal comfort of users. The software analyzes data from many areas, among others: sensors monitoring external atmospheric conditions and internal states of temperature, humidity and CO2 content, air conditioning, ventilation, heating etc. as well as power sources. The use of modern information technologies, many statistical analysis and a wide range of configuration options allows to comprehensively assess the energy efficiency of a building. The modular structure and the option of parameterizing the system allows user to tailor the solution to a specific object. The project has wide opportunities to expand and develop system modules, inter alia, a direct connection to building automation.

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ESTIMATORS OF THERMAL COMFORT PARAMETERS USING ARTIFICIAL NEURAL NETWORKS IN THE PROCESS OF AUTOMATIC CONTROL OF PROCESSES IN BUILDINGS

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ABSTRACT

The article presents a method of estimating individual parameters of thermal comfort in selected points of rooms with a given functionality. The approximation was made using a two-layer artificial forward-forward neural network implemented in Matlab. The estimation results show a high agreement between the input data of the neural network and the values resulting from the estimation.

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THE USE OF PHOTOVOLTAIC CONVERSION IN INNOVATIVE SOLUTIONS

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ABSTRACT

The year 2021 is inevitably coming, in which all newly built buildings should meet the standard of almost zero-energy all newly build constructions (nZEB). This means that buildings should have almost zero or low energy consumption. The energy demand should be covered to a very high degree from renewable sources, including renewable energy produced on-site or nearby. One of the renewable that can be used is solar energy, which for the 9th time in a row has achieved the largest share (42.5%) of new investments utilising renewable energy sources. Currently, solar energy is most often used by photovoltaic cells, which converts it into electricity. Over the past 15 years, the accumulated annual growth rate of photovoltaic production has been over 40%, which means that the photovoltaic industry is the fastest growing in the world. The annual capacity of new solar installations installed has increased from 29.5 GWp in 2012 to 107 GWp in 2018. The development of solar technology is huge. Previously known technologies are improving and refined, which stands for that the efficiency of electricity conversion is increasing. New innovative technologies using photovoltaic cells are also emerging. These include cells dedicated to the building facade BIPV, used in louvres of curtain blinds, filling mullion-transom facades, roof skylights or balustrades. NanoPV windows are a new product appearing on the market. This is a product that uses innovative material - quantum dots, i.e. small semiconductors with the sizes of several or several dozens of nanometers, having the ability to absorb and emit electromagnetic radiation. In this work, the authors present the development of photovoltaic technology and the most interesting solutions according to the authors regarding the use of solar technologies.

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MODERN WOODEN CONSTRUCTION: SYSTEM COMPARISON

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ABSTRACT

Wood-based construction is a rapidly growing branch of construction in the world, it is slightly worse on the Polish market. In the era of care for the environment, it is important that newly constructed buildings, including buildings, not only use as little energy as possible, but also be made of materials received as ecological. Wood-based construction combines both of these aspects. There are, however, two other market aspects: price and availability of materials and technological solutions. Wooden buildings are more environmentally and human friendly than other material solutions, and with proper insulation, finishing and well-chosen installation systems, they can also be tempted to become a zero-energy building, i.e. one whose energy balance is zero per year. Among the architectural design offers today you can find a large number of residential or public building designs (low or large volume) with a wood-based structure, both in terms of bar solutions (generally seen through the prism of skeletal objects), as well as massive structures (today mainly seen through the prism plate objects). Each of them has different design assumptions, but in principle the goal is common. The right kind of construction, insulation and finishing materials should be chosen for each. For structural elements, various types of protection should be taken, e.g. in the field of fire safety or against technical wood pests, etc. In the field of insulation, analyzes of thermal issues, waterproofing and wind protection are undertaken. The choice of finishing materials should also take into account solutions that are the least burdening the environment and minimize energy losses, among others by avoiding possible thermal bridges. This article attempts to present the topic in a synthetic way, outlining global trends and possibilities of the Polish wood-based construction market. The calculation example illustrates the heat balance and environmental loads of a single-family wooden building with thermal insulation selected so that the building envelope meets the current requirements given in the Technical Conditions.

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THERMOMODERNIZATION OF A RESIDENTIAL BUILDING TO NZEB LEVEL

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ABSTRACT

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency introduces a zero-energy building standard, for which the energy balance per year is zero, i.e. the amount of energy obtained from renewable sources is equal to the annual demand. Each Member State shall establish a long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, into a highly energy efficient and decarbonised building stock by 2050, facilitating the cost-effective transformation of existing buildings into nearly zero-energy buildings. To achieve energy consumption at an appropriately low level in an existing building, you must adjust the heat transfer coefficients of the building envelope and the demand for primary energy to the requirements of the Technical Conditions for year 2021. Renewable energy sources, primarily from the sun, will also play a key role. A computational example of a single-family building shows which partitions are best modernized, what thickness of thermal insulation materials should be used to properly reduce heat transfer coefficients, and which installation systems to use to reduce the potential energy index (EP). It is also depicted as to how much the demand for usable energy in the building will decrease. This article aims to show residents of single-family buildings what steps should be taken to reduce energy consumption and thus - operating costs in an existing building to a minimum.

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THERMAL PERFORMANCE AND ENERGY EFFICIENCY OF LIGHTWEIGHT STEEL BUILDINGS: A CASE-STUDY

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ABSTRACT

Steel façade systems follow the actual tendencies in construction offering robust and sustainable solutions, able to answer to actual conditions and to offer adequate interior thermal comfort. The modern sandwich panels provided by the current façade system producers combines the required thermal resistance by varying the thermal insulation material and its thickness with the required structural demands. In addition, the façade layer could be over-coated with different materials, thus offering the required architectural aspect. Other advantages of the systems rely on industrialized prefabrication, fast installation and adaptability. They could also be disassembled and reused. The study presents an analysis of some envelope solutions existing on the market for buildings made of thin-walled cold-formed steel structural systems. The study consists in an annual energetic analysis of Mineral Wool (MW)-based system and a more sustainable recycled-PET thermal wadding-system. The analysis includes for input the own-produced energy by power grids and additional national grid energy while for output heating / cooling and electric appliances are considered. The study is completed by a life-cycle environmental analysis. The study revealed that when the thermal insulations have nearly the same U-value, the environmental impact of the recycled-PET thermal wadding-based system is smaller than that of MW-based system. Although the environmental impact of the recycled-PET thermal wadding is higher in the production stage, the insulation quantity of the material needed for PET-recycled thermal wadding to accomplish the required thermal resistance is much smaller than that of MW. Moreover, the original material for the recycled-PET thermal wadding is 100% recycled which implies a certain benefit of circularity to the material. The study also proves that the glazing ratio has also an impact on the thermal performances of studied systems: by reducing the overall glazing ratio of the envelope, the solar gain drops significantly, which leads to an increased heating energy demand, in order to meet indoor thermal comfort.

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THE BRAVE NEW WORLD OF REM KOOLHAAS

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ABSTRACT

In 1972 Rem Koolhaas presented his thesis project at the Architectural Association School of Architecture in London. The work was a collaboration of four authors: Koolhaas himself, architect Elia Zenghelis, artist Madelon Vriesendorp, and painter Zoe Zenghelis. Titled Exodus, or the Voluntary Prisoners of Architecture, it used a pictographic storyboard to present an alternative scenario for the contemporary metropolis. The text, illustrated by eighteen drawings, watercolours and collages, envisioned the creation of a restricted (albeit expansive) enclave in central London. The new urban tissue, protected from any external influence by high walls, was designed to cut through the existing structure of the city, offering the metropolis an alternative – and superior – social environment. With this project, Rem Koolhaas joined a group of visionaries, and the work itself ultimately was a catalyst for the formation of Office for Metropolitan Architecture. Studying Exodus, one cannot help noticing a number of literary parallels. The title explicitly refers to the Second Book of the Biblical Old Testament, but the design itself also bears some resemblances to the utopian novel The New Atlantis by Francis Bacon and Aldous Huxley's notorious dystopia Brave New World, written over 300 years later. It is sure, however, that all three had a tremendous impact on shaping the mindset of generations of readers. Drawing on Koolhaas's merging of architecture and literature, the author seeks to offer an interdisciplinary approach to Exodus that would echo the multifaceted spirit of Koolhaas's work. The aim of this paper is, therefore, to show that interpreting Exodus alongside these three texts allows us to see it in a new light. The author argues that the literary context allows for a more comprehensive approach to Koolhaas's Exodus, making it possible to see him as a future "prophet of a new modern architecture".

PASSIVE BASE ISOLATOR FOR VERTICAL DIRECTION USING A POST-BUCKLED SHAPE MEMORY ALLOY BEAM AND ITS DYNAMIC PROPERTY

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ABSTRACT

Recent years, a high-performance and compact vibration isolator has been demanded with the advancement of precise technology. Among various vibration isolators, a passive vibration isolator is the most commonly adopted form due to its simplicity, stability and low cost. In the previous studies, the authors have proposed a simple, compact and high-performance passive vibration isolator for the vertical direction using a post-buckled shape memory alloy beam (hereafter, called SMA, and the initial form of SMA was memorized straight). This isolator achieved a low natural frequency assuring high static stiffness by utilizing a negative tangent stiffness of a post-buckled SMA. It is assumed that the expression of the negative stiffness is deeply related with the phase transformation of the inner material of a post-buckled SMA, however, the fundamental principle of the occurrence of the negative stiffness and the response for a reciprocating motion (vibration) of a post-buckled SMA have not been clarified. In this study, in order to clarify these characteristics and establish design guidelines for the isolator, we investigated the restoring force characteristic of a post-buckled SMA when it was subjected to reciprocating motion in its post-buckled state by the Finite Element Analysis which took in account the phase transformation of the post-buckled SMA. As a result, it was found that the restoring force converges to a certain value when SMA was subjected to vibration. And it was also found that the negative tangent stiffness arises when the phase of SMA transforms from Austenite phase to Martensite phase. In future research, it is necessary to validate the performance of the isolator taking in account the phase transformation of a post-buckled SMA.

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THE IMPACT OF SUSTAINABLE LIGHT RAILWAY SYSTEM ON THE URBAN DEVELOPMENT: CASE STUDY OF DUBAI, UAE

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ABSTRACT

The UAE witnessed significant growth in sustainable development during the past few years. Today, Dubai has raised a call for sustainable transportation development at all levels, including the light railway which is a friendly mass transit system to satisfy the requirements of urban mobility. The rapid urban expansion and economic growth have led to the use of vehicles more widely. This trend is still mainly in favor of expanding the infrastructure of the Dubai metro. The shift towards sustainable mass transport systems has become the ideal solution to overcome the challenges accompanying the growth and development facing cities and to convert them into sustainable environmentally friendly places. Dubai is arising an extraordinary development of urban projects and strong attention targeting infrastructure and transportation systems. Therefore, the most sustainable transport system used to enhance the rabid development is the light railway system that plays a major role in shifting the city and works as the driving forces of urban development. Consequently, the Metro and Tramway systems are recognized as optimal provisions of public transport mode for high-capacity public transport systems in Dubai. This helps to improve the infrastructure by promoting connectivity, economy and a sustainable environment using the mass transit system. This research examines the level of transport responsibility to provide mobility and accessibility to all urban areas with the city of Dubai, including various types of transit rail networks: metro, tramway, and monorail palm respectively. The research paper aims to examine the connectivity between urban areas of Dubai by providing the light railway system. To address this aim, the following objectives are covered: a) investigate the needs of the sustainable transport system to cope with the urban development requirements; b) define the light railway as a mass transit system, and its impact on urban development; and c) evaluate the impact of Dubai Metro and Dubai Tramway on urban development. Accordingly, the research methodology focuses mainly on qualitative analysis of the use of a light railway transport system. This can be covered through a literature review, case study analysis, and feedback from users.

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ANALYSIS ON THE PROTECTION STATUS OF A WORLD CULTURAL HERITAGE SITE UNDER TOURISM DEVELOPMENT: CASE STUDY OF SHUHE ANCIENT TOWN

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ABSTRACT

In 2019, China joined Italy as the two countries with the most UNESCO World Heritage Sites. Among the Chinese heritage sites, the inhabited ancient towns, called Living Heritage, are the most difficult to protect in the eyes of many scholars. Only two Chinese ancient towns are listed as UNESCO World Heritage Sites, including the Old Town of Lijiang in Yunnan province, the most important settlement of the Naxi people. This indicates Lijiang's significance in the protection of China's cultural heritage. As one of three heritage sites within Lijiang Old Town itself, Shuhe is a pilot site for tourist development and heritage protection, led by the local government. In contrast to the Model of Dayan, the largest area and the earliest tourist development heritage site in Lijiang, Shuhe was renovated and modernised by one real estate company under the official guidance of the Lijiang government. This model was created to solve the contradiction between local development and cultural heritage protection in Shuhe. Since its renovation 17 years ago, the model of Shuhe has typical Chinese characteristics and has been a great influence to many other historical cities in China. After nearly 20 years of follow-up research, this study combs the development history of Shuhe Ancient Town, by analysing examples of architectural heritage transformation, and further reflects on the root causes of Shuhe development from the perspective of laws and regulations. The rapid development of tourism has become a means for the local government and the people to lift themselves out of poverty at the cost of their historical heritage. The development of tourism has brought immediate economic benefits to the local government, developers, outside operators and local habitants in Lijiang. However, the original Naxi habitants have left their historic settlement, and the profound changes to the Naxi living environment have caused the Shuhe world heritage site to lose its original significance. In the renovation of heritage buildings, architects and craftsmen are not responsible for the modification of the historical heritage but are only tools for local governments, developers and outsider operators to gain wealth. The defects, backwardness and inability to fully implement the laws and regulations on heritage protection are the fundamental causes of Shuhe's problems, which reflect the huge gap between the administrators' awareness of heritage protection and the requirements of the professional guidelines of the UNESCO for the world cultural heritage protection.

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DISPLACEMENT OF THE POPULATION AS A RESULT OF CLIMATE CHANGE – THE FUTURE CHALLENGES OF SPATIAL PLANNING IN EUROPE

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ABSTRACT

Climate change is one of the biggest challenges facing humanity, including the European community. The European Union's efforts to reduce carbon dioxide emissions will not stop the changes that await us in the coming decades. One of the pillars of the new Horizon Europe framework program (2021-2017) can be relevant to climate change and adaptation, including social change (35% of the budget). One of the effects of climate change will be the need to withdraw from low-lying coastal areas, other that will be cyclically threatened by natural disasters. The aim of the article is to present the current preliminary studies of the subject and considerations for a broader interdisciplinary discussion on the problem of resettlement that will accompany new and constantly changing environmental conditions. The post-war experience of Central Europe and mass forced resettlement in new geopolitical conditions after 1945, now the situation of the Balkan countries and cities that have accepted refugees, are a source of information about the migration and resettlement process. Historians' studies show in retrospect the processes and long-term effects of these migrations. However, the current situation of the Balkan cities shows the problem of technical infrastructure limits, but above all the problems of social infrastructure. An issue that particularly interests the author in the context of future resettlement is the protection of local communities in Europe as a value in itself. If it is not possible to protect the urbs (physical urban-fabric), the goal will be to protect civitas (communities). This goal goes beyond the scope of spatial planning issues. Despite this, the future role of planners, urban planners, architects and constructors will be crucial. The results of the article are: conclusions about historical processes and the current situation of spatial planning in the context of the studied issue on the example of Poland. The final element of the article is to identify future challenges as a starting point for further research.

A MULTI-DISCIPLINARY APPROACH AS ASSUMPTION FOR DESIGN SUSTAINABILITY IN DEVELOPING COUNTRIES

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ABSTRACT

The research proposal (framed within the Polisocial Award 2015-2016, a competitive call for research and social responsibility of Politecnico di Milano) concerns a project application experimentation to verify methodology that can be repeated in contexts similar to that under consideration, with the aim not so much of defining prefabricated modules that can be proposed in an undifferentiated manner and detached from the context and environment in which they are inserted, but rather to develop a useful method in a conscious design practice of new interventions. The project focuses on Mongue, a location in southern Mozambique located on a promontory at the end of the peninsula in Inhambane bay. We intervene on Mongue not only for its specific prerogatives, but also because it is considered an exemplary point of transcal application of a methodological proposal of analytical and design intervention of a more general nature, which can bring to the attention some general objectives that are considered important for Mozambique as a whole. The title Mo.N.G.U.E. is also an acronym for Mozambique, Nature, Growth, University, Education, which are the themes addressed by the research project: the theme of nature, environment and landscape, associated in Mozambique with a condition of both fragility and potential, addressed locally with the Municipal Ecological Park project; the theme of growth, understood as qualitative development; the university as the engine of the country's economic and civil development, expressed through the project of a research center dedicated to environmental issues linked to the Pedagogical University of Maxixe; widespread education that today also extends to childhood, with the project of a nursery school for the Mongue community. The results of the research project were not only made possible thanks to a transcalar approach, concerning an analysis of the African and Mozambican as well as local context, but also were founded on multidisciplinary assumptions, thanks to which it was possible to define different project levels in order to arrive at a common goal. The collaboration of the architectural, urban, territorial and landscape field, of the field of conservation of historic buildings and of the existing heritage, of the technical structural and of bioclimatic, environmental and energy sustainability, of economic enhancement, financial sustainability, management and maintenance of buildings, has provided the research project with an added value of general interest: the possibility, through an operational synthesis that overcomes the distinctions of separate approaches, to consider the complexity that affects, at all scales, not only the specific case examined, but in general all the spaces of our living. Through the transcalar and multidisciplinary approach, it was possible to define a broad territorial and local knowledge framework and a project masterplan which, with the aim of pursuing real sustainability at the methodological level, was based on the basic themes of architecture making: the relationship with the soil, climatic conditions, available resources. A project that bases its assumptions on this, naturally leads to the configuration of sustainability, in terms of material resources and as a response to the present and traditional uses.

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BUILDING LANDSCAPE A NEW ROAD-INFRASTRUCTURE AS OCCASION FOR A MULTIDISCIPLINARY APPROACH TO LANDSCAPE PROJECT

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ABSTRACT

This work presents an analytical study founded on the assumption that the design of a new infrastructure (not only road-infrastructure) is primarily the transformation of a portion of landscape (natural or anthropic). This endeavor is undertaken with a methodological approach that is able to avoid resulting in a project that is just specialized in one aspect. This goal is reached through the definition of a new road infrastructure, respecting technical and legal requirements, within a residual logic that has to both mitigate the impact on the landscape and the environmental system of which it will be part. The study involves a group of researchers from Politecnico di Milano called to support the different parts of the project of a road infrastructure in the area north of Milano - Como province. Therefore, the project should assume specific and aware intentions aimed at transforming the environment and the landscape itself. The environmental aspects involved are many: ecological (vegetational, forestry, wildlife biodiversity), hydraulic (rainwater, irrigation, surface water and groundwater), agronomic (farm and cultivation system), acoustic and air quality. Many are also the needs of the landscape: conservation and land protection (architectonical and spatial part to enhance, point of view to define), fruition and tourism (paths and rest areas), and an architectural design (contextual section, new assets for greenery). The study represents an opportunity to work in a multidisciplinary context able to involve a contribution of different knowledges, but also to develop a multi-scalar project that deals with a large territory in which the new road is the core, in its specific condition of linear infrastructure, capable of linking far places and of defining margins, materials and rainwater collection system. The dimensions of a road, in the specification of a section able to vary adapting to context - not only according to legal, technical and functional reasons but also guided by visual relations, protection and enhancements triggered by the project - are the most interesting aspect of multi-scalar design. This process doesn't resolve itself in an exploratory progression of the territory at many scales. It presumes to consider the road as possibility of a mutual design process that works on large and small scale: a sort of elastic line between the *roadside* and the *landscape dimension*. "[...] restarting from landscape means overall having the awareness that acting of the territory is like entering in an history that others helped build before us [...]" (Pinter 2003). Roads become readable and indissoluble part of landscape itself. Mostly vanguard and development promoters, they represent the land *palinsesto* with which it is possible to interact. The landscape re-writes itself through a net of connections that changes and transforms itself in time. If only some of them could get a chance to be redone through a museum-like logic (for example road Timmelsjoch), the new project has the duty of considering itself as a multidisciplinary experimentation. The challenge of designing this road was to conceive it as a system with the dual complex role that a highly trafficked linear infrastructure has: dividing different parts of the territory and also connecting and integrating the context it crosses.

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ASSESING THE NON-MOTORIZED MODES AS A SUSTAINABLE TRANSPORTATION OPTION IN THE INDUSTRIAL AREA OF AL AIN CITY, UAE

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ABSTRACT

It is vital to consider the main actor of the urban scene which is the pedestrian citizen and therefore to plan a city around the pedestrian needs. Non-Motorized Transportation (NMT) includes all forms of travel that do not rely on an engine or motor for movement which includes walking, bicycle and using small-wheeled transport such as skates, skateboards, push scooters and hand carts. While designing the sustainable modes of non-motorized transportation system, it is important to consider all pedestrians, whose interests vary according to their age, physical and sensorial abilities, psychological and cultural personal approachs to make them able to use public spaces and to have safe, easy and pleasant pathways. The industrial area, which is located on the eastern side of ALAin city, at United Arab Emirates is considered as one of the most crowded parts of the city due to the concentration of the main industrial services imposing huge burdens on the existing infrastructure, especially transportation systems. Most of the daytime, the area is busy and highly trafficked because it provides both a passageway to the central part of ALAin city and provides various types of retail shops and industrial activities. It is mainly dominated by inhabitants consisting of a large number of single men hailing from Bangladesh, the Philippines, and India. This study evaluates the existing condition of the non-motorized mode as a sustainable transportation system in one of the most crowded areas of Al Ain City, taking into consideration the new vision of Al Ain Master plan 2030. This study will recommend possible improvements to non- motorized transport system which would accelerate the development of the industrial area on one hand and improve the safety on the other hand. To fulfill the aim, the study attempts to identify the main problems facing the pedestrian movements within the industrial area of Al Ain City. Once the industrial study area is identified, a set of possible qualitative analysis to provide clear descriptions and illustrations will be carried out. Walk-through and observation will be conducted to observe occupants' interactions with the surrounding environment to record the pattern of the movement in a specific condensed zone in the industrial area. A literature review to disclose the lessons which may be drawn from experiences in similar areas with similar problems will be covered. Based on the assessment of the existing pattern of the non-motorized movement, the study will recommend standards and guidelines to improve the walkability and other non-motorized modes and their safety within the industrial area of Al Ain.

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VISCOELASTIC PROPERTIES OF THE COLD RECYCLED MIXTURE WITH ADDITION OF INNOVATIVE HYDRAULIC BINDER

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ABSTRACT

In the article was presented the results of testing the dynamic modulus | E * | of recycle mixture with foamed asphalt for base coarse layer. The design of the recycled mixture assumed considering two types of mixtures due to their grain size. In addition, the type of hydraulic binder in composition of recycled mixtures was included. Seven types of innovative hydraulic binders were used with various compositions of cement, hydrated lime and dust from bypassing installation (cement by-pass dust). The dynamic modulus of recycled asphalt mixtures was determined at temperatures of -10°C, 5°C, 13°C, 25°C and 40°C and at a loading frequency of 0.1, 0.3, 1, 3, 10, 20 Hz. The dynamic modulus in linear viscoelasticity range was tested. The master curve of the stiffness modulus was build using the generalized Maxwell model and the time-temperature superposition principle (TTSP) as well. It was found that the difference between the results of dynamic modulus of samples from fine-grained mixtures was averagely slightly larger than the average value of samples with coarse-grained composition. The effect of binder type was much more pronounced. Samples of recycled mixture with the hydraulic binder containing large amount of dust attained higher stiffness than samples with a binder with the same amount of cement. Nevertheless, a hydraulic binder with large amount of dust was characterized by high sensitivity to loading time. Samples with a binder with large amount of hydrated lime achieved averagely the lowest stiffness. The samples of recycled mixture prepared with hydraulic binder containing 100% cement exhibited the excessive stiffness modulus that could lead to early cracks in pavement.

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RECENT BLIND PREDICTIONS IN THE FIELD OF NONLINEAR RESPONSE OF RC AND SFRC STRUCTURES

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ABSTRACT

Three recent blind predictions carried out on full-scale structures addressing critical aspects in the nonlinear performance of reinforced concrete (RC) and steel fiber reinforced concrete (SFRC) are discussed. The first concerns the dynamic testing of two 7-storey RC frames with different sources of torsional eccentricity. The specimens were tested on a shaking table at the National Laboratory for Earthquake Engineering in Tainan (Taiwan) in 2019. Torsional eccentricity in the first specimen was introduced by placing URM infills on the west side of the frame only, resulting in stiffness eccentricity and damage irregularity. In the second specimen, ground floor columns were detailed with different confinement reinforcement ratios resulting in strength eccentricity. The second blind prediction concerns an on-going European project on the punching design of RC flat slabs subjected to seismic actions. A two-storey full-scale slab-column frame was tested under dynamic (hybrid) and pseudo-static (cyclic) loading at the JRC Laboratory in Ispra (Italy). The second-floor slab was provided with punching reinforcement around the critical perimeter, whereas the first-floor was not. Punching failure due to induced lateral drift was therefore expected. The last blind prediction concerns testing of SFRC T-beams without shear reinforcement. The 4.5m long beams were tested at the University of Minho (Portugal) under three-point bending. Shear reinforcement was present in the web region of the right shear span only. For all three cases the modelling approach and analysis results submitted by the author are presented. Comparison with experimental results and overall submissions are presented as well when available.

MA'AN - THE NEW APPROACH TO AN AUTONOMOUS BUILDING

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ABSTRACT

The dependence of climate phenomena on civilization development is already widely noticeable today. Architecture and civil engineering are fields responsible for the generation of a significant proportion of greenhouse gases and the consumption of immense amounts of energy and water. Therefore, it is becoming important to take specific steps to reduce the environmental impact of the aforementioned fields. The article presents the general principles of operation of self-sufficient buildings, focusing on the possibilities of their application not only in single-family housing but primarily in public utility facilities, especially in high-rise buildings. Derived from those considerations, a building concept, which ensures energy and water self-sufficiency, has been presented. An additional advantage of the presented solutions is also the minimalization of the carbon footprint of the building - both during construction and operation. The solution is based on a system combining the technology of a cooling tower and a solar updraft tower, enhanced with reverse osmosis technology and with other technologies. All this was achieved by creating an original architecture that matches its place of origin as well as the fulfilled functions. The technologies used had a direct impact on the architectural form and functional layout of the interior. The presented solution uses available technological achievements, combining them and creating a new quality. In addition, the design uses the characteristic features of the environment in which it is located - access to water and high temperatures - combining them in such a way that they affect the building helping to maintain its self-sufficiency. The solutions presented in the article clearly indicate the possibility of implementing self-sufficient, environmentally neutral public utility facilities. The analysis and proposed solutions point to the existence of technologies that implement self-sufficiency principles, in particular in the field of energy and access to fresh water. In addition, it draws attention to the fact that not all currently operating technologies are available at all latitudes, demonstrating the need to adapt the construction to conditions prevalent in a given location, in order for the building to benefit from the environment without destroying it.

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CLIMATE ADAPTED FAÇADES IN ZERO-WASTE AND CRADLE TO CRADLE BUILDINGS – COMPARISON, EVALUATION AND FUTURE RECOOMMENDATINS, E.G. IN REGARD TO U-VALUES, G-VALUES, PHOTOVOLTAIC INTEGRATION, THERMAL PERFORMANCE, SOLAR ORIENTATION AND EMBODIED ENERGY

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ABSTRACT

The construction methods we are using today on a broad scale are highly unustainable in regard to their resource efficiency. Fundamental improvements are necessary in order to change towards a more ecological future. The integration of reusable building components could be an adequate option to significantly reduce the ecological deficits we are facing today. The concepts of Zero-Waste and Cradle to Cradle are seen as viable solutions for the future. The few already existing Zero-Waste and Cradle to Cradle buildings are currently representing the most advanced construction standards of resource efficient design. In regard to their façades, however, there is still a high improvement potential. Therefore, methods have been elaborated within this research which demonstrate how the façades of Zero-Waste buildings can be strongly optimised. In particular, the research is questioning: with which interventions can we improve the performance of façades of Zero-Waste buildings? Which interventions are most important and how can we prioritize them? For example, which role plays the insulation capacity of the building skin in comparison with a building's capability for natural ventilation and external shading? Within this paper, at first the façades of selected existing Zero-Waste and Cradle to Cradle buildings are examined and critically evaluated in regard to their u-values, g-values, photovoltaic integration, thermal performance, orientation and embodied energy. Furthermore, criteria such as sun exposure of glazed areas, natural ventilation capacity through façade openings etc. are investigated. Thereafter follows an assessment in form of a list which interventions could significantly improve the façade's performance in regard to energy efficiency. The considerations include active strategies such as improving the u-values, photovoltaic energy generation and passive strategies, such as enabling natural ventilation through the façade and external shading of sun exposed glazed areas. The selected case study buildings are "Aktivhaus" development in Winnenden by Werner Sobek, "Woodcube Building" in Hamburg by IfuH Architects and Architekturagentur, "ICON Rheinlanddamm" in Dortmund by William McDonough and Partners. In order to recommend which interventions are best applicable in relation between cost and ecological performance, the paper concludes with a priorization of the suggested improvement options. Overall, it demonstrates that the building's overall energy performance can be significantly improved by adapting the façades towards a better implementation of passive strategies which take a strong advantage of the project site's individual climatic conditions.

EXPERIMENTAL STAND FOR THE STUDY OF ELECTRIC GRAVITATIONAL CONVERSION

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ABSTRACT

Even though the science and technology in the field of energy production for buildings has reached an advanced stage of development, there is still a considerable part of the population who do not have access to electricity. Currently, renewable energy (Solar, Wind, Geothermal, Hydro, Wave energy, Biogas), are considered sources that will meet future energy requirements, but have geographical limitations, are not available throughout the territory and are difficult to integrate into energy systems due to of the unpredictable character, their functioning being determined by the weather conditions. Also, the power and efficiency of renewable energy systems are still limited. Given that gravity (the fundamental forces of nature) is available everywhere, regardless of the climatic conditions, it represents an inexhaustible source of energy. In the context of apocalyptic scenarios or cyberattacks on energy systems, gravitational electrical systems can offer solutions for restoring electricity supply from simple to most complex solutions. Starting from the operating principle of a lift whose constructive and functional principles have not exceptionally advanced since 1835, the experimental stand made for the study of electric gravity conversion analyses the conversion of potential energy as a measure of gravity into electrical energy. The experimental stand is composed of two gravity systems of type tank-counterweight. Both tanks are charged with waste water from a water-water heat pump. The drive of the tank-counterweight mechanism is due to the filling of the tanks, during which time they store potential energy until the total filling. At this moment, the stored potential energy sets the mechanism in motion, the reservoir descending raising the counterweight. Arriving to the Top Dead Center (TDC) - the lowest position of the tank, the tank is emptied, its potential energy becomes lower than the potential energy of the counterweight, the tank rising to the Bottom Dead Center (BDC)- the highest position of the tank, and the filling / emptying cycle is resumed. The movement of translation is realized through a Gall chain that drives by means of a speed multiplier a three-phase generator with permanent magnets. The electricity produced is recovered and stored in a battery. For the quantitative evaluation of the electricity produced, the maximum power point MPPT was determined experimentally. Neglecting the frictional forces in mechanical systems, the resisting electric force introduced by the electric generator regulates the movement speeds of the tank-counterweight mechanism. The experimental data obtained show that gravitational systems can become an alternative source of energy that uses as a primary source wastewater from technical systems or rainwater - both free of costless.

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PROBABILISTIC ASSESSMENT TO DETERMINE THE FRAGILITY OF NPP STRUCTURES UNDER EXTREME CLIMATIC IMPACT

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ABSTRACT

This probabilistic assessment of NPP structures for Probabilistic Safety Analysis (PSA) level 2 of VVER 440/213 in the case of the extreme external even without the earthquake is presented. On the base of the meteorological monitoring of the locality the extreme load parameters were defined for the return period 10^4 years using the Monte Carlo simulations. There is showed summary of calculation models and calculation methods for the probability analysis of the structural safety. The numerical simulations on the base of the LHS method were realized in the system ANSYS and FReET. The international organization IAEA in Vienna set up the design requirements for the safety and reliability of the NPP structures. The extreme environmental events (e.g. wind, temperature, snow, explosion...) are the important loads from the point of the NPP safety performance. NPP buildings with the reactor VVER 440/213 consist the turbine hall, middle building, reactor building and bubble condenser. The building of the power block was idealized with a FEM model consisting of 996 917 elements with 2 666 556 DOF in program ANSYS. On base of the linear analysis using 3D calculation NPP model, the critical frame structures were defined. Next, the maximum extreme loads were calculated from the ultimate state of the critical frame. The limit state of the steel frame was considered to utilize the geometric and material nonlinearity in program ANSYS. The resistance of the steel frame is more times higher than the action effects of the extreme snow and wind. The elastic-plastic model of steel material was taken in compliance with the Von Mises yield function. The Newton-Raphson iteration method to solve nonlinear equations was taken. The plasticity model is defined as multilinear isotropic hardening material model. The failure snow and wind loads were determined on the base of the nonlinear analysis of the steel frame for the characteristic values of the load and material properties. The probability of the frame failure was determined by the probabilistic analysis by the simulation in LHS method using program FReET. The uncertainties of the input data – action effect and resistance are for the case of the probabilistic calculation of the structure reliability defined in JCSS and Eurocode 1990. The probabilistic density of the failure function of the steel frame for the extreme snow and wind will be presented in this paper. The fragility curve was calculated for various levels of snow and wind loads using the results from the nonlinear analysis of the steel hall frame. The results from the numerical nonlinear analysis and the idealized fragility curves of the steel hall frame will be presented. The limit state (frame collapse) was obtained from deterministic analysis for the ultimate loads $p_{s.u} = 2.30\ p_{s.exl}$ for the extreme snow load and $p_{w.u} = 2.44\ p_{w.exl}$ for the extreme wind load. The 5% probability of the steel frame collapse results under snow loads equal to $p_{s.0.05} = 2.30\ p_{s.exl}$ or $p_{w.0.05} = 2.44\ p_{w.exl}$ under wind loads. This paper presented the methodology and application of the probabilistic nonlinear analysis of the safety and reliability of the NPP structures under the extreme environment loads.

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TOWARDS A RESPONSIVE UNDERSTANDING OF SUSTAINABLE SCHOOL ARCHITECTURE

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ABSTRACT

Current international strategies admit the vital importance of education as the development engine for our knowledge-based society, where sustainability is the all-encompassing vision. In this context, a school building project should not begin with a design solution. This study aims to investigate the ways in which architects can better understand sustainable strategies and also how can they translate the real users' needs into architectural design solutions. Sustainability may be implemented both inside the school's curricula – knowledge, skills, critical thinking, attitudes, way of life – as well as into the design approach, construction, operations and maintenance of the school building. Not only the school building in itself should be a tridimensional textbook which offers sustainability lessons, subtly, attractively and interactively, but architects can become teachers of sustainability. Education for Sustainable Development has become a long-term strategic objective across the world. The strategy adopted by The United Nations Economic Commission for Europe in 2005 aims for integrating sustainability as a central nucleus within the educational curricula by 2040. This research applies a double filter in analysing the architecture of educational facilities: "What qualifies as sustainable?" and "What could educate?". In other words, the study answers an original filter of analysis, "What is it in the sustainable architecture of a school that has the power to educate its users?" and defines major interconnected elements of a sustainable school building: Site, Transportation / Mobility, Safety & Security, Energy, Lighting, Indoor Air Quality, Acoustics, Water Management, Waste Management, Materials & Resources, Structural Systems, Modularity & Prefabrication, Accessibility / Universal Design, Image / Awareness / Local Footprint, Interior Design & Furniture, Orientation & Signage, Health, Nutrition & Physical Activity, Operations & Maintenance, Building services, BMS, Smart / Intelligent Buildings, Information and Communications Technology, Costs & Financing, New or Rehabilitated, Innovation. An 8-boxes matrix type SWOT Analysis have been applied for each specific component, investigating the situation of existing Romanian schools. The SWOT Analysis details the Strengths, Weaknesses, Opportunities and Threats and put forward sustainable and educational strategies. Following this study, architects may benefit from new open paths, landmarks and a research toolkit for generating original design solutions. New designed schools should be able to offer a wide range of dynamic methods of teaching architecture, engineering and environmental sciences. Therefore, Education for Sustainable Development is shaped through sustainable school architecture. If we offer users the opportunity to learn and work in educational spaces which are able to capitalize on the creative potential, in schools strategically placed within the environment and deeply rooted in their context, then children, adolescents and adults can all be proud of schools where they feel valorised, they all will be able to evolve, innovate and develop sustainable behaviours. Applying the filter of sustainability to educational purposes, architects can develop a responsive process of integrated design, based on evidence and looking towards the future.

SAFETY OF OIL/GAS OFFSHORE PLATFORMS DESIGNED ACCORDING TO EUROPEAN PROVISIONS UNDER THE ACTION OF PULSE-LIKE GROUND MOTIONS

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ABSTRACT

Oil and gas offshore platforms are important civil constructions which are loaded by various types of environmental actions such as wave loads and wind forces. These actions usually govern the platforms' structural design, while seismic action appears to have minor influence. Nonetheless, numerous offshore structures have been founded in earthquake-prone regions where the structural design can be strongly affected by earthquake action. Many studies have investigated the seismic behaviour of oil and gas offshore platforms examining traditional seismic records. This study investigates the application of simple pulses, i.e., exponential, triangular, rectangular and sinusoidal pulse waveforms, as an earthquake excitation for offshore platforms. To the best of the authors' knowledge this is the first time that the aforementioned set of simplified ground motions have been applied to assess the nonlinear seismic behaviour of offshore oil/gas platform. It should be mentioned that pulses can make available important information concerning the dynamic response considering that many intense seismic events enclose actually an acceleration pulse which can lead to nonlinear structural response. It is worth noticing that a small number of works have examined the nonlinear response of platform and most of the previous works assumed fixed boundary conditions ignoring the soil-structure interaction. On the contrary, this study investigates the structural response of 3-D platforms under the action of simplified pulses, considering also the soil-pile-platform interaction. It should be mentioned that the structural design of these special structures fulfils the Eurocode 8 standards. Finally, this work investigates the effect of angle of incidence of earthquake waves.

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FATIGUE LIFE OF A COLD RECYCLED MIX WITH FOAMED BITUMEN IN TERMS OF THE TYPE OF HYDRAULIC BINDING AGENT

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ABSTRACT

In the article was presented the results of tests on the fatigue life of a cold recycled mix with foamed bitumen (CRM-FB) in the aspect of the type of binder used in the CRM-FB. The binder used in the composition of the base coarse layer was a hydraulic binder, which was manufactured by mixing three basic components: Portland cement CEM I 32.5R; $Ca(OH)_2$ hydrated lime and CBPD cement by-products. The percentage share of the components in the composition of the hydraulic binder was related to a recycled mixture based on simplex centroid experiment plan. As a result, seven hydraulic binders were prepared. The amount of binders used in the composition of the cold recycled foundation was as follows: the amount of binder was 3%, foamed asphalt was amounted to 3%. The assessment of the impact of the type of hydraulic binder on the properties of cold recycled mixtures with foamed bitumen was made for two different mixtures in terms of maksimum grain size. The percentage of ingredients was determined so as to obtain a fine-grained and coarse-grained mixture. The percentage of mineral aggregates guaranteed that the gradation curve was continuous. Fatigue tests were performed in compliance with the requirements of standard PN-EN 12697-24 (appendix E) at a constant normal stress at three levels from 250 kPa to 900kPa. The results were used to compare the effects of the hydraulic binders type applied to the recycled base and to determine the service life in terms of the applied stress level. Analysis of the obtained test results allows to state that the type of hydraulic binder affects fatigue life at varied damage stresses (σ_6).

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OPTIMIZING OF THE GEOMETRICAL ACCURACY OF WINDOWS AND EXTERNAL DOORS

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ABSTRACT

Geometric accuracy of building structures is an important part of the quality of construction work. Within the technical standards it is assumed that the designer determines the functional geometrical parameters of building structures by calculation. The functional geometrical parameters are to be determined primarily for critical elements, i.e. for structures whose geometrical accuracy is important for structures that requires high precision or are subject to functional requirements. If, for any reason, the designer fails to perform the calculation of the functional geometric parameters, the designer may use the recommended values of the geometric parameters given by the technical standards. The assumption is that the designers incorporate these geometrical deviations in the planning of spatial parameters of building structures, which should ensure that the minimum dimensional requirements for finished structures are met. The problem may arise in the implementation phase, when the contractors follow the technical standards for the execution of individual parts of building structures. At present, when we adopt European technical standards, the system of technical standards is not interrelated and there may be situations where the standard requirements for the geometric accuracy of successive structures will differ significantly or will not be determined at all. These differences could lead to the fact that the designer considered the design documentation with a margin for geometrical deviations for finished structures with specified geometric accuracy requirements and required dimensions will not be met. One of these constructions is windows and external doors. Therefore, it is necessary to pay attention to the determination of the basic requirements of geometric accuracy and to define procedures for the fulfilment of these basic requirements in all related operations.

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THE STUDY OF THE LANDSCAPE OF POPULATED AREAS FOR NEEDS OF THE DEVELOPMENT OF THE CONCEPT OF GREENERY

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ABSTRACT

Thematic planning of the blue-green structure is increasingly incorporated in development plans of European cities, within which the qualitative green structure is implemented at various scales – of the county, of the populated areas and locally. European experience shows that it is important to divide several levels or scales of planning (national, regional, county, city, local level) in the planning of green structures, defining the objectives and tasks to be achieved in each level, and the hierarchy between them. The methodology for developing the concept of the greenery is based on the planning of a three-level / scale greening system, based on widely used in Europe creation structure of green infrastructure, green network (green grid, etc.), basic principles of ecological design and urban acupuncture (urban acupuncture – the activation of urban space with punctuated public outdoor objects, elements, territories). It is written that the structure and elements of the landscape space of the city of Ikšķile (Latvia) and villages have been studied and analyzed in the pilot area. The levels included in the concept of the greenery of the country of Ikškile – city, neighbourhood or village, landscape space and object levels – form a hierarchical system in which each subsequent level details the previous one. Similarly, the study of the existing greenery structure of the populated areas is based on a multi-level study which is linked to a future planning. The most significant natural and cultural historical elements of the city have been identified and analyzed at level of the city of Ikšķile, dwelling on the cultural historical structure of the populated area , as well as day-to-day important objects and areas at a level of the city, designated as "nodal points" of the city. The "nodal points" and the "connecting elements" at the level of the city are analyzed in two directions – objects and territories of daily importance and important for the development of tourism. At the level of urban neighbourhoods and county villages, the elements forming the identity of the place and the existing structure of greenery are more analyzed. At the level of landscape space and objects, the existing greenery elements in specific functional zones and situations of the city (street greenery, greenery of residential areas, etc.) are analyzed – their diversity, typology, quality and usability, accessibility are analyzed. As a result, the existing image of Ikšķile, the forming elements of the identity and the existing greenery and spatial structure are obtained, as well as problematic situations at each level of the study are defined. The elaborated research serves as a basis for the development of the concept of the city of Ikšķile and villages.

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THE SPATIAL STRUCTURE OF THE LANDSCAPE AS ONE OF THE ELEMENTS OF THE LANDSCAPE IDENTITY

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ABSTRACT

The landscape identity is a holistic concept and includes many aspects of equal importance. Studies of the landscape identity often reflect local-scale aspects of the landscape identity; this is due to the emphasis and exploration of cultural and historical landscapes – through researching of a traditional management, traditional technology, the usage of local materials and local traditions. On a local scale, there are individual details, events, and people. The visual analysis and methods developed on its basis are mostly used in the studies of landscape identity. Architectural science recognizes the power of visual message which should be a planned and strategically guided aspect, as it has a significant impact on the forming of an overall image of the urban environment, as visual message is a source of information and a topical issue in the context of the urban landscape. One of the characteristics of the visual aspects is the spatial structure formed by the building volume, the terrain, and the groups of woody plants, the planes formed by pavements, streets, meadows and fields, the water surface. Landscape identity is also based on the cognitive landscape research. The study of the interaction between identity and geographical environment provides an answer to how the transition from physical to socially cognitive identity occurs. Equally important is the group of cultural historical aspects of the landscape, based on a multiple study of the history of a particular place – from the beginnings of landscape formation, where morphological and climatic factors play an important role, to human made elements, where changes in the landscape structure and individual landscape elements are as a result of human economic activity that reflects the political, social and economic situation of the country. In the landscape planning process, the concept of the landscape identity is used to reinforce the character, distinction and specificity of each populated place or rural landscape, which is essential to preserve in creating structures and objects of a new landscape. The purpose of this article is to analyze the role of a spatial structure in the overall image of the landscape identity, as well as the subconscious, cognitive aspects that people think of landscape identity by common spatial structure, abstracting, smoothing out details, and giving symbolic meaning. The article summarizes the spatial structures of different landscapes, analyzes their diversity in both rural and urban environments, classifying them into types and subtypes. The article develops various spatial models and analyzes the cognitive perception of people using the survey capabilities. As a result, there are defined the role of the spatial structure in the comprehension of the landscape identity and recommendations for the inclusion and preservation of important spatial structures and elements in the planning process.

APPLICATION OF THE MONTE CARLO METHOD TO EVALUATE THE IMPACT OF UNCERTAINTY OF MODEL PARAMETERS ON THE TIME OF CONCRETE COVER DAMAGE

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ABSTRACT

The problem in the durability of reinforced concrete structures is estimation of concrete cover cracking time due to reinforcement corrosion. The process of concrete cover damage can be separated in to two parts. In the first one in the initial stage after the initiation of the corrosion process of reinforcement the pore structure of the transition layer is filled by corrosion products. In the next stage the pressure exerted by corrosion products on the concrete cover increases and crack propagation takes place. In the most of the papers it is assumed that the chemical composition of corrosion products, material parameters as well as the cover microstructure are clearly defined. This assumption is simplified because these parameters are subject to uncertainties and are not deterministic. This work presents the application of the Monte-Carlo method to estimate the concrete cover cracking time of the reinforced concrete element subjected to corrosion of reinforcement. It was assumed that the basic parameters defining the corrosion process such as the chemical composition of corrosion products, transition layer microstructure, parameters defining the efficiency of the corrosion source mass are random numbers with Gauss probability density function. The results of computer simulations were the maximum and minimum values of effective and equivalent volumes of corrosion products and as well maximum and minimum values of the increments of volumetric strain tensor of corrosion. The final values of the time of concrete cover damage that depend on the progress of reinforcement corrosion was calculated by using the finite element method where in the mechanical model the maximum and minimum values of increments of volumetric strain tensor was applied to take into the consideration the impact of corrosion.

AIR-IONIZING LATTICE

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ABSTRACT

At the present time, there are high levels of air pollution in urban buildings and homes, which affect the health of its inhabitants because the particulate polluted air enters these living spaces. Within the construction industry, materials that can be used to reduce air contamination are being studied. Such materials are related to construction items such as bricks, concrete blocks or facade elements. In this document, we present the design of an air-ionizing lattice prototype. This is a filter proposed to be placed as a window accessory to improve the air quality that enters, by eliminating contaminants such as particles that may be present or suspended in the air. This is possible by means of an ionization system that attracts the flow of contaminated air, retaining particles that are smaller than 2.5 microns in diameter and releasing only the cleanest air. The research proposes a lattice structure composed of an ionizing mesh that will be connected to the electrical network or to the photovoltaic system of a house, office or construction space, causing electrostatic attraction, which consists of joining particles of contaminated air, with a positive charge, with negatively charged particles. Produced by this network. Heavy particles will precipitate on the ground and will be easy to clean for its users. To protect the core of this prototype and that the particles descend, additional sheets of wood or PVC were placed at the bottom. This is a blind type lattice so that any element descends easily and this design will help preserve the aesthetics of the facade, purifying the air between 70% to 100%. Urban housing is incorporated in a context where there are severe problems with air quality. It is undeniable that this is due to the daily activities that take place in the cities and the low control measures that are carried out. Additionally, it should be considered that many places, where homes are located, are areas with high historical recognition of the urban landscape which restricts the incorporation of elements that change the architectural concept and that possess the ability to purify the air. Hence the importance of this accessory, which allows the elimination of particles by means of an ionizing system, which can not only be implemented or installed in facade windows, but also in mansards and doors. Likewise, it can be integrated into the historical and modern architectural context of constructed buildings, since the design of the air-ionizing lattice maintains its consistency and identity with the architectural concept and its design can be changed for total integration.

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DIY ULTRASONIC DENSIMETER FOR A NON-INVASIVE COMPACTION MEASUREMENT

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ABSTRACT

Within the construction area there are some equipment and tools that are used to measure the compaction of ground and subgrade of the soil, as is the case of the Nuclear Densimeter. The same that emits a large amount of radiation at the time of handling, causing damage to health and the environment. Another method is by means of the Electric Densimeter, which uses darts to drill the ground to obtain the density of the soil, these equipments are difficult to handle or transport due to their volume and weight. In addition darts are a type of destructive test. Therefore, there is a need to create a lightweight, environmentally friendly and health friendly device; which also facilitates data collection as a compaction percentage, moisture content and soil density. At the same time you process the values immediately through a DIY system (Do It Yourself) with emitters and ultrasound sensors. This can be achieved by measuring the ground ultrasound speeds obtained from the sound travel time that allows estimating an embedded system using ultrasound sensors, finally sending the system the data to a mobile device via a bluetooth connection, where in an APP Measurements are detailed. The pulse generating unit that would be used in this investigation would be an ultrasonic pulse generator of electronic type and with external voltage or power amplifiers; A rectangular or sinusoidal waveform is generated using a Raspberry Pi. It will consist of an amplification stage that adapts the signal to the transmitter. This generator would have a voltage output with a maximum amplification value of 50 V within an impedance load of 50Ω. The transducers of emission and receiver (will be of type HC-SR04) of transverse waves would work at 40 KHz. The emitting transducer receives the electrical energy and converts it into mechanical energy, which passes through the medium in the form of acoustic elastic waves, and is then received by a receiving transducer that again converts it into electrical energy and that sends the data via bluetooth to the operator's phone. This signal is analyzed by the Raspberry Pi to determine the travel time of the ultrasonic wave in the grade. Finally, the Raspberry Pi via a Bluetooth module sends the information to the mobile App. For which two HC-SR04 type sensors will be used. The system will be used to measure the density of soil compaction, using DIY hardware. This will determine the speed with which the waves travel the grade. The speed will vary according to the density of the material. Easy transport and storage. Remote data capture (Bluetooth).

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REMEDIATION STRATEGIES OF HYDRAULIC COURSES CONTAMINATED BY METALS DUE TO MINING: CASE STUDY RÍO SANTA BÁRBARA, CANTON CHORDELEG - ECUADOR

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ABSTRACT

Water is considered an indispensable element for the development of life on the planet, which is why a good water quality guarantees a better quality of life for the population of the different countries and regions that consume it. Mining in Ecuador has been developed since pre-classic times, with the obtaining of metals such as gold, as well as clays to make vessels. Water pollution by metals originates mainly around mining industrial centers; It can also come from military activities or through leachate, (Zambrana, 2009). The canton Chordeleg presents an increase in mining concessions that are dedicated to the exploitation of non-metallic materials, such is the case of the "Rancho Grande" mining concession, which is located in the Santa Barbara river. Downstream of mining, the water resource is used for various activities, including agriculture and livestock, as well as use for different domestic activities. The objective of the present investigation is to determine the contamination by metals, produced by the mining company "Rancho Grande" in the Santa Bárbara river, Chordeleg canton, province of Azuay to propose the guidelines of a Sustainable Environmental Management Plan. To carry out the sampling of both residual and natural waters, an analysis was made of the current situation of the area under study, for this, a tour of the mining concession was made, and the sites surrounding it, where the affectation could be appreciated to the geomorphology of the river and environmental impacts, in influence of the concession, in this way determine the sampling points and days. The sampling frequency is once a month, thus obtaining information on the fluctuations of the concentrations of the different metals in the water in the different periods of time. The materials used and applied in this research have been taken as a reference of the Ecuadorian Technical Standard NTE INEN 169: 98. The method used to tabulate the data obtained from the laboratory, based on water sampling, is the descriptive statistics, in which various tables and graphs make it known whether the values of the concentrations of metals in the wastewater, exceeds or not, Ecuadorian regulations, that is, the one established by the Unified Text of Secondary Environmental Legislation of the Ministry of Environment, table number 12, discharge of wastewater to freshwater bodies. The results obtained show the high increase in water pollution and allow the establishment of strategies to mitigate, for example, the self-purification caused accidentally by the mining company by digging the 4 meters in the riverbed, which caused a considerable decrease in the polluting metals, even decreasing the levels described in the baseline.

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PRE-WAR INSPIRATIONS IN SHAPING GREEN SPACES IN POST-WAR WARSAW

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ABSTRACT

This article explores green space planning in Warsaw between 1916 and 1954, as an example of the creative development of the concept of shaping green spaces through years in the city. Based on relevant plans and documents this study shows that regardless of the conditions or political system, the urban green areas adopted after the war was optimal, because it resulted from the real needs of the state capital, which after many years of partitions, regained independence, and thus the ability to self-decide about its further development. The article examines the impact of planning concepts from the interwar period on the reconstruction of Warsaw in shaping green spaces. The paper focuses on indicating the similarities and differences in urban plans derived from the interwar time and the "social-realistic" period. The research starts with studies at the general level and leads to detailed solutions. The research uses the method of critical analysis of source data, including cartographic studies and the comparative method. In addition to strictly scientific research methods, the study also uses artistic evaluation of the designed urban greenery assumptions. As a result of the war, many European cities suffered severe damages. Warsaw belonged to the most experienced in this area. Paradoxically, the city's destruction has become an opportunity for rebuilding it as a better one, also in terms of strengthening the resources of green urban areas. Already in the pre-war period, the need to increase the city's area resources was strongly articulated to enable a coherent and future-oriented urban policy. The idea of strengthening the field base constituting urban resources was at the root of the idea of cooperative activity so popular in the Scandinavian countries or Germany. However, in Poland, right after the war took a pathological form. Under the so-called decree on communalization, also called the Bierut Decree, the ownership of land within its administrative boundaries was transferred to the municipality of Warsaw, which facilitated the process of implementing changes. The concept of building Warsaw in 1945 assumed functional segregation of the city following the idea of Le Corbusier. The overall thought was to rebuilt Warsaw as the town for the new "socialist" type of citizens. Although the urban planners working during the so-called "social-realistic" period (1945-1954) affirmed that their ideas of the development of towns were entirely new, the plans prepared for Warsaw depict many similarities to the ones worked out in the interwar period, from 1916 on. At the same time, the plan assumed maintaining wedge-shaped zones of greenery entering downtown. Subsequent proposals of the first post-war years followed this principle. Subsequent concepts for the development of Warsaw arising in the second half of the 1940s were consistent with the assumptions of the Athens Charter of 1933, guaranteeing residents' access to greenery, accompanying residential districts, or creating a city-wide recreational space.

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PROBLEMS OF GARDEN CITY PROTECTION IN THE SUBURBAN ZONE OF WARSAW, POLAND

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ABSTRACT

The article aims to present the issues of protection of settlement with features of garden-cities in the suburban area of Warsaw. Howard's idea of combining the advantages of the city and the village in one was so popular that it also affected Warsaw. In the area of Warsaw-city, as well as in its outskirts, garden-housing estates were built or planned. To this day, in the suburban landscape, these areas are distinguished by a vast content of greenery and small-town character, but the investment pressure is so intense that changes are taking place at a dynamic pace. Often, even the legal protection of these values is not sufficient to resist these urban processes. Thus, the purpose of the article is to show the problems of protecting settlement systems with the features of garden cities in the suburban area of Warsaw. The research uses the case study research method and critical analysis of formal and legal conditions. Interviews with residents were additional support. The examples given have shown that systems that have been protected for many years, with more stringent regulations, are in a much better position than places whose inheritance is being tried to preserve by introducing regulation now. In many cases, social resistance is so strong that even with evident advantages, it is not possible to introduce protective laws.

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INDUSTRIAL ERA POWER SOURCE FACILITIES IN POLISH CONTEMPORARY CITY STRUCTURES

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ABSTRACT

The nineteenth century was a period full of changes, both social and economic. The industrial revolution energy supply has evolved many times and changed the ways of industrial production. Factories were initially powered by a water drive, which, however, was soon replaced by new technologies created during this period. The most important way of supplying facilities created at that time, used to this day, is electricity, gas and thermal energy. In connection with the new types of power demand in the 19th and 20th century energy production and distribution facilities were created. The work will discuss power infrastructure objects created to supply the city. These facilities were often located in city centers, which is why they are now a major spatial and conservation problem. The technology and life span of these objects, is not eternal and new ones are being gradually closed. In the case of such facilities, we are dealing with gigantic areas together with historic buildings that are out of use. After closing, objects generating development in space began to fulfill a completely different role. Space isolation and inaccessibility caused by abandoned and closed areas of the city has created a problem of dividing the city into individual districts. The problem of such evolution is unevenness in the space development. We encounter degraded areas, not interacting with each other, creating both spatial and social problems. Such complexes for post-industrial cities are becoming a big problem in the process of revitalization and reconstruction of urban tissues. On the example of selected Polish cities, I will present the problems of assumptions of this type, and about which we should pay special attention when working on such objects

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POSSIBILITIES OF TRANSFORMATION OF PUBLIC SPACE IN MULTI-FAMILY HOUSING ESTATES IN POLISH CONDITIONS - CASE OF THE *BAJKA* ESTATE IN BYDGOSZCZ-FORDON

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ABSTRACT

The aim of the paper is to show the possibilities of transforming public space on a selected example of the *Bajka* estate in Bydgoszcz-Fordon, which can be considered a typical multi-family residential development completed at the turn of the seventies and eighties of the twentieth century in Poland. Multi-family housing estates created in the above mentioned over a period of time they were characterized by very modest use of public space and underdevelopment of basic equipment with parking spaces and social, cultural and recreational infrastructure. The main activity of investors was the construction of apartments, and the development of housing estates was considered as secondary. It should be noted that in their housing estates residents spend a significant part of their lives and public spaces in housing estates should be friendly to residents and meet the needs of all residents. The methodology for developing the concept consisted of analyzing the current state of knowledge, collected source materials and documents related to the area. Analysis of the existing state was carried out in the field of: public space development, transport service and infrastructure, road safety, types of property, greenery and spatial composition, which indicated the spatial and program conditions and possibilities of transformation. To find out the residents' needs, a survey was conducted, the results of which were guidelines for the assumptions of the proposed project. The results of survey showed that the public space of the *Bajka* estate needs a variety of activities that would increase its functional and aesthetic value, and improve the living environment, taking into account the needs and mobility of all ages groups residents. Respondents consider it necessary to supplement the development of public space with elements of small architecture. Existing undeveloped areas in the housing estate were used to transform the public space of the estate. and was divided into 3 areas: a. In Area A, which was envisaged as an area with a dominant recreational, sports and social function, The Socio-Cultural Pavilion as a year-round place for meetings and integration of residents as well as the development of technical and social facilities of existing tennis courts, as well as a playground and an outdoor exercise area. b. In Area B, new development was designed in the form of a housing estate square and a water reservoir that would serve the rest of the residents. C. Area C, which connects Areas A and B, creates Fairytale Trail - a pedestrian path along which the brass figurines of Polish fairy tale heroes were designed. In the aspect of the spatial composition, this pedestrian route is at the same time a compression element for Areas A and B. In the transportation service aspect, a traffic calming zone was developed by implementing technical solutions limiting speed and the possibilities of converting existing surface parking lots and garages into cubature solutions located outside the housing estate are shown. Presented case showed the possibilities of implementing various outdoor and cubature development, which can significantly improve the living environment, as well as the aesthetics and quality of public space.

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FEASIBILITY STUDY ON THE PRODUCTION OF SUSTAINABLE MORTARS PACKAGED WITH RECYCLED AAC AGGREGATES

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ABSTRACT

Building sustainability is one of the current global goals due to the variety and the quantity of the resources consumed in all the construction phases. Mortars – for masonry and plasters applications – are one of the most "produced" and high-impact composite building materials, since they are used both in traditional and modern constructions. Moreover, the production processes of binders and aggregates used to package mortars require the consumption of energy and resources and lead to the management of a huge amount of waste. In order to reduce the environmental weight of the mortars, the scientific world has been focusing, over the last years, on the substitution of natural aggregates with lightweight-recycled ones. Several studies have shown that this substitution improves some performances (thermal insulation and vapor permeability) and decreases other ones (compressive and flexural strength) as a result of the mortars density reduction. Moreover, the variability of recycled-aggregates materials (ceramic, plastic, concrete) and of the composition of mortars allows many different possibilities. However, little is known about the effective convenience of the market placement of these products. The aim of this study is to measure the environmental and economic sustainability of mortars made with natural hydraulic lime and a partial substitution of the natural sand with recycled aggregates from the production waste of Autoclaved Aerated Concrete bricks. These mortars were physically and mechanically characterized in a previous research phase and they were classified according to UNI EN 998-1 and 2. In particular, mortars with 25% by weight of AAC at most were suitable for masonry applications. The present study investigates the synergic possibility of packaging pre-mixes with recycled AAC aggregates in establishments where AAC is produced, moving from the unconventional perspective of the manufacturer. At first, LCA analyses are performed on these scenarios, in order to prove the strong decrease in the environmental impact of both production phases – AAC production, where waste is reduced, and mortar packaging, where the use of natural aggregates is limited –, then the research moves to the analysis of the economic sustainability of the implementation of this production line. For this purpose, two cases are considered: an AAC manufacturer who does not produce pre-mixes, and an AAC manufacturer who produces pre-mixes, but does not own machineries to recycle Autoclaved Aerated Concrete bricks. Following a cost analysis related to the introduction of the production line of pre-mixes with recycled AAC in the two cases, hypotheses of market prices for this product are formulated in order to assess its economic sustainability, by performing a market analysis, and verifying the compatibility of the payback periods that derive from the related investments.

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REGENERATING VERNACULAR VILLAGES FOR ECOTOURISM SPACES - THE CASE OF ALDEIA DA PENA IN SÃO PEDRO DO SUL - PORTUGAL

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ABSTRACT

In last decades, Portugal has witnessed frequent rural depopulation with the abandonment of agricultural land, forest, and even some villages. On the other hand, the ordinary citizen, in a tourist view, begins to look more and more for spaces linked to virgin nature and even to spaces associated with traditional agriculture, being therefore an opportunity to revitalise certain spaces, especially when they are of unique vernacular heritage. The case of Pena Village, almost in its totality, preserves its architectural trace and original materials. All the houses are built with local stone, schist, including its roofs, fitting into the landscape in an invisible and perfect way, which makes any citizen there to feel like an element of nature itself. Thus, in the present paper, after a brief characterization of the Village of Pena, the methodological aspects and the formulated concept are presented, and then a proposal for the revitalization of the village is presented, with the purpose that it functions as a global housing unit, consisting of several separate buildings, with various infrastructures and equipment needed for Ecotourism.

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CHARACTERIZATION OF THE NATURAL ENVIRONMENT TO SUPPORT THE CONSTRUCTION OF THE INFRASTRUCTURES NECESSARY FOR THE REGENERATION OF ALDEIA DA PENA IN SÃO PEDRO DO SUL (PORTUGAL) FOR ECOTOURISM SPACES

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ABSTRACT

Portugal is witnessing a phenomenon of depopulation of the rural areas in the interior of the country, with the tendency of almost total abandonment of some small villages. The situation of Aldeia da Pena in the municipality of São Pedro do Sul, embedded in a mountainous area, has led to this abandonment, already begun many years ago, has preserved its vernacular architecture and is worth recovering and converting to accommodation and leisure spaces, in order to support new segments of tourism and in particular Ecotourism and Geotourism, which are emerging in the region. Thus, there is a tendency for these places to be recovered and to change functions, since they once served the population that depended on subsistence agriculture. The new function to be viable requires more water than in the past, both for human consumption and for other activities, namely leisure and recreational activities, which currently value and help to make the tourism sector economically viable. Thus, with the intention of an effective recovery of the Aldeia da Pena, in order to contribute to the implementation of the various infrastructures appropriate to a modern society, in the present work, after a brief historical framework, the geomorphological, geological and hydrogeological aspects are presented, with emphasis on the lithologies that occur there, in order to favor the rehabilitation of the houses essentially in schist stone, and the water potentially available, either underground or of superficial origin. Finally, the main aspects of the proposed infrastructures are presented, and some final considerations are made.

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CROSS-SECTIONAL SAFETY ANALYSIS OF BIKE LANES IN OTTAWA-CANADA

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ABSTRACT

The sustainability of the transportation systems in Canada and all over the world is a topic of growing significance. Cyclists occupy a niche among transportation modes in being sustainable and emission-free, yet capable of mixing with vehicle traffic at various speeds. In order to reduce conflicts between the two modes, bike lanes are often considered to channelize bike traffic away from traffic lanes. This paper studies the relevant factors in mixed urban traffic that may impact cyclists' comfort during vehicle interaction and lateral spacing between bicycles and vehicles (passing distance, PD) based on the video data that were conducted at six sites in Ottawa, Canada. For each site, video data was collected from approximately 8:00 AM - 4:00 PM over a total of six days in the summer of 2016 and 2017. This video data covered cyclists, and motor vehicles. Cyclists approached these sites through segregated bike lanes, supper-sharows, bike lanes and advisory bike lanes. The physical segregation is achieved using concrete barriers, paints and posts. The cyclist speed was measured based on metric measurements at these sites and temporal measurements from the video data. Lateral distance to the adjacent motor vehicle was measured as a factor that affects cyclist speed. Statistical analysis is conducted to link cyclist speed and the lateral distance

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MODELLING OF TEMPERATURE DISTRIBUTION OF ENGINEERING OBJECTS ON THE BASIS OF DATA OBTAINED FROM A THERMAL IMAGING CAMERA AND GEODETIC INSTRUMENTS

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ABSTRACT

In the modern world, collections of various types of data have become the most valuable commodity. Data is obtained automatically or manually and comes from various measuring techniques, monitoring systems, sensors or methods of tracking human activity on the Internet. This combined with the idea of intelligent devices, which can automatically exchange data (Internet of Things), creates unimaginably large sets of data that seem to be unrelated to each other. Only the application of advanced Big data analysis can detect connections that are not visible at first glance. A common desire to integrate various types of measurement data also applies to engineering facilities. In the case of modelling temperature distribution, the integration of data from terrestrial laser scanning and thermovision, i.e. mapping of thermal images on point clouds, is very popular. This provides a three-dimensional representation of the tested object enriched with information about temperature. These types of models are used to identify damaged parts of the object, determine the size of leaks (e.g. heat and/or air leaks) or perform thermal analyses. In the classic approach, modelling of temperature distribution is performed in two-dimensional space using a set of quasi-continuous thermographic images with a coloured scale or a set of point data with temperature values measured at a specific time. In the latter case, we can talk about the integration of spatial data (regarding the location of points, obtained by geodetic techniques) with the results of point measurements of temperature made by physical techniques (e.g. contactless pyrometer). The combined data sets can be further analysed, e.g. using geostatistical methods, enabling a continuous temperature distribution model to be obtained. This article presents the three-dimensional integration of data from two measurement techniques and methods to model the temperature distribution in two-dimensional space. Three-dimensional spatial integration concerned the point cloud acquired by terrestrial laser scanning and thermal imaging. The measurement object was a fragment of the ventilation system in the underground car park. Modelling of temperature distribution in two-dimensional space uses an unusual data source, which is temperature readings from a precision level, obtained during measurements of vertical displacements of a multi-level underground parking structure. These data, combined with images from a thermal imaging camera, enabled performing thematic maps of temperature distribution to be made using the IDW method and ordinary kriging. These maps can help in the future to interpret the values of vertical displacements of the parking structure.

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THE RELATIONSHIP BETWEEN THE DESIGN STUDIO CULTURE AND CRITICAL THINKING

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ABSTRACT

Critical thinking ability is one of the primary objectives of architectural design studios. Design educators focus on the methods to improve the critical thinking abilities of the design students through design studios. The study investigates the relationship between architectural design studio culture and critical thinking. To this extent, the qualitative research method was followed, and in-depth interviews were conducted with thirteen undergraduate architectural design students. All students were in their final year of architectural education and had experience in many design studios at least for three years. All students allowed for voice-recording, and each interview lasted approximately forty minutes. The study aims to understand the significant influencers of the design studio culture in terms of its relationship with the students' critical thinking abilities. In this respect, five subtopics were defined as follows: (a)self-development during the architectural education, (b) jury, (c) different methods in studio, (d) studio environment, (c) studio motivation. The qualitative data were transcribed and analyzed by the researcher. As a result, the study showed that the relationship between the educator and the students have the most significant impact on the students' critical thinking abilities. All respondents stated that the primary motivation of them to study and improve their critical thinking is the dialog between the educator and the student. The negative and strict attitudes of educators are the main restrictor of the students' critical thinking processes. According to the findings of this study, financial difficulties, responsibility for the family, and the low-grade anxiety decrease the students' academic performance and their critical thinking abilities during the architectural design studio courses.

THE POETICS OF ACCESS APPARATUSES IN CONTEMPORARY LYRIC EXHIBITION SPACES

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ABSTRACT

Cultural architecture of exhibition spaces is a complex program, which oftentimes relies on dualities and contrasts that transcend the visual, material or functional experience, thus, sometimes imperceptibly creating a dialogue between the palpable and the intangible. As a fundamental architectural theme, that, in spite of extensive research, cannot be mathematically quantified, but only holistically experienced through an accumulation of senses, feeling, thought, imagination, personal memory and identity, the intangible may be regarded as an additional dimension only experienced in profoundly designed spaces that shelter an intrinsic emotion of architecture. These spaces of cultural, historical, social representation and remembrance succeed in "speaking" without using any "words", or even if they do, they come to rather represent the space between the "words"... The intangible aspect of representation spaces can only be analyzed in regard with the human factor, as it is the one that, both through the process of creation and through the one of experimentation, doubled by the measure of time, can generate this additional dimension and lyric depth, transforming space into experience, mere visual assimilation into transcendental synesthesia. The main feature of these spaces based on collective memory, emotions and reflexion beyond their tangible features is thus, given by their innate spatial and temporal identity. But when does this transformation from the epic to the lyric genre take place in architecture? Having this query in mind, we aim to study when and how this poetic dimension occurs, as cultural exhibition spaces are actual, physical buildings, part of tangible cities. Therefore, focusing on the boundary between the exterior and the interior of contemporary cultural spaces of exhibition, we intend to analyze and categorize types of access apparatus as part of welcoming gates into spaces with different types of immaterial depth and atmosphere. Generated through addition, subtraction, volume reinterpretation, contrast, dialogue, geometrical transformation or story-telling successive approach, accesses are the first tools the architect can use in order to design an experience. Being previously involved in collectives that designed innovative remembrance or exhibition spaces, our research will be based on both existing models and personally designed ones, as well as on both the experience of the user and the one of the architect, therefore, decoding the relationship between practice, empirical design and experiential environmental poetry. Focusing on the gateway between the pragmatic exterior and the interior intrinsic spatial consciousness, an expression of their dialogue will be revealed.

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SMART SOLAR MICROINTERCHANGERS FOR SUSTAINABLE MOBILITY OF UNIVERSITY CAMPS

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ABSTRACT

A significant number of universities have several campuses located in urban or rural settings, or with scattered university buildings that require the use of a means of transportation. This implies the mobility and potential displacement of a large community of students, professors and researchers. The use of electric bicycles (e-bikes) is an intermediate alternative between the bicycle and electric cars. Its incorporation in the University Campus can be an important stimulus for the promotion of the decarbonisation of the University Campus, and even a more sustainable alternative than the displacement by electric cars, since its economic investment and ecological footprint is smaller, in addition to avoiding the traffic congestion and reduce space requirements for parking. This paper presents the solar micro-exchanger (SME) model managed through a sustainable mobility web platform, applied to the case study of the University of Malaga (Spain). The idea of SME transfers the modal exchange nodes of the large means of transport on a small scale. It is a solar charging station for e-bike, whose design is based on the principles of solar architecture and, compared to other designs, provides greater security to e-bike. In addition, the SMEs are managed by a web platform and app that allows the user to make reservations for the refill beforehand, learn about the savings in CO2 emissions. The system not only promotes sustainable mobility and the reduction of CO2 emissions, but does not promote healthy lifestyle habits on university campuses, since its use allows you to perform an aerobic sports activity without sweating problems when you reach the job. The platform also incorporates a database of quiet and safe routes for e-bike users. Although this type of platform applies to University Campus, the possibility of locating them in residential neighbourhoods is discussed.

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INFLUENCE OF THE DAMAGED SLEEPER AND FASTENING RATES ON RAILWAY TRACK GEOMETRY VERTICAL LEVELLING

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ABSTRACT

The main function of the railway track is to support the loads of the railway vehicles and to guide their movements. This track can be subdivided into structural components such as rail, sleepers, fastening, ballast, sub ballast and subgrade, each having a specific function in the train load support. Sleepers and fastenings are considered to have fail when the track geometry – gauge and levelling – cannot be maintained. The aim of this study has been to evaluate by numerical analysis the effect of existing damaged sleepers and fastenings on track geometry vertical levelling in a railway in-service. The advantage of this approach is that the vertical track displacement can be appropriately addressed for various patterns of wrecked sleeper and fastening rates, track parameters and boundary conditions.

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RAILWAY TRACK SETTLEMENTS UNDER DIFFERENT AXEL LOADS AND TRAIN SPEEDS: A NUMERICAL APPROACH

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ABSTRACT

As wheel loads and train speeds has increased along with the railway line rationalization, demands on track structure has increased significantly. The requirements for bearing strength of permanent way depend largely on load parameters: axle load (static vertical load per axel) and running speed. The first one, to which the dynamic increment is added, initially determines the required robustness of the track. The second depends on train speed and vertical track geometry plays a fundamental part here. In turn, a combination of deferred track maintenance coupled with a large increase in axle load and speed has driven a large decrease in the track quality. The aim of this study has been to perform a numerical analysis applied in evaluating how the axel loads and train speeds affect the railway track settlements, focusing on vertical levelling. The advantage of this approach is that the displacements can be calculated in each track components such as rail, sleepers, ballast, sub ballast and subgrade under different track characteristics, parameters and loading conditions. In fact, this approach can deal with distinct track boundary conditions since these could be inputs for the method. The results provided by this analysis becomes also advantageous to research the railway track geometry degradation.

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NATURAL MATERIALS IN CONTEMPORARY LOW-TECH ARCHITECTURE

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ABSTRACT

Contemporary tendencies of sustainable and energy-efficient architecture imply a reconsideration of urgent society's relationship to nature. Nowadays building technology demands a responsible approach to construction which involves fostering of low-tech architecture, as an alternative to high-tech architecture. These are current challenges for architects and the building technology to improve the application of natural materials in architecture. The necessity for advancement and contemporary usage of building materials as clay, stone, reed, wood, transparent wood, thermal insulation, have also resulted in low-tech architecture, which is increasingly present in the building construction. This research aims to delineate through several contemporary case studies how serious global problems related to the energy and environmental crisis are increasingly reflected in the intention towards the use of natural materials in the architectural design. These contemporary designs implement innovative solutions of natural materials in case of building envelopes, construction details or structural elements. The comparative analytical method involves a critical reflection on the integration of natural materials between traditional vernacular application and its contemporary innovative solutions. These contemporary precedents represent diverse design approaches that reinforce the importance of environmental and ecologically responsible design. Current problems related to the energy and environmental crisis are increasingly being reflected on the underlying design concepts and the final building design. The contemporary usage of natural materials as a building resource indicates the evolving advancement and re-evaluation of an ecologically responsible architecture. Whereas the contemporary ways of integrating natural materials carry universal values which originate from the principles of vernacular architecture.

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ECONOMIC AND ENVIRONMENTAL ASSESSMENT OF NEW GENERATION CONCRETES

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ABSTRACT

The identification of an anthropogenic environmental degradation has led to a transformation of social and economic trends in the world, which has resulted in the idea of sustainable development, which in recent years has become a key point of scientific consideration and a challenge for economic operators. Previously, the dominant aspect of the design of buildings and constructions was functional and structural issues. Nevertheless, based on sustainable development, a new approach to design has emerged, taking into account all the requirements for sustainable construction in one design process, called ILCD - integrated life-cycle design. The new concept combines the design of a building at the level of material, structural element and the whole structure, while at the same time assessing design solutions in terms of meeting technical requirements and, among others, economic and environmental efficiency. The development of concrete technology involving a new generation concrete with significantly improved properties not only in terms of strength and durability but also in terms of rheology has made it necessary to evaluate these materials from an economic and environmental point of view. The article presents such an assessment of new generation concretes. In this way, the idea of integrated design was presented in practice. The paper also indicates the sources of data and the tools that can be used for the inventory of the indicators for individual processes. The conducted analyses were also an attempt to estimate selected issues of the integrated design of new generation concrete technology against the background of normal concrete technology.

A CITY GAME: GUIDELINES AND RECOMMENDATIONS FOR CONTEMPORARY URBAN POLICY

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ABSTRACT

Cities are settlement units with a very diverse genesis and character. However, most of them are affected by similar, degrading social, economic and spatial phenomena. Solving city problems requires special attention and a very individual approach when looking for alternative functions, development opportunities and ways to improve the quality of life of their residents. The changes that constantly occur in the structure of the settlement network, as well as changing visions of shaping cities and problems related to such phenomena as: shrinking of cities, depopulation, suburbanization, metropolisation, climate change, etc. cause the need to answer the questions: what is the contemporary city vision and what contemporary urban policy should be in this connection. In order to solve the problems constructed in this way, several research methods and techniques were used. Among other things, a query was made of selected urban strategic documents and an analysis of the literature on the subject. On this basis, the vision of a modern city was determined. In the next stage of work, a proposal was prepared of a set of desirable directions of urban development and actions necessary for local government units to undertake in the area of spatial planning and development. These activities should support the qualitative and sustainable development of cities. This is the answer to social, environmental and economic needs. Nowadays, it is essential for improving the quality of life and planning for the benefit of future generations. Referring to the developed vision of the city, the author of the article presented recommendations that were divided into ten topics: shaping space, restoration of degraded areas, investment policy, demography and management of urban resources, social participation, transport, low-carbon and energy efficiency, economic development, environmental protection and adaptation to climate change. An important element of contemporary urban policy seems to be the exchange of experiences between cities, promotion of examples of good practices and still underestimated social participation.

ECO-CITY: MODEL CONCEPT FOR TRANSFORMING BROWNFIELD INTO MODERN URBAN DISTRICT

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ABSTRACT

Brownfields are undoubtedly a problem in many 21st century cities. Abandoned, degraded, dangerous, overgrown and degrading the image of cities, they also have many potentials and assets. In the context of contemporary urban development trends related to sustainable development and idea of creating a compact city with a high quality of life, post-industrial areas, especially those located in city centers, are an ideal area for new investments. Polish cities still have a tendency to urban sprawl, which is why the purpose of the article is to draw attention to the transformation of brownfield areas into modern eco and healthy urban districts as a way of creating sustainable urban space. In addition, the article deals with the topic of pro-ecological solutions, including those related to adaptation to climate change. The studies were used the case study method. Five significant examples of post-industrial area transformation from Germany, Spain and France were selected. During the analyzes compared masterplans, functional schemes and location of these areas, and then the basic parameters and relationships between them were distinguished in four main categories: general data, environment, land development and attractiveness assessment. The conclusions of the comparative analysis allowed for the definition of detailed guidelines for creating a model concept for land development of the brownfields located in the city structure. The chosen location is placed in Katowice in former areas of Silesia Zinc Plant. The proposed concept presents functional solutions for connecting residential, recreational, commercial office and industrial areas. It is a template solution for the process of spatial, social and economic development. The project proposes pro-ecological solutions and technologies, including: water recycling, use of solar energy, energy storage, intelligent control and monitoring systems, sustainable mobility, building development based on natural ventilation of the city, rain gardens, reducing heat islands, etc. The transformation methods based on modern pro-ecological technologies in the context of adaptation to climate change which were presented in the article may constitute guidelines for the implementation in the similar cases of transforming brownfield areas into modern urban districts.

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CITY SPACE RECYCLING: THE EXAMPLE OF BROWNFIELD REDEVELOPMENT

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ABSTRACT

In many parts of the world the manufacturing and minig industries have left a huge mark on the spatial structure of entire regions, as well as individual cities. Urban tissue has been growing for years around the dynamically developing industrial plants and mines during the period of intensive industrialization. As a result of industrial restructuring, abandoned and degraded post-industrial areas created problematic places in the structure of cities. Moreover, many of them are located in the direct neigourhood of the centers of these cities, in the strict urban fabric. Nowadays, in the era of balancing urban development, creating compact, smart and eco cities, one of the important problems faced by city authorities, architects and urban planners is solving the issue of optimal shaping of city structure, including revitalization of post-industrial areas. The article deals with the subject of transforming brownfield areas into modern urban tissue, related to the surrounding areas, and at the same time referring to its industrial heritage. For this purpose, a number of studies were carried out, including comparative analyzes. Therefore five examples of projects from Europe related to the transformation of brownfield sites for the purposes of industrial and technology parks were selected. This list includes two examples of Polish parks located in Upper Silesia and three examples of areas located in Germany in the Metropolis of the Ruhr Area. Selected areas were analyzed and evaluated in terms of a number of parameters in order to identify the most important factors positively influencing transformations and problem areas requiring the most attention. Based on the results of the case study, a model concept for post-industrial area development was prepared for the purposes of developing an industrial and technological park and recreational areas, complementing the leisure offer for the surrounding residential areas. The location in former Baildon ironworks in Katowice in Upper Silesia was chosen as the place of the conceptual design. Upper Silesia is known as one of the most urbanized and industrialized regions of Poland, which is still struggling with the negative effects of industrial restructuring. Research results indicate that the areas of former mines and production plants, thanks to their strengths, can be attractively transformed into other functions to become again a showcase of the entire city, providing an incentive to learn about the industrial history of the region. The introduction of a diversified program and giving a new character to areas with huge investor potential, helps to return the city to areas of great social, economic and spatial importance.

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ARCHITECTURAL WAYFINDING DESIGN AS A MEANS OF COMMUNICATION IN ENVIRONMENTAL PERCEPTION

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ABSTRACT

From prehistoric times, Signage was a means of visual communication helping people reaching out different environments (internal or external). Long before paper's invention, humans made marks on objects, such as cave walls, in the surrounding environment, for their communication. As cities grew and mobility increased, making the built environment more complex, people requirements for better information concerning spatial perception and navigation, also grew. Thus, the necessity of proactive, systematically planned, visual unified signage and wayfinding programs have been emerged. Wayfinding is how people get from one location to another, including their information-gathering and decision-making processes for orientation and movement through space. Wayfinding design builds on research in cognition and environmental psychology to design built spaces and products that facilitate the movement of people through urban settings and individual buildings. Despite its demonstrated importance to building use, costs, and safety, wayfinding receives less than its due in planning, research and building evaluation. Often the investment in wayfinding systems is less than that devoted to amenities like art and furnishings. Planning for wayfinding systems is best when it is integrated with every step of the design process, and incorporates participation of user groups. Similarly, post-construction evaluation can identify further problems of wayfinding rather than waiting until a serious problem occurs. Architectural wayfinding design addresses built components, including spatial planning, articulation of form-giving features, circulation systems and environmental communication. Information design encompasses all sensory-based information systems, and, more recently, GIS-based systems. The main reason of this presentation is the refugee/immigrant issue which originated in Greece in recent years. Especially, people of different racial, ethnic, religious and cultural backgrounds, speaking different languages, are hosted and moved in Athens. Because of the supernumerary coming of these people, their accommodation, social integration and communication problems, became more and more intense. Concluding, the aim of this paper, is to provide a "clear" reading of the environmental space and city's routes to the users, through architectural wayfindig design.

IMPACT OF BIOCHAR ON WATER PERMEABILITY IN SOIL

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ABSTRACT

Water is the most important substance which occurs in nature. As a soil solution it is a basis of life for plants, both as an indispensable element of plant tissues as well as a carrier of mineral salts collected by plants through root hair. Ability to collect water by plants depends on the power of its binding with soil and thus on the quality of soil and amount of water. The objective of the article is to determine the water permeability in the superficial layer of soil in relation to the applied biochar dose. The research was provided in 2018 and 2019 year at agricultural field located in Krakow, Poland. The soil used for test was typical brown clay soil. The changes of soil granulometry were made with sunflower husk biochar. The biochar permeability was $3{,}2 \cdot 10^{-5}$ m·s^{-1}. The lowest value of water permeability $3{,}3 \cdot 10^{-7}$ m·s^{-1} was observed for soil where 30 t·ha^{-1} of biochar was applied. Water permeability is strictly connected with general porosity and is often assumed as such in many papers. It was reported that the water permeability for control soil where no addition of biochar was used indicates up to two times lower permeability in comparison to the soil where biochar was added which indicates that biochar influences the amount of water available for plants which the investigated soils were able to store.

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IMPACT OF BIOCHAR ON SOIL GRAIN SIZE

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ABSTRACT

In the literature on the subject, the most common are analyzes of degraded acidic soils, which have a large fraction of the fraction with a particle size greater than 0.2 mm. In these soils, the addition of biochar increases the concentration of organic carbon, increases the specific surface area, improves microporosity and increases water availability for plants. A properly selected dose of biochar converts macro- and mesopores into micropores, which positively affects its physical parameters. The purpose of the work was to determine the effect of different doses of biochar on the change in grain size composition of cultivated city soil. The addition of biochar caused a reduction in the amount of grains of this fraction from 1.4 to 7%. The largest fractional loss was recorded for the dose of biochar in the amount of 50 Mg·ha-1, and the lowest for the dose of 100 Mg·ha-1. The last type of fraction - responsible for water retention in the soil - is clay (Φ <0.002 mm). In the analyzed soil their content is at the level of 10.5%. The addition of biochar into the soil caused the division of plots into two groups. The first one corresponds to doses of 30, 40 and 100 Mg·ha-1, which caused a decrease in the content of these particles while increasing the presence of sand fraction. In the second group there are doses of biochar at levels 1, 5, 20, 50 and 60 Mg·ha-1 that caused an increase in the clay fraction in the soil. Biochar doses in the range of 10 and 80 Mg·ha-1 did not cause a significant difference in the clay fraction content.

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SOIL HUMIDITY MAPPING WITH TIME-DOMAIN REFLECTOMETRY USAGE

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ABSTRACT

The aim of this paper is to use time-domain reflectometry (TDR) method to measure soil humidity. The purpouse of the present paper is to validate and to clarify the limits of TDR method for long-term moisture measurements in field conditions during two years' experiment. The experiment was established in the experimental field belonging to the University of Agriculture in Krakow. The soil used for research is a brown soil made from Jurassic limestones. To determine the effect of biochar on soil grain composition, 10 experiments were established with biocarbon content in the range of 1÷100 Mg·ha-1 and 1 control plot. Analyzing humidity variation over time, both methods recorded its variability, but in the case of the TDR method it is clearly non-linear. The resulting differences between methods can be partly explained by the periodic occurrence of air around the probes. The gravimetric method allows very accurate moisture determination, while TDR means local moisture in the so-called effective volume around the sensor. This phenomenon is the reason for undervaluation of the measurement results obtained in the TDR method. The standard error of TDR measurements was 0.4% with a standard deviation of 0.17% for the 95% confidence level and the coefficient k = 2. The TDR method, by measuring the surface moisture of the material, does not show moisture accumulated in the soil molecular structure, which is the source of the error of the presented measurements.

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URBAN DESIGN and LANDSCAPE DESIGN FOR A GOVERNMENTAL PROJECT IN TURKEY CASE: GAZIANTEP OUR CITY PROJECT

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ABSTRACT

The purpose of this paper is to describe and evaluate the “Context”, “Phases” and “Methodology” of the Urban Planning, Architectural Projects, Urban Design and Landscape Design Projects in the Case of “Gaziantep Our City Project”. In the Technical Specification of the project mentioned above; “Objectives of the Urban Planning” and other all projects (architectural, urban design, landscape architecture etc.) to be carried out by the Ministry of Environment and Urbanization, that brings together the concepts of “Green”, “Safe”, “Public-oriented”, “Traditional Identity” and “Smart City” components. The Project tries to present the urbanism of our civilization as a new vision and its foundations are based on the different projects and works that our Ministry has completed or is continuing. This project covers the work which will be implementation of the preparation of a pilot project on an area of approximately 287 hectares in the Bağlarbaşı neighborhood of Şahinbey District of Gaziantep Province. The subject and aim of this paper, to describe the “Phases and the Design Periods” for Our City Gaziantep Projects which is not a correct way of our professional and academic life generally. This projects mentioned above are the development of original spatial solutions that reflect the civilization imagination of our country, and maintain the traditional and local identity of the city and develop future-oriented spatial solutions. On the other hand, it is envisaged to create a new urban jurisprudence that improves the quality of life in the light of our imagination of civilization by taking into account the changing needs, the requirements of the age and the modern urban principles. However, there are some problems in achieving the results of this project which has very high aims. These are the problems arising from the planning, planning and design processes carried out within the scope of the project, the timing, the coordination and the teams. These problems will affect the success of the project in the process of planning and implementation as it affects the design process. In this study, it is aimed to reach important information and results based on direct experience for these problems and their solutions. In this context; our aim is to define the stages of “Architectural” and “Urban Planning”, “Landscape Architecture Design”, “Urban Design” and “Architectural Design” by our professional and academic teams. studies were examined, deficiencies and deficiencies sources were determined. To propose the solution opportunities and ways were put forward, correct working process and method were determined. The results of the study are expected to be an important basis for the ministries and institutions responsible for urban planning and design.

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SELECTED ASPECTS OF BUILDING STRUCTURES THERMOMODERNIZATION IN THE CONTEXT OF IMPROVING THE ENERGY EFFICIENCY OF BUILDINGS

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ABSTRACT

In the light of applicable regulations, it is required to reduce heat loss through the building casing. The newly designed objects meet the requirements that result from legal regulations. This is the consequence of modern technologies and materials. Nevertheless, in existing buildings the thermal modernization usually includes only warming baffles and exchange of windows, doors and their framing. In exceptional circumstances, such as the case of historic buildings under conservation supervision or when the existing building façade cannot be changed, the thermo-modernization works must be carried out from the building interior. The implementation of wall insulation from the inside is usually controversial due to the principles of building physics, however, sometimes it is the only available solution. In the study, the selected aspects of building structure thermo-modernization influence on heat flow through an external envelope was analysed. The analysis took into consideration the material properties such as: heat transfer coefficient and parameters of the geometric structure of the surface. Selected building materials used for thermal modernization are discussed in this paper. Numerical calculations were performed with CFD Ultimate®, which is based on Finite Element Method (FEM). The process of heat exchange between the interior with the constant temperature of 20 °C and the external environment with the design outdoor temperature for the third climate zone in Poland of −20 °C was simulated. The numerical model for internal and exterior thermal insulation model was verified in experiments. The research was carried out on a single-family building erected in traditional technology in the 1980s and a historic building erected in the 18th century located in Lublin, Poland. Moreover, humidity and the economic aspects connected with the application of insulation from inside were taken into consideration. The conclusion of the study is the need for a global view of the building. Sometimes it is sufficient to use another insulating material (allowing for air diffusion). However, there are situations in which you will need to use mechanical ventilation or hybrid to improve the air quality. This approach will help to reduce heat loss while maintaining thermal comfort and avoid sick building syndrome. Fresh air, free from pollution is vital for the healthy functioning in indoor climate, where people spend most of their time. Based on the results of research from the computer analysis and experiment carried out on exemplary building insulated from the inside, it has been indicated that all considered building partitions have been designed correctly in terms of increased thermal resistance and through this can significantly improve economic aspects.

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IMPACT OF HEURISTIC OPTIMIZATION PARAMETERS ON OPTIMIZATION OF HYDRO-THERMAL COORDINATION

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ABSTRACT

Nowadays heuristic methods are one of the most used tools for the optimization of problems. The proof of that is the fact that they are widely used in chemistry, economics and energy. Among the most popular of heuristic methods belongs genetic algorithms and very hopeful differential evolution, belonging to the so-called 'evolutionary algorithms'. Those methods can handle difficult, large-scale problems with many parameters, like the optimization of the hydro-thermal coordination of hydro and thermal power plants. As with any other methods, genetic algorithms and differential evolution also have certain parameters. These parameters, among others, are the size of the population, the maximum number of generations, crossover parameter and mutation factor. The effect of these parameters on the results of an optimization using genetic algorithms and differential evolution is the focus of this paper. The hydro-thermal coordination of one hydro and one thermal power plant was used as an example to explain this issue.

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COMPLEX PROPOSAL OF FLOOD PROTECTION MEASURES FOR SMALL MUNICIPALITIES IN AREA OF SMALL CARPATHIANS

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ABSTRACT

The article describes problems associated with the design of flood protection measures for small settlements situated at the foot of a mountain. In recent years, these settlements have had problems with flood discharges due to new development (concreted areas), land/soil management change (private owners farming on their own grounds and do not cooperate together), neglecting of maintenance of surface drains (or their full filling) and river bed channels of the small streams (often dried up during the year, overgrown with woody plants, covered with waste), and of course also due to climate changes, where the flood discharges are revalued – they are increased. In addition, sub-mountain regions are also characterized by flash floods when a large amount of rainfall falls on a relatively small area with a steeper longitudinal slope. Since the creeks are small there, it could be said to be insignificant, no gauging stations are being built there, so the hydrological data necessary for the design of the flood protection measures are missing. In the article is described the procedure of the flood protection measure design for a small sub-mountain area which resulted in the design of additional detention reservoirs, complementing the existing detention reservoirs. The HEC-HMS software was used for the hydraulic calculation and the GEOSTUDIO program was used to assess the bank slope stability of the proposed detention reservoirs.

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EFFECT ON LOCAL ECONOMY FROM METRO SYSTEM EXPANSION

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ABSTRACT

The expansion of the metro railway system has been observed in many cities across the UK. However, there are still doubts regarding the expansion of the metro railway system in the region of Birmingham. Aiming at the subway expansion project under construction and the local catering industry, this research explores the commuting and dining habits of residents and tourists in Birmingham and the benefits that a comprehensive metro rail service will bring to People. Field visits explore the status of comprehensive metro systems in UK and their surrounding strews and restaurants. The analysis leads to the identification and discussion regarding several aspects of People's expectation from public transportation and restaurants, which are time, convenience, purpose and location. From the perspective of urban planning and public transportation, this essay explores the meaning and relationship between the metro expansion and the restaurant industry as well as the impact on people's living standards. The expansion of the Birmingham metro will bring more convenient travel methods and more restaurant options for residents and tourists. Meanwhile, bring new opportunities to the restaurant industry in Birmingham. Taking Edgbaston area as an example, the locations and types of the restaurants are recommended.

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DESIGN AND CONSTRUCTION OF SITE ROADS

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ABSTRACT

The purpose of roads on construction sites, also referred to as site roads, is to enable unobstructed internal transport and timely supply of both the construction site and construction process with materials. They connect storage areas, workshops and plants on the construction site with the place where works on the structure are performed. The quality of site road construction depends on the quantity, type and duration of traffic they will need to withstand. When solving the issues of internal transport, it is important for the transport to be compatible with construction processes. Transport must be adapted to construction so that it conforms to the necessary dynamics of the construction process. It is possible to determine the trajectories of movement of construction machines and to analyse the swept path of vehicles through planned routes by using computer programs for analysing horizontal paths of vehicles. The goal of swept path analysis of construction vehicles is to maintain unobstructed work dynamics. Site roads are built in accordance with legal and technical regulatory requirements in order to enable unhindered internal transport for vehicles on construction sites and safety for people participating in the construction process, as well as to ensure visibility and to preserve the quality and quantity of transported materials needed to build the structure. This paper presents the particularities of designing and construction site roads and describes the process of analysing movement trajectories of design vehicles on selected construction sites by using computer programs *Autopath 2017* and *Autodesk Vehicle Tracking*.

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TAKING ADVANTAGE OF VOLUNTARY ASSOCIATIONS OF MUNICIPALITIES FOR FINANCING PUBLIC INVESTMENT PROJECT

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ABSTRACT

Due to the settlement structure of the Czech Republic which is quite extensive, there is a large number of small municipalities on its territory, which do not have the possibility to finance larger investment projects aiming at the development of their area. Therefore, it is important, if not essential, for such municipalities to join into associations with other municipalities. The article deals with the characteristics of possible forms of inter-municipal cooperation with a more detailed focus on taking advantage of voluntary associations of municipalities. The data from the municipal association register shows that a substantial part of municipal associations was created for the purpose of building drinking water supply, sewerage systems or waste water treatment plants. Although this purpose is still up-to-date, the aim of this article is to show how to take advantage of the associations of municipalities also for other investment projects and to propose an optimal way of financing. The main aim of this article is to find out if it is possible to take advantage of the associations of municipalities for financing investment activities of municipalities. Furthermore, based on the analysis of the current state of the register of associations municipalities in the Czech Republic, it tries to propose optimal ways of financing such activities. Based on the analysis of several investment projects financing in municipalities, the research evaluates whether joining of municipalities into voluntary associations and the implementation of construction works via these associations is generally beneficial for them. The resulting proposal described in the article can serve municipalities as a well-arranged guide to the organization and financing of their investment plans.

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EXPERIMENTAL EVALUATION OF WORKABILITY AND COMPRESSIVE STRENGTH OF CONCRETE WITH SEDIMENTS DREDGING FROM THE DAM OF BNI HAROUN- ALGERIA

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ABSTRACT

The experimental study was conducted on sediments dredging from the dam of Bni Haroun, the most important and the largest dam in Algeria. The first phase of the performed work was to substitution of crushed sand by sediments to study the workability and compressive strength of ordinary concretes. The second phase of the work is to study the behaviour of concrete with sediment under the effect of the freeze-thaw cycles. The results showed that the mechanical performance of concretes with sediments is better with a substitution rate of 10%.
Keywords: concrete, dam, durability, sediments.

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NUMERICAL INVESTIGATION ON THE SEISMIC BEHAVIOR OF REINFORCED CONCRETE EXTERIOR WIDE BEAM-COLUMN CONNECTIONS

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ABSTRACT

During past decades, the use of wide beam-column RC system as a way to optimize the cost of construction has been proposed. In this context, many researchers had been studied seismic behaviour of wide-beam column connections. However, no researches have been carried out on the behaviour of these joints when the axis of wide - beam and the axis of column have eccentricity relative to each other. In this study, exterior wide beam-column connections have been simulated using nonlinear finite elements. Concrete material is simulated using plastic-damage model integrated in ABAQUS software. The lateral load- drift curves are in a good agreement with experimental results. After validation of the numerical models, the effect of various parameters including eccentricity, beam to column width ratio and column axial load have been investigated. The results indicate that the torsion induced by the eccentricity of axis of wide beam relative to axis of column, must be included in the design of wide beam-column connections. Furthermore, increasing of eccentricity causes the drop in lateral load-drift and connection shear-drift curve and for the specimen EWB2 the amount of this drop in drift of 5% and maximum eccentricity of axis of wide beam relative to axis of column is 12.8% and 10.2% respectively. In addition, by increasing the ratio of beam to column width, eccentricity of axis of wide beam relative to axis of column is more destructive.

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EVALUATION OF SOIL-PILE-STRUCTURE INTERACTION IN STEEL STRUCTURES ON SOFT SOIL MEDIUM ACCORDING TO 4TH EDITION 2800 STANDARD

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ABSTRACT

The prediction of the earthquake and its effect on the structure is the most important stage in the design or construction of the structure. Specialist designers often oppose the seismic response of structures to the effects of interaction soils, pile and structure, which may distract the analysis from reality. The experience of the past decade has shown that the effect of building structures and soil is significant in heavy and rigid buildings constructed on soft soils. In cases where buildings are constructed on soft soils, the existence of a flexible substrate increases the time allowed by the main system. On the other hand, the input frequency of the earth in the common part of the soil and the structure plays an important role in interaction soil, plie and steel structures on the soil is evaluated according to the letter of 2800. For this purpose, using Ansys software, three steel structures 12, 16 and 20 floors are modelled on the soil type three regulations 2800. The soil failure criterion was considered as Drucker Prager and the force entered on the accelerated structure of the earthquake. The results indicate that taking into account the interaction of soil, structure and candle will increase the amount of structure response. The values of the displacement in the 12-story structure are about 10%, in the 16-story structure of about 15%, and in the 20-story structure, it increased by about 18%. In other words, the higher the height of the structure, the greater the impact of considering the interaction of soil and structure. Considering the interaction of soil can be effective in the period of the structure and increase its amounts. The longer the structure is, the greater the impact of considering the interaction over the allowed period of the structure.

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TENDENCIES OF THE GREEN CONSTRUCTION IN RUSSIA

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ABSTRACT

With the development of scientific and technological progress and the dense development of large metropolitan areas, the issue of ecology is particularly relevant. The purpose of the study is the study of new technologies, that allow a green roof to exist. Research methods include analysis, comparison and detailed study of the components of a green roof. We examined in detail the components of green building on green rooftops in different countries and we analysed the main elements of the green building coverings system. In this article, using concrete examples, the solution of a whole complex of highlighted problems, with the intensive development of green innovations is shown. The result of the research is evaluation of the effectiveness of the different tendencies of green construction, including the use of green coverings.

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IMPROVING PROTECTIVE EQUIPMENT IN THE HIGH-RISE CONSTRUCTION

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ABSTRACT

The article considers the problem of organizing workplace in the high-rise construction. If the workplace has a mark above 1.3 m from any base or closer than 2 m horizontally to the vertical drop, then it qualifies as a workplace at altitude. Climbing work begins at 5.0 m. It is estimated that approximately 50% of all accidents during installation work due to the fall of people from above. This is usually caused by deficiencies in the arrangement of the workplace. The analysis of existing and new types of devices for safe installation in the high-rise construction. The reasons of injury when working with building cranes are also investigated.

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A COMPARATIVE META-ANALYSIS OF RESIDENTIAL GREEN BUILDING POLICIES AND MEASURES IN THE EU, AND THEIR IMPACT ON OVERALL ENERGY PATTERNS

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ABSTRACT

Data shows residential energy consumption constituting a significant portion of the overall energy end use in the European Union (EU), ranging between 15% and 30%. Furthermore, the EU's dependency on foreign fossil fuel-based energy imports has been steadily increasing since 1993, constituting approximately 60% of its primary energy. This paper provides an analytical review of diverse residential building/energy policies in targeted EU countries, to shed insight on the impact of such policies on energy consumption/efficiency trends. Accordingly, the adoption of robust residential green and energy efficient building policies in the EU has increased in the past decade. Moreover, data from EU energy efficiency and consumption databases attributes 44% of total energy savings since 2000 to energy upgrades and improvements within the residential sector. Consequently, many EU countries and organizations are continuously evaluating residential building energy performance in order to increase the residential sector's energy efficiency. To that end, energy efficiency gains in EU households were measured at 1% in 2000 compared to 27.8% in 2016, a 2600% increase. Accordingly, 36 policies have been implemented successfully since 1991 across the EU targeting improvements in residential energy efficiency and reductions in energy consumption. Moreover, the adoption of National Energy Efficiency Actions Plans (NEEACP) across the EU have been a major driver of energy savings and energy efficiency. Most energy efficiency plans have followed a holistic multi-dimensional approach targeting the following areas, legislative actions, financial incentives, fiscal tax exemptions, and public education and awareness programs and campaigns. These measures and policy instruments have cumulatively generated significant energy savings and measurable improvements in energy performance across the EU since their inception. As a result, EU residential energy consumption trends show a consistent decrease over the past decade. The purpose of this analysis is to explore, examine, and compare the various green building and energy-related policies in the EU, highlighting some of the more robust and progressive aspects of such policies. Lastly, the paper analyzes the multiple policies and guidelines across targeted EU nations.

A PARAMETRIC MODELING ANALYSIS OF ARCHITECTURAL VARIABLES AND THEIR ASSOCIATED IMPACTS ON ENERGY CONSUMPTION IN A BASELINE PENNSYLVANIA SINGLE-FAMILY HOME

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ABSTRACT

Buildings have substantial impacts on energy consumption, the environment, and overall comfort of occupants. Rapidly increasing energy use associated with the building sector is a significant and growing problem. Despite advances in energy efficiency and building technology, U.S. energy consumption and resources use per capita continue to increase. This paper examines residential energy performance in a Pennsylvania (PA) single family home, to assess the impact of the most optimal options of building upgrades. Energy consumption in the residential sector has remained relatively steady for several years as increased energy efficiency gains has offset the surge in the number and average size of housing units. To that end, the average area of a U.S. home increased 45% from 1970s. Alternatively, the average number of occupants per household decreased 15% from 1970s. Both of these are alarming trends as it pertains to overall energy use outlooks. As a result, the steady downward energy consumption patterns are threatened to be offset by those trends. Hence, these trends could have negative impacts on energy efficiency gains and greenhouse gas (GHG) emissions. In 2018, the residential sector consumed approximately 21% of the total primary energy produced in the U.S., compared to just 10% in the late 1940's. Furthermore, total annual U.S. residential energy swelled from a mere 6,000 trillion Btu's in the 1950's to almost 22,000 trillion Btu's in 2016. As a result, 6% of total U.S. GHG emissions are attributed to the residential sector. Given the significant size of this industry, there is tremendous potential to reduce energy use and associated environmental impacts. For example, Pennsylvania could yield a 6.9% reduction of the state's residential energy market load by 2020 if robust optimal energy conservation measures (ECMs) are adopted in single-family homes. Current and future market trends are projecting a steady increase in home size and population growth, which will inevitably exacerbate environmental and energy use issues further. Left unaddressed, the implications of population growth, rising energy prices, proliferation of modern home appliances and electronics, steadily increasing home sizes, and energy shortages could be profoundly detrimental to overall energy consumption patterns and the environment. This paper reviews the state of residential energy consumption patterns in the US and Pennsylvania specifically, to understand the underlying mechanisms of energy saving mechanisms and methodologies. Furthermore, the paper examines a myriad of energy efficiency measures available to homeowners. Lastly, the study assesses and investigates the impacts of various building upgrades on energy consumption in a baseline PA single-family home via a parametric modeling and simulation approach, to provide comprehensive energy conservation and efficiency recommendations.

ENERGY PRODUCTION AND CONSUMPTION PATTERNS: AN EXAMINATION OF THE STATE OF ENERGY, ELECTRICITY, AND AIR POLLUTION IN LEBANON

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ABSTRACT

Natural resources including energy are very scarce in Lebanon. As such, the country imports more than 90% of the fuel to satisfy its energy and electricity needs (EIA), primarily fossil fuel based. Furthermore, fuel consumption is forecasted to grow over the next decade, exacerbating the reliance on foreign volatile energy sources. This paper provides an overview of the energy sector in Lebanon and its impact on air pollution. Similarly, population growth is expected to continue on a steady and consistent rate, while resources remain limited. To that end, electricity consumption is disproportionate to population growth, indicative of severe inefficiencies and waste. Furthermore, the total energy consumption per household in Lebanon far exceeded its counterparts in the EU and the US. The country's energy production market is severely volatile and unreliable, resulting in only a 50-70% coverage of electrical needs from public governmental sources. Consequently, current public electric generation capacity is not meeting consumption patterns, resulting in widespread power outages, blackouts, and a heavy reliance on the unregulated" mafia-like" private generation market. Furthermore, energy consumption patterns have been increasing over the past decade and are projected to continue to grow over the next 10 years. Correspondingly, emissions patterns follow a similar trend to energy consumption patterns. As a result, the World Health Organization (WHO) estimated a 100% of the population is exposed to pollution levels above the recommended guidelines. Moreover, governmental failure to regulate and protect the environment has severely impacted the country's natural resources and overall environment. As such, Lebanon was ranked 5th in the 2019 Pollution Index for Country, which examined air pollution in countries worldwide. The World Health Organization estimates the percentage of air pollution in Lebanon at 75.98%. Furthermore, air pollution is considered the greatest threat towards the health of Lebanese citizens. The proliferation of the transportation sector, unregulated energy sector, and private diesel generators are major contributors to air pollution in the beleaguered nation. To that end, the residential sector constituted a major contributor to this pollution, accounting for more than 30% of total energy use in the country. Most of this energy is provided via liquified petroleum gas (LPG) generated electricity, a major fossil fuel. This paper explores the state of energy and electricity in Lebanon and their implications on air pollution. It also examines the state of energy use within the residential sector as it relates to overall electricity and pollution patterns. Lastly, the paper provides a sampling of alternative solutions and mechanisms to combat the electricity crisis and air pollution problems.

BARCELONA "TRADE BUILDINGS": A FEASIBLE ENERGY REFURBISHMENT OF GLAZED MODERN MOVEMENT BUILDINGS

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ABSTRACT

The Modern Movement in architecture was a key player in the post-war construction of many countries around the world, having diverse facets that can be seen from Chicago's skyscrapers, to Brazil with the construction of Brasilia. Such an International Style has become famous for its buildings characterized mainly by diaphanous volumes supported by concrete and steel structures, which enable to build enormous glass façades. In a Spanish scenario, it is possible to find some unequal examples of preserved architectural heritage that also present distinctive curtain walls. The Barcelona "Trade Buildings" (1966-1971) are a great example of those glazed volumes. Characterized by their four curvilinear towers with fully glazed enclosures, the architectural solution, proposed by José Antonio Coderch in 1968, has a great historical and architectural value. By using a particular curtain wall, an innovative solution for the years of its construction, the aesthetics and materiality of the project is created, turning the building to a veritable masterpiece that writes the architectural history in the Barcelona skyline. Although many modern glazed façade buildings age relatively well, the current environmental requirements are way far from the initial ones, configured during the 50´, 60´s or 70´s. It is thus undeniable that most of those buildings require an energy refurbishment as soon as possible to keep operating in the sustainable environment we are trying to accomplish. In order to determine an analysis methodology for refurbishing the glazed buildings of the modern heritage, this study aims to evaluate a building through its energetic aspects and establish refurbishment strategies that contribute to a more sustainable development, always respecting the historical and architectural value of the cities. Using the Barcelona "Trade Buildings" as a case study, this research surveys problems related to the lack of energy efficiency in the building. An intervention of this nature must identify the current conditions of the building, analysing its energy and comfort requirements to finally propose energy-efficient and heritage-friendly solutions for the project. The three main responsible aspects that can influence in the energy consumption are, first of all, the users, who usually are responsible for energy wasting, the external building envelope, which is that factor that determines the energetic demand, and the mechanical systems, that must provide the appropriate habitability and comfort conditions. The analysis method has been carried out by developing an energetic survey through data of consumption and energy simulation programs. The results of the performance of the building materiality and systems obtained, were used to propose improvement measures for the building based on Nearly Zero and circular economy concepts, through the development of isolation strategies and shading mechanisms.Among the objectives of this research we have imposed the preservation of the modern exterior image devised by Modernism, extending and improving the building's lifetime, implementing comfort conditions in accordance with current habitability requirements. In addition to this, in the long term, it is assumed that the building will have a sustainable character, by reducing the energy costs and carbon emissions originally generated.

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SLOPE STABILITY STUDY IN QUARRIES BY DIFFERENT APPROACHES: CASE CHOUF AMAR QUARRY- ALGERIA

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ABSTRACT

The Lafarge -M'sila group's cement plant (Algeria) is supplied by the Chouf Amar limestone quarry, which allows great quarrying at the national level with annual productions of 4.2 mt / year, since several sliding in previous years have disrupted the exploitation and production of the quarry, and in the strategy of the Lafarge group increased its production up to 5mt / year in the medium term 2020-2030; a stability study is necessary to ensure production under the right conditions, the aim of our work is to study Chouf Amar stability and identify the important causes of the landslides that have influenced the site in question. We start with an empirical approach through a geomechanical characterization of the massif was put in place to highlight the instability at the level of the various rock formations. then, a stability analysis was carried out using two different approaches: the analytical approach using the limit equilibrium method (Slide 6) and the numerical approach using two methods: the finite element method (Phase 2) and the finite difference method (Flac) in the static and dynamic case considering the state of dry and wet marls. The results show an optimal state of stability on the scale of the full profile north flank of the quarry and bad stability on the scale of the benches of the different levels and the main facies of the potential slide is that of the marls.

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ARCHITECTURE OF A HYBRID MANUFACTURING PLANT: CONCEPTUAL DESIGN ISSUES

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ABSTRACT

The purpose of presented paper is to identify and examine the key innovation areas in architectural design for manufacturing plants that are likely to appear due to the recent progress in the production technology. Firstly, the principles of hybrid manufacturing system are discussed, with regard to the effects that the recent shift of production paradigm brings to the work organisation as well as to the character of human participation in the industry. In the next step, the analysis of exemplary designs is used to investigate new tasks and difficulties that this change is likely to pose to the architects. The research method is logical analysis, while the material used consists of empirical designs realised with architecture master students. The most significant design issues encountered at different decision-making moments of the design process are subsequently discussed. They point to the stages of setting the functional programme, deciding upon the site selection, elaborating the factory plans and the composition of architectural form, as representing four key areas of design sequence for innovative concepts to emerge. Among other conclusions drawn from the study, evidence for the growing importance of the aesthetics in design can be distinguished. This corresponds to the observed shift of design trends from office to industry functions.

TYPOLOGY OF CANTEEN FACILITIES IN MODERN MANUFACTURING PLANTS

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ABSTRACT

The aim of this paper is to investigate the potential impact that the concept of the fourth generation industry can have on the architectural design of canteen facilities in modern manufacturing plants. The concept of Industry 4.0 initiates an important shift regarding the architectural design of industrial plants. This research paper will look in more detail at the spatial and functional features of canteen facilities in manufacturing plants of the fourth generation. More specifically, it will search to answer the question whether labour organisation systems that are typical for Industry 4.0 vision will have impact on the typology of canteen facility applied to a specific architectural project. The research methods used are multiple case studies and comparative analysis, including typological and functional analysis of factory layouts, while the source of material are designs of manufacturing plants developed by architecture master students at the Poznań University of Technology. Despite being realised by students within the framework of a design studio, the projects selected for the study are accurate and realistic works, based in each individual case on thorough analysis of existing relevant examples as well as of the future-oriented trends in industry development. The effects of the research include observations concerning the canteen's situation on the factory plan, its type, as well as its spatial and functional characteristics. The conclusions comprise identification of further research directions with particular potential for development as well as some existing trends that link canteen typology with work organisation system.

INDOOR CLIMATE MEASUREMENTS IN BUILDINGS AND DESIGN FUNCTIONS FOR BUILDING SIMULATION

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ABSTRACT

For the planning or energetic optimization of buildings, building physics simulation programs are indispensable tools. Even though relevant building physics standards and guidelines usually refer to stationary calculation methods to prove the serviceability of a building, these powerful planning tools usually also allow transient calculations in any time steps. However, the use of modern simulation programs leads to realistic evaluations only under the condition of valid, expected input variables. Well known are the building material parameters as well as the site-related outdoor climate. For the indoor climate such precise information does not yet exist. Nevertheless, the indoor climate is required as an essential input variable for many simulations and verifications in building physics. In this case rough approximations are used in this case. Information in the literature on the development of the indoor climate is usually generally valid and does not differentiate between climate regions, occupancy profiles or room use. But especially for the increasingly powerful transient simulation programs these data provide insufficient results. Indoor climate measurements are therefore carried out over a period of several years at various locations in Germany. Measurements are carried out in window-ventilated living spaces. This paper presents indoor climate measurements from this study over a measurement period of one year in twelve living rooms and nine associated bedrooms. From the measured values, outdoor temperature and time-dependent compensation functions for indoor air temperature, indoor air humidity and dew point temperature are derived. During the measurement period the living rooms were free of damage and showed different occupancy profiles. The comparison of both room types shows the great influence of room use on the indoor climate in residential buildings. This is especially true for the indoor air temperature. Model curves for the parameter of the indoor climate for both window-ventilated living rooms and bedrooms are derived from the measurement results. This information can be used as a basis for planning. Furthermore, it can also be used to check and evaluate simulation results with regard to the risk of condensation on the wall surface of window-ventilated rooms.

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TECHNICAL PROBLEMS CONNECTED WITH THE ADAPTATION INTO A LOFT OF A POST-INDUSTRIAL BUILDING: CASE STUDY

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ABSTRACT

Adaptation of post-industrial facilities for modern residential buildings improve the results and aesthetics of urban spaces with full respect for protection of cultural heritage. Adaptation of post-industrial of the historic building requires a series of preliminary research facility. The article presents the results of the diagnosis of the technical condition preceding the adaptation of the former factory to lofts in Zielona Góra. The building at Fabryczna 14 in Zielona Góra was built in 1913 and for over 60 years it was a weaving mill in a textile factory complex. In the 70s of the 20th century, the building was adapted to the office of the "POLON" Nuclear Apparatus, in the first years of the twenty-first century, the building served as a commercial facility and storage. The building is 4-storey, made of solid brick, covered with a desktop roof, with a 5-storey corner tower from the south. The building's facades are made of non-plastered bricks, have numerous profiling - pilaster strips, cornices, bands, panels. From the north, in the 70s of the 20th century, a part containing the reinforced concrete staircase was added. The interior of the building is three-tract, the supporting structure is made of longitudinal brick external walls and parallel steel beams based on cast iron pillars. The main assumptions of the adaptation to lofts primarily assumed changes in the interior of the building. Flats with an area of 60 to 150 square meters were designed, for this purpose additional transverse walls were made. The brick façade remained, the attachment for the staircase and elevator was changed. At this point, the architect used modern trends related to modern technologies and finishing materials. The projection housing the new elevator and staircase was made of a steel structure with a reflex glass cladding. Modern solutions have been integrated into the brick architecture of the historic building. The political and social changes of the 1990s meant that many industrial facilities, often with a rich history, were out of use. A prolonged break in the use of buildings often causes irreversible degradation of their construction. This is mainly due to neglect of basic maintenance principles.

AN EXPERIMENTAL STUDY ON RECYCLED CONCRETE AGGREGATES AS A BASE MATERIAL

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ABSTRACT

In Turkey, the amount of the construction and demolition waste materials existing during the application of urban renewal projects is continuously increasing every year and storing these kinds of materials creates an important environmental problem. The use of recycling materials in various engineering applications has become a popular investigation subject in recent years. It is obvious that using recycled materials especially concrete waste in civil engineering application provides an economic utilization of natural resources as well as protection of environment. The recycled concrete aggregates (RCA) gained from the waste of the old buildings are used in various engineering applications such as high strength concrete production, using backfill or filter material in retaining structures etc. In road or highway constructions, the fact that base layers require too many natural aggregates leads to use of recycled concrete aggregates rather than natural aggregates, which causes this application come to the forefront among the other applications. That the geotechnical properties of the used materials in base layers have an important influence over the road performance makes it required to determine geotechnical properties properly. In this study, using the recycled concrete aggregates obtained from urban transformation projects in Istanbul, Turkey as a base material within a road construction project were investigated by the laboratory testing methods. By considering the criteria defined in American Association of State Highway and Transportation Officials, AASHTO, Atterberg limits, wet sieve analysis, hydrometer analysis, Standard and Modified Proctor test, constant head permeability test and California Bearing Ratio (CBR) tests were carried out and the results were evaluated. Also, in case of using recycled concrete aggregates as base material, in order to investigate effects of cold climate conditions, freeze and thaw tests were performed and their possible strength losses were studied through CBR.

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AN APPROACH TO REDUCE COOLING LOADS IN TRANSPARENT FACADES

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ABSTRACT

The possibilities offered by the developing technology in terms of materials and construction systems, the requirements of today's user profile and living conditions and user demands have caused the facade systems of the buildings to change as well. The facades of the buildings, which are very effective in the energy efficiency of the buildings and constitute a large proportion of the building envelope, are built independently of all the contexts of its location and the spatial needs based on comfort conditions. Glass curtain facades, which are especially located in the facade systems of multi-storey office buildings, are constructed with similar qualities on each facade of the buildings and cause problems in the efficient consumption of energy as they cannot respond adequately to the comfort conditions of the spaces. Increasing cooling loads of buildings due to excessive heat gain from large transparent surfaces, is one of these problems.

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TRIANGULARLY CORRUGATED WEB GIRDERS WITH RIGID SUPPORT JOINTS AT LATERAL-TORSIONAL BUCKLING

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ABSTRACT

This work presents a study of the triangularly corrugated web girders behaviour at Lateral-Torsional Buckling (LTB) that is one of the common failure modes of large span beam structures. LTB for I-girders with corrugated webs still needs more investigations, due to its sophisticated formulation for cross-section properties. The paper presents the results of numerical (Finite Element Software ABAQUS) and theoretical analysis of LTB for welded I-girder with triangularly corrugated web and rigid supports under concentrated loads. A parametric study is carried out for various girder spans and corrugation densities. The densities of corrugation adopted for this study represent practical geometries, which are commonly used in modern building practice. Plot showing the influence of section slenderness on value of reduction factor for lateral buckling is presented. It is determined that existing buckling curves poorly describe the dependence of the reduction factor on slenderness for bending members with triangularly corrugated webs. Finally, recommendations and expressions were proposed for the design of rigid-supported girders with corrugated webs at lateral buckling in accordance with numerical results.

WHAT INFORMATION CAN BE PROVIDED BY THE ASPHALT CRACK PROPAGATION TEST DONE ON SEMICYLINDRIC SPECIMENS?

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ABSTRACT

For several years the crack propagation test data of bituminous mixtures according to CSN EN 12697-44 have been collected and evaluated at CTU in Prague. Over the time the standardized test procedure was adapted to the conditions more suitable to be used mainly in the Czech Republic - in terms of compaction of test specimens, availability of cutting discs, diameters of test specimens etc. Some of the other test conditions were adapted as well as the procedures of collecting and evaluating the test data. Step by step it has also been identified that the strict European focus on fracture toughness as a suitable qualitative parameter is probably not correct. The characteristics of fracture energy have been introduced and further study is devoted to use of tangent direction of force-strain diagrams. Selected findings from the testing of HMAC 22 are summarized in the paper.

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BEHAVIOUR OF HIGH-MODULUS ASPHALT CONCRETE FROM THE PERSPECTIVE OF DEFORMATION CHARACTERISTICS - STIFFNESS

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ABSTRACT

High-modulus asphalt concrete is a specific type of asphalt mixture which is used for several decades in pavement engineering. It was originally invented as a solution which should help to minimize the effects of permanent deformation caused mainly by heavy traffic and mainly during periods with elevated temperatures. These mixtures are used either in binder or base courses, whereas for base courses it is important to combine reasonably high stiffness with good fatigue life to avoid premature pavement failures not caused by rutting but by fatigue cracking. In this respect various types of HMAC used and designed in the Czech Republic were tested first and foremost to determine stiffness. The stiffness modules were tested according to EN 12607-26, test method IT-CY, at selected temperatures representing cold, moderate and high service temperatures. The susceptibility to temperature change can be shown by thermal susceptibility for each mixture. In parallel test specimens were laboratory age to identify the changes in stiffness caused by thermo-oxidative ageing. This allows to calculate a simple measure of ageing index. Not presented in this paper but performed as a very last test was resistance to crack propagation.

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AROUND SOME JEWISH ARCHITECTURAL FEATURES

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ABSTRACT

Central and Eastern Europe were always on the edge of cultural, historical, and political trans-formations. The constant modifications reshape the architecture and urban realm of cities and urban fabric. Structural and socio-political boundaries affecting cultural minorities. In most cases, the effect is so critical that the cultural heritage of the minority in terms of architecture and built environment is degrading. Memory as a collective force to the reality of the city al-ways follows these modifications. The built environment in these complex areas rather of showing the truth (coexistence of physical realm and built form) is mutating and presenting the fragmentation of its different parts. The phenomenon of Jewish reality and settling stiles in Central and Eastern European cities, its transformations, assimilations and segregations be-came an operational tool for the research, to build wider understanding of the problematic aspects. The characteristic generalisation was done in terms of the architectural settings. However, all the cases are specific and need a deep understanding of each one's problems deeply. In Central Europe, the problem occurs in terms of segregation and closure, while in Eastern Eu-rope the cases of separation were presented along with condition that leads to structural integration. The Prague Ghetto in the old town, the Jewish settlements of Warsaw city and the shtetl in Eastern Europe state the criticality of the problem of memory in a wider range, from physical build one to the intangible. In Prague due to the constant pressure of segregation and final demolition of Ghetto, the fragmented pieces of the Jewish culture in terms of a building fabric were left. Space was gone but the memory still alive. Jewish culture's integration into War-saw's build form through years and final demolition of the city during the second world war left singular architectural pieces of their complex reality in the city, as a fragmented island of memory. In contrast, Shtetl presents a case of physical form while the spirit of the place is ab-sent. Memory as an operational tool ensures the collectiveness, as it depicts the contrast of elements within its architecture and urban form. The coexistence of different part of the city with their specific architectural character and memory ensure the fact of its completeness a whole.

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SURVEY STUDIES IN CONSTRUCTION PROJECT ENGINEERING

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ABSTRACT

Construction project engineering provides us with both specialist knowledge and the skills and competencies necessary in decision-making concerning construction company management and carrying out construction projects, which requires reliable information and a wealth of knowledge on technical, societal, legal and economic conditions in the aspect of carrying out the process of construction, in addition to the skills necessary to make managerial decisions under market conditions while accounting for the expectations and preferences of developers and users alike. Survey studies can be a source of this data. This paper presents the results of the author's research experience and proposals concerning the possibility of applying survey studies in construction project engineering. The author presented the results of many years of her original studies and analyses of the potential for applying survey methods in construction project engineering, a methodological and analytical approach typical for studying social phenomena and processes which is rarely used in the technical sciences. The author argues that the methods are appropriate and can be helpful in construction project engineering and, as a result, can support decision-makers in the process of making decisions. The author analysed and described the possibility of applying survey studies in both research and practice in the field of construction project engineering and proposed a typology of survey studies in said field. Survey methods are a source of valuable data, either individually or when paired with other methods, and can provide information that is then studied by researchers. The conclusions of these studies can be used to diagnose and prognosticate phenomena and problems or to control processes. Most importantly, such studies and their results support decision-makers in the difficult process of making decisions. When designing and carrying out survey studies, one should always inspect the soundness of the survey's design and measurement quality (reliability and accuracy). Further studies should focus on developing measurement reliability verification methods adequately to the most common research problem groups in construction project engineering. There also exists a practical need to develop proposals of survey question sets that correspond to the most commonly observed research problems in construction project engineering.

ARCHITECTURAL DESIGN AS AN INTERMEDIAL CREATIVE PROCESS: SCENOGRAPHY AS A CREATIVE TOOL

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ABSTRACT

The development of generative methods of architecture has reached the point when it is continuously moving apart from its archetype to newer intellectual encodings. The ways of its creation and perception have radicalised by means of new media to offer a greater extent of its own representation. The theoretical and architectural discourse, influenced by philosophy, sociology, and literature creates by its multiplicity still opened and complicated discussion in the 20th century. Architectural education reflects the need for such creative participation with other media at different levels depending on the possibilities or focus of the university where architecture is taught. The paper focuses on a case study from the Faculty of Architecture of the Slovak Technical University (abbreviate FASTU), where, besides other visual media, it is also possible to attend scenography as an optional course. It also deals with the reasons to build such an intermediary learning process. Theater (performative arts), same like architecture, has always had great power and the potential to open discussion and be a critical mirror of various social phenomena. The aim of the study is to analyze the alternative method in education and in the teaching of architecture. Architecture will be explored herein in relation to space and its inherent characteristics by means of heterotopy and synaesthesia. The study does not understand the classical term architecture as the building and scenography as a staging of decorative mise-en-scéne. Can architectural creative process be turned into a psychoanalytical laboratory which helps to build optimal space for living and for the human's relationships?

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REPLACE MINIMUM REINFORCEMENT IN TORSION BEAMS BY STEEL FIBERS: EXPERIMENTAL AND NUMERICL STUDY

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ABSTRACT

The literature provides a lot of information about the use of steel fibers in concrete beams subjected to pure torsion. Most of these studies focuses on experimental tests aiming at investigating the structural behaviour of beams in which transversal reinforcement is combined with steel fibers. Among these studies, a small number of tests includes beams containing low amounts (Vf<0.6%) of steel fibers, whereas a proper mechanical characterization of the tensile behaviour of Steel Fiber Reinforced Concrete (SFRC) is generally totally missing. The present work reports and discusses the results obtained from experimental tests carried out to assess the potential ability of steel fibers to replace minimum conventional reinforcement in beams under pure torsion. All the SFRC beams are constructed with quite low amounts (25 kg/m3 and 50 kg/m3) of high-strength double hooked-end steel fibers and without transversal reinforcement. The torsional behaviour of the SFRC beams is compared with that of a reinforced concrete beam reinforced with the minimum torsion reinforcement recommended by Eurocode 2. A series of numerical simulations has also been carried out to validate a finite element model able to predict the torsional response of SFRC beams. Based on such a model, the results of a parametric study considering different mechanical and geometrical parameters are also presented and discussed.

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FROM THE POINT CLOUD TO CHBIM: METHODOLOGY FOR THE IDEAL RECONSTRUCTION OF A LOST BASTION OF THE CACERES WALL

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ABSTRACT

The research carried out focuses on all the actions and the methodology carried out for the virtual reconstruction of the lost canvas of the wall of the historic city of Cáceres, a World Heritage city. For this, both preliminary studies (architectural, archaeological, historical ...), as well as the works carried out, as well as the first results of the study of the immediate environment of this section of the fence in Cáceres, have been crucial in determining where the wall went original of the city, data until now completely unknown and that sheds light on the most unknown history of the city. The research work includes images made by the work team that are the result of an exhaustive analysis of the surroundings of the area of action and that explain how the defense bastion of the city was at a specific point in the unknown part of the wall. A precise survey with laser scanner and photogrammetry has been prepared, which, after further processing, clearly indicates the place and layout of the old wall. With these traces, the precise knowledge of the geometry and especially of the topography (unknown until now) and with a meticulous analysis of a multidisciplinary team, we dare to launch the hypotheses of how this section of the wall could be formed, with a defensive bastion of which it was thought that there was nothing left and of which we have detected irrefutable remains of its presence, confirming the theory of the importance of defending the city at that specific point. It should be noted that the rigorous work carried out has ensured that these documents have a centimetre precision, a precision that until now has not existed in any document carried out and published on the intramural city of Cáceres or on its monumental area or on any of its most influential palaces at a national level. international. The methodology carried out will be a guide and support to protocolize the documentary updating that a heritage city of all needs (as it was named by UNESCO in 1986) and that is required by the new international documentation standards.

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THE REGENERATION OF TRADITIONAL RESIDENTIAL BLOCK WITH TYPOLOGICAL APPROACH-TAKING ZHONGNONGLI IN NANJING AS AN EXAMPLE

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ABSTRACT

With the rapid development of urbanization in China, the conservation and renewal of old cities face a huge challenge from a large amount of demolishment and construction without reasonable urban planning, which have been a widely discussed topic. As one of the most representative traditional residential blocks built in the period of the Republic of China (1912-1949), Zhongnongli has great value in culture and plays a significant role in sustaining the continuity of history and maintaining the characteristics of city in Nanjing. Taking Zhongnongli block as an example, based on the approach of architectural typology, this study aims to explore an organic renewal path to solve main problems in the process of regeneration, such as the confusion in space structure, the lack of public communication space and the protection of historical scene. Specifically, the research can be divided into two stages: typological extraction and typological transformation. Firstly, the thesis analyses and summarizes regional elements and deep structure of the block and buildings, trying to simplify and abstract them into prototypes like linear spatial pattern, pleasant spatial scale and patio house. Secondly, according to the traditional cultural connotation and modern life needs, these prototypes are appropriately transformed into new block morphology and building forms by means of reconstruction and translation. The experimental design we have done suggests that the application of typological approach in contemporary urban planning and architectural design can contribute to realize the harmonious coexistence of old and new buildings as well as the balance between inheritance and innovation, which serves as a model for the sustainable development of traditional residential blocks.

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INTERNATIONAL BAUAUSSTELLUNG BERLIN 1987: SPATIAL AND TEMPORAL CONTEXT

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ABSTRACT

Berlin plans an International Architecture Exhibition about the topic: “The urban centre as a place to live”. The centre of the city was going to be preserved as a suitable place to live, renovated and revived. This was the fourth architecture exhibition in Berlin focused on contemporary problems from the perspective of architecture and urbanism. This research analyses and describes the spatial and temporal context of the *International Bauausstellung Berlin*. It presents the geographical, political and social background that made this exhibition possible and fundamental in West Berlin. It involves the understanding of the urban scope in which IBA´s activity develops: devoted to contemporary architectural and urban problems defined by History. Berlin has always been and still is an exceptional scene of the international architecture, a modern version of *locus amoenus.* But today it is necessary to discover this beauty among the traces of its destruction and the interventions carried out by an almost complete generation of architects to create the image of a city that was frantically seeking a promising reconstruction. Berlin offers itself to be the spatial framework for IBA. It is a place with a great number of pragmatic variations for the architectural study and the urban development. It is part of Berlin´s tradition to have considerably influenced the changes of urban planning through International Architecture Exhibitions. The idea behind IBA, its program and the results achieved must be seen as a cultural manifestation incorporated in a city that acted as the centre of theoretical controversy regarding the urban issues and the construction according to man and changes in society.

THE NECESSITY OF USING THE EXHAUSTION SYSTEMS IN ORDER TO REALIZE CONSTRUCTIONS IN LANDS WITH HIGH LEVEL OF GROUNDWATER

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ABSTRACT

Groundwaters can often be a major obstacle for construction projects. Exhaustion is the process of lowering groundwaters level to allow digging under perfectly valid conditions, which means on dry land. Exhaust system was successfully implemented for the ISHO Living project in Timisoara (a residential complex on Bega's shore where the tallest building in Timisoara is being built, with 20 floors, and where the groundwater level is high). In order to evacuate the site water, so that the land on which the development of ISHO Living is being built to be a safe one with adequate working conditions, an exhaust system was implemented, designed and monitored. In the first phase, the project required a geotechnical study and a hydrogeological study. The hydrogeological study was performed with experimental pumps used to design a scheme from which to result foundations realized in soils without water. To interpret the pumping and to recovery the dates, standard methods specific to the hydrogeological conditions identified in the enclosure area were used. The geotechnical study was prepared in order to establish the stratification, the physical-mechanical characteristics of the land in the active area and the founding conditions for the block construction with the height regime of B + Gf + 20 F / B + Gf + 4F. The research program indicated by the beneficiary aimed at covering the entire site. In the case of the ISHO Living project, the boreholes were made with 300 mm diameter pipe. The entire depletion plant (wells, pumps) has been dimensioned so that the groundwater is kept at least 30 cm below the digging quota in the foundation pit. In order to achieve the evacuation of groundwater, a number of 13 holes were dimensioned at a depth of 12.00, respectively 16.00 m. To stop the groundwater in order to complete the foundations of the buildings, exhaustion systems were used successfully.

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SEARCH FOR THE SYNTHESIS OF CULTURAL HERITAGE AND MODERN ARCHITECTURE IN MULTI-STORY RESIDENTIAL AREAS. EXAMPLE OF JELGAVA / *MITAU*

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ABSTRACT

Jelgava / *Mitau*, as the former capital of the Duchy of Kurzeme and the province, has experienced very bright prosperity until the Second World War and great devastation in the war and post-war years. It existed with a strong stratification of the German cultural environment in architecture, art, and science, which was wiped out by the Russian totalitarian regime in 1940. When the city entered the 21st century. Over time, it has embarked on rapid steps of modernism in the development of the urban environment. This is clearly due to the perspective development of new multi-story residential areas. The city's building area is surrounded by several small rivers, which is an ecologically good indicator for the formation of large blue-green recreational areas, which is a high-quality indicator for the creation of multi-story residential areas in perspective. The quality indicator is also applicable to the development opportunities of modern architecture for residential construction. Thus, there is an opportunity to search for a synthesis of the development of the natural base, cultural and historical heritage, and modernism in the 21st century. Proximity to the sea and the airport can facilitate multifunctional infrastructure attraction. The research looks at the perspective synthesis of the urban environment. The research aims to determine the possibilities of perspective development of cultural and historical heritage with the methods of modern architectural formation.

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RESISTANCE OF YOUNG CONCRETE ON FROST ACTION AT EARLY AGE: PART 1 – COMPRESSIVE STRENGTH

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ABSTRACT

Concreting at winter time and in cold weather regions causes technological problem by production of fresh mix prevented from temperature below 0°C. Generally, problem concerns fresh mix as well as young concrete. Apart from higher costs of mix appears durability of this concrete. Young concrete is prevented from single freezing if its strength obtains minimum 3,5MPa according to ACI 306R-16 but based on other publications the range of compressive strength can be much wider. Nevertheless, standards do not precise, how investigate and how looks in reality the durability of concrete, which was subjected to freezing at early age. High compressive strength of concrete after 28 days and 90 days cannot be an indicator for its durability. Admittedly high early strength cannot lead to unambiguous statement, that durability was reached. The destructive mechanism differs from freeze-thaw resistance of hardened concrete and depends on free water content, which remains after each freezing and initial curing temperature. Used measurement technic can also play significant role by describing of results. This paper presents part of doctoral thesis entitled “Resistance of young concrete on frost action at early age”, scope and parameters of freezing test base instead on analysis and long-standing author’s practice on building sites. The objective of the paper is to evaluate compressive strength loss after cyclic freezing of young concrete in different air conditions with different material modification and its effectiveness. It was considered change in modification of concrete mainly standard air entrainment, polymer microspheres and cement replacement. Concrete series with microspheres reached on the one hand the lowest reference compressive strength on the other hand has shown resistance on freezing at early age, but not in all cases. Modified concrete series by sulphate aluminate as replacement in 10% of Portland cement showed lack of resistance on freezing. Air entrained concrete and self-compacting concrete have shown different behavior depending on cycles and initial curing temperature. Frozen samples independently for strength increment in time revealed different strength loss after 28 days and 90 days. It is interesting, that cyclic freezing at early age must not influence on strength increment, however concrete loses its permeability in almost all cases.

RESISTANCE OF YOUNG CONCRETE ON FROST ACTION AT EARLY AGE: PART 2 – WATER RESISTANCE OF FROZEN SAMPLES

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ABSTRACT

Freezing of concrete at early age can influence on its durability. On that account it should be considered role of concrete element in whole construction. Destruction due to early freezing can affect entire element, its part or surface of the element. In previous article Part 1 - Compressive strength research showed, that due to freezing concrete lost its compressive strength in relation to reference concrete. Nevertheless, compressive strength of frozen samples increased in time. Gain of compressive strength in time and strength loss must not indicate apparent destruction of materials. The higher risk can concern thin elements like walls for water tanks and their strength loss is not significant. This paper presents next part of doctoral thesis entitled “Resistance of young concrete on frost action at early age”. The objective of the paper is to evaluate water permeability of frozen specimens after cyclic freezing in various initial temperature. Depth of penetration of water under pressure was carried out according to European Standard EN 12390-8. After freezing cycles specimens were kept in air dry conditions until 90 days. Test was begun after 90 days. Reference samples showed minimal depth of penetration of water. In spite of different modification and freezing cycles almost each concrete lost their water resistance. In case 50% of frozen samples lateral out flow of water was observed, what can imply deep surface damage. Due to destruction of microstructure probably concrete specimens cannot keep water inside. This problem can occur especially by concrete with air entrainment. Similarly, as compressive strength depth of penetration of water decreases with freezing cycles, what is very interesting. Analysis of results has not shown relations between depth of penetration of water and compressive strength of frozen specimens. Some trends are to observe for each modification however spread of results is high.

THE NOTION OF PLACE AND COLLECTIVE MEMORY IN URBAN RENEWAL

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ABSTRACT

In the production of urban places and its regeneration much priority is given to the quality of the physical components. During this course of metamorphosis, places were transmuted and meanings were constructed and embodied in to the existing socio – cultural setting. However, less priority is given to the identification and conservation of components of meaning construction which are already spread out in these landscapes. This study reviews the concept of place and collective memory to highlight the importance of place-based approach during the process of planning and development. In-depth interview method was utilized to identify the components that cater to the meaning construction in the historic city of Kandy, Sri Lanka. It was evident that despite the socio – cultural aspects, memory carriers play a vital role in establishing meanings; hence, a priority should be given to conserve and rejuvenate such components in the city.

EFFECTS OF WATER CONTENT ON UNCONFINED COMPRESSIVE STRENGTH OF CLAY

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ABSTRACT

The most significant index property of clay in the natural state is the consistency. The water content has extreme influence on the consistency. At low water content clay behaves more like a solid, but at high water content clay may flow like a viscous fluid. Depending on water content, the consistency can qualitatively be expressed as solid, semisolid, plastic, and liquid. Quantitatively the consistency can be expressed by the unconfined compressive strength (q_u). In this research, the effects of water content on unconfined confined compressive strength of two different clays are investigated. The samples, clay-1 is collected from Jashore, Bangladesh and clay-2 is collected from Ashulia, Bangladesh. The clay-1 and clay-2 have liquid limit and plastic limit of 33.0, 44.0 and 22.5, 26.0 respectively. The laboratory compaction tests revealed that maximum dry unit weight of clay-1 is 17.20 kN/m^3 and clay-2 is 16.16 kN/m^3. In the unconfined compressive strength tests, cylindrical specimens having diameter of 38 mm and height of 76 mm are prepared at 90% of maximum dry unit weight with varying water content in the range of plastic limit. The experimental results revealed that, water content has extreme effects in the reduction of unconfined compressive strength and this reduction is predominant while water content reaches near to liquid limit. It is also observed that the unconfined compressive strength of clay has a linear relationship to the water content. It is expected that, the insights of this research can be used to predict the reduction of unconfined compressive strength of clay with the changes of water content.

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DESIGN EXPLORATION TOOL AND COLLABORATION WITHIN GROUPS IN LEARNING-BY-MAKING (LBM) APPROACH - STUDY CASE: THE 3RD PARAHYANGAN BAMBOO NATION

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ABSTRACT

Using a case study of the 3rd instalment of Parahyangan Bamboo Nation 2018, an international learning workshop for bamboo structure and construction, this research explores Learning-By-Making implementation with a focus on design exploration tools and collaboration within a group tasked with designing cores. As commonly found in LBM practices, the participants involved in the 3rd Parahyangan Bamboo Nation (PBM) were assigned to design and, eventually, build a 1:1 scale model within two weeks. In that process, there were tendencies for groups that relied on a particular tool physical models as a more relatable to each other. The study inquires specifically on the design explorations, using particular tools and collaboration aspects within groups in the 3rd PBM. The result will provide a basis for further development to improve design performance in LBM as a design approach. Data collection regarding design processes and products were from first-hand documentation and interviews with data for collaboration assessments were obtained by peer-assessment and self-assessment from every participant in the 3rd PBM. Both types of data then further analysed according to Design Exploration Aspect and Collaboration Aspect. A comparison of these aspects concludes the analysis. The study is a focus in finding a relation between a group's productivity on delivering design alternatives and its collaboration aspects within groups. It also investigated the design tools that the groups used, whether by physical models or any other tools, on their contributions in the whole aspects of Learning-By-Making (LBM) processes. Contribution of the research will involve mainly evaluation of the LBM characteristics as an alternative for design and technical-based studies and suggestions for further applications of the approach.

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POSSIBILITIES AND LIMITATIONS IN SHAPING CUSTOMIZED RESIDENTIAL INTERIORS

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ABSTRACT

Own, satisfying home is one of the things that having, in a person's lifetime, is extremely important, because it ensures meeting basic needs. Nowadays, in the era of increasingly stronger privatization and individualization of social life, paying attention to the individual and not universalistic user is becoming an important planning task. The Polish multi-family housing stock mostly comes from the '70s and '80s, when the construction was based on a large-panel system – hostile, rigid and heavily standardized. At present, the buildings are erected in technologies based on modern materials and technologies, but the layout and size of residential units are not much different from those erected 40 years ago. The paper is an attempt to draw attention to the issue of shaping residential interiors tailored to the individual user. An attempt to analyze the possibilities or lack thereof for the free creation of residential interiors. The aim of the research is to analyze the possibilities of spatial creation of individualized residential interior layouts, both in existing multi-family residential stock – a project in adapted space, and in a model space (cube 6 x 6 x 6 meters). The research material comes from both: the design classes conducted by the author of the article and the housing stock that has been inventoried by her. The research method is a comparison of existing flats and ideological systems, designed by students of the Faculty of Architecture of the Silesian University of Technology, within the design classes based on the author's own didactic program. The interior utility program includes residential functions – daily rest, sleeping, personal hygiene, preparation and consumption of meals, storage and implementation of hobbies. In principle, the residential interior is intended for two users: two people, or a person plus a pet, taking into account the individual needs of each co-resident. The designed residential interiors, apart from utilitarian solutions, are characterized by aesthetic and functional solutions related to the selected interests (hobby) of the inhabitants. Basing on the analysis of selected conceptual designs and comparing them with existing residential layouts, conclusions will be drawn about the occurrence of possibilities and limitations in shaping individualized residential spaces. It is important to determine – what are the restrictions on adaptations, in connection with the existence of a specific structural and installation system, arrangement of windows on the facade, etc., which lead to impoverishment of the arrangement possibilities and adaptation of the interior for a defined user. The presented projects will also show a different view on the way housing is shaped, which breaks the patterns existing in public awareness. The main conclusions from the research may be useful in subsequent development projects. They can be a clue to discuss the existing restrictions on residential interiors located in multi-family buildings, whose shape is governed by: building regulations, rigid building structure and its equipment with technical installations and devices, as well as development policy focused on maximum investment return.

"CONFLICT" OR "COOPERATION": A STUDY ON THE SPONTANEOUS ORDER IN THE DIACHRONIC EVOLUTION OF URBAN STREET SPACE FROM THE PERSPECTIVE OF STAKEHOLDERS

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ABSTRACT

Urban public spaces nourish social relations, at the same time, the evolution of public spaces is also influenced by social relations. Urban street space, as an important part of the public space, is a place for people's daily lives, contacts, and activities. In the occupation and use of street space resources, pedestrians, residents, vendors, and investors become conflicting or cooperative stakeholders out of different demands such as security or exchange. The game among these stakeholders has a significant impact on the spatial pattern and environmental quality of urban streets. Thus, this paper attempts to explain the diachronic evolution of urban street space from the perspective of stakeholders, analyse the influence mechanism. On this basis, this paper aims to investigate how the spontaneous order generates in the evolution of urban street space and how to actively guide this order. A certain urban area of Jinan, a city in northern China, was selected as a case study. Using field observation and Google earth history images, supplemented by analysis graphics, the author represented and compared spatio-temporal data and spatial patterns of activities over four important periods during 2000~2020 of the typical street spaces in the case. On this basis, the diachronic evolution of this street space was analysed from the perspective of stakeholders: firstly, different stakeholders were clarified; secondly, the changes in the relations of stakeholders and their demands in different periods, the actions they had taken, and the phased outcomes of street space pattern were analysed; finally, a game model of stakeholders in the evolution of street space was established. The results indicated that in the occupation of public space resources, the relationship between the stakeholders was dynamic: when the cost was high and the benefits were low, the stakeholders showed a trend of "conflict"; when costs were low and benefits were high, the tendency to "conflict" diminished.; when costs and benefits were in equilibrium, "cooperation" tended to rise and gradually led to spontaneous order. This spontaneous order had a positive effect on forming a more orderly street space and a more pleasant street environment. In the concluding section, the paper proposes optimization strategies of interest integration and coordination for urban street space development, which may provide a positive reference for architects and the government to actively guide this spontaneous order in urban planning and governance, and ultimately create a pleasant urban street space.

HYDRAULIC MODELLING OF RIVERBED EMBANKMENT UNDER THE HRIČOV WEIR

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ABSTRACT

The weir of the Hričov water structure has an untypical shortened stilling basin, which affects significant scour development in the downstream riverbed. A rockfill embankment structure adjacent to the stilling basin was constructed to prevent the formation of scours in the riverbed. However, increased flows at the weir erode this fortification and it is necessary to replenish the material back to the embankment after the flow situations. A 2D hydraulic model constructed in a flume of the Hydraulic laboratory was used for the research of new downstream fortification, which would be better resist the scouring effects. The model was created according to Froude's modelling similarity as a 2D model of the weir structure with control gates and part the downstream riverbed consisting of gravel. Different designs of the embankment were not allowed to interfere with the existing construction of the water structure. The construction of the embankment was designed as a concrete “secondary” stilling basin adjacent to the existing one. Tested variants of the embankment were of different length and depth of the stilling basin. The length varied from 11 to 24 m and the depths varied from 0 to 1,8 m. Overall 11 different design of the embankment were investigated. Each design was tested for three different flow rates on the model simulating common and extreme flow situations at the weir. The flows were selected to simulate also different hydraulic phenomena at the weir – overflow, outflow, and free overflow. After each flow simulation the scour in the riverbed was measured. The measured scour parameters were depth of the scour, the distance of the deepest point from the existing water structure and the amount of the material carried away. The resulting parameters were assessed with respect to each other for the corresponding flow rates. The best results in scour reduction were achieved for horizontal embankment with the depth of 0 m. The designs with increased depth were causing secondary hydraulic jump in the riverbed which increased the scours. The tested designs of the embankments were able to reduce scour size by up to 45% for the outflow, by less than 20% for free overflow and by more than 80% at the overflow.

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INTEGRATING CREATIVITY IN ARCHITECTURE: IMPACT OF THERMAL ENERGY & DAYLIGHTING ON STUDENTS' PRODUCTIVITY IN ARCHITECTURAL DESIGN STUDIOS

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ABSTRACT

This paper explores the factors that influence students' resourcefulness over an academic year at Kwara State Polytechnic, Ilorin, Nigeria, Architecture studio. Part of the factors identified are daylight and other indoor environmental features that plays a huge factor in the design thinking process. To compare the performance of 200 students in the studios, Correlation analysis was used as a means of assessment. A Statistical tool (SPSS) was used to determine the relationship between Daylight in studios and students' productivity in their studios which affects the students' ideation processes, aesthetic perception of physical elements in façade design, and how the environment plays a huge factor in design ideas. Other elements such as thermal comfort, acoustics, indoor air quality, artificial light were also examined which could affect the students' performance in studio. Furthermore, interview with some students in the Department was made to determine the extent to which Daylight affect the students' academic productivity.

EVALUATION OF STRATEGIC BUILDING DESIGNS: A REVIEW OF CONCIOUS BUILDING DESIGNS FOR ENERGY EFFICIENCY

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ABSTRACT

This describes user experiences with different types of energy efficient buildings, focusing on indoor climate, technical operation, user attitudes, and general satisfaction. Energy efficient buildings are often rated better than conventional buildings on indoor climate, but when investigating more thoroughly, the users have different concerns. The varying results from the user evaluations reflect that the quality of the buildings differs. However, user concerns may also be a result of inappropriate use. Perceived personal control and sufficient information on operation and use is crucial for an overall positive experience of the building.

BACK TO VERNACULAR ARCHITECTURE: EFFECT OF MODERNIZATION ON TRADITIONAL ARCHITECTURE IN NIGERIA

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ABSTRACT

Vernacular buildings across the globe provide intrusive examples of sustainable solutions to building problems. Yet, these solutions are assumed to be inapplicable to modern buildings. Despite some views to the contrary, there continues to be a tendency to consider innovative building technology as the hallmark of modern architecture because tradition is commonly viewed as the antonym of modernity. The problem is addressed by practical exercises and fieldwork studies in the application of vernacular traditions to current problems. This study deals with the dynamics and challenges of Nigerian architecture in practice. The focus was on the trend and development of housing forms in Nigerian cities, the forces that have shaped and patterned their evolution overtime. Drawing on the divergent example of the transition from traditional to modern urban housing forms in post-colonial Nigeria, the paper reveals that social changes, particularly the shift from traditional community, family values to more western ways of life, have had variegated impact on buildings and residential layouts. One of these was the 'inhabitant' alienated from the urban environment and the seeming identification with home place of origin outside the city. While this situation poses a major challenge to the practice of architecture, professional planning practice on the other hand, seems to have demonstrated little interest in what people think or feel about places. The paper concludes by suggesting ways to promote Nigeria. the practice of contemporary architecture and planning to enhance communal living in Nigeria.

IMPACT OF VARIABLE INTENSITY OF HYDROPEAKING ON RIVER MORPHODYNAMICS

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ABSTRACT

Hydropower plants cause frequent flow fluctuations - hydropeaking. This study examines short-term impact of hydropeaking on the sediment transport using numerical morphodynamic model. Calibrated morphodynamic model is subjected to six hydropeaking scenarios. All scenarios are designed to be bound by operational limits of the considered hydropower plant with minimum discharge at 1250 m^3/s and maximum discharge at 2750 m^3/s. The studied variable of the model is the intensity of hydropeaking. In the evaluation phase the cumulative bedload volume is calculated for each scenario. The differences of transported volumes for considered hydropeaking scenarios are found to be within the margin of error of ca. 3% from the average value and therefore considered negligible. Based on this study, variable intensity of hydropeaking of the considered hydropower plant upstream of the studied river section has negligible effect on the bedload transport.

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ARTIFICIAL INTELLIGENCE IN THE CONSTRUCTION INDUSTRY AND THE IMPACT ON ARCHITECTURAL PRACTICES

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ABSTRACT

Artificial Intelligence (AI) is concerned with the development of computer systems capable of engaging in human-like thought processes and performing tasks that ordinarily require human intelligence such as learning, reasoning and self-correction. AI has been known for decades however a few studies have analysed the application of AI in the built environment. This research aims to investigate the use of AI in the construction industry, with a particular focus on the impact of AI on architectural practices. Productivity in many sectors, such as agriculture and manufacturing has noticeably increased in the past decades however recent research shows that there has been consistent decline in the construction industry's productivity since the late 1960s. Various attempts have been explored, promoted and mandated to increase efficiency in the construction industry and improve the quality of projects. Innovations and digital technologies have been used across the design and engineering, construction, and operation stages including big data and analytics, simulation and virtual reality, mobile interfaces and augmented reality, BIM tools and processes, 3D scanning, AI, robotics and drones. We start by defining the concept of AI and its evolution in architecture. Following that we evaluate case studies in which AI was used to highlight the benefits, challenges and lessons learnt. We conclude be exploring the possible influence of using AI on architectural practices. We build on previous research that examined AI at the early design or construction stages and expand this by considering using AI across the life cycle of projects in the construction industry.

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INNOVATION FOR TRADITION: A NEW METHOD FOR RESEARCHING THE CHROMATIC IDENTITY OF ARCHITECTURAL ENSEMBLES

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ABSTRACT

Until the industrial revolution, materials and coating techniques depended on and expressed the culture of regional construction through its geographic and geological context: a "Geography of Color" existed. From the 20th century, that condition changed: many countries in the world became aware of the impact caused by chromatic alterations in architectural ensembles, especially in environments and landscapes with heritage value, due to the endless possibilities of chemically synthetized pigments that de-characterize their regional context. Since then, the investigation of the chromatic identity of buildings and sites became a relevant field of research. This paper aims to present a method for data collection created to study the chromatic identity of architectural ensembles, based on the recognition of the variables that compose this identity. Its application will be demonstrated on the historic center of Tiradentes, Minas Gerais, Brazil, where it was implemented with the main purpose of enabling the documentation of relevant information on the object of study. The paper will be presented according to the following phases of study: (i) Identification of variables: description of the process of construction of the method, explaining how the variables were identified; (ii) Attribution of categories for variables characterization: description of the method`s development process, using the variables identified; and (iii) Validation and results of the method: report of the application of the method in field research, emphasizing the challenges and advantages observed in its implementation. Among the conclusions, it was possible to confirm the innovative character of the proposed method and highlight that innovation is important and necessary for the knowledge and preservation of tradition.

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PLANNED VILLAGES AS RURAL HERITAGE IN THE FUNCTION OF SUSTAINABLE DEVELOPMENT: CASE STUDY OF GORNJI VRHOVCI IN SLAVONIA, CROATIA

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ABSTRACT

Although cultural values are the subject of an increasing number of officially adopted documents, at international as well as on European level, elaborations of planned villages values are rare. In the 1990, the term cultural landscape was confirmed in several international texts as a concept related to protection and heritage (World Heritage Convention, 1992; Recommendation on the Integrated Conservation of Cultural Landscapes Areas as Part of Landscape Policies, 1995). From the beginning of the 21st century, the concept is dispersed into several disciplines and the focus shifts to the side of natural values, visual values of the landscape, built structure, heritage values, elaborating the concept of cultural landscape more widely and at the same time clarifying its components more in depth. The paper analyses the values of planned rural settlements in the context of cultural landscape and the values of the rural heritage. The importance of planned rural heritage as a tourist attraction and potential destination is examined through a spatial multi-level research of the regional area on the example of the area of Western Slavonia, Croatia. Since the middle of the 18th century, in the area of Slavonia there is the largest number of planned and regulated villages that have been integrated into the landscape, contributing to the spatial diversity and consequently the spatial identity. Therefore, the question arises whether their planned spatial structure can be recognized as heritage and whether this part of heritage can be used in the function of rural tourism development. This paper explores the historical urban - architectural reconstruction of the village Gornji Vrhovci (1945-1948) after its damage during World War II, and reconstruction (1995-1998) after damage during the Homeland War. Since architects led both reconstructions of the village, the paper explores whether the recognizable spatial structure of the village can serve as a contribution to the development of a model for the development of rural tourism. The paper concludes that, despite the need for development of rural tourism in Croatia, the identity of spatial structures of the village are neglected by development plans both in the sense of heritage and resource sustainable development.

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A PARTICIPATORY APPROACH ON SAVING VERNACULAR TIMBER HERITAGE: A CASE STUDY ON RELOCATING A WOODEN CHURCH IN ROMANIA

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ABSTRACT

This paper presents a case study on participatory and collaborative traditional design- build architecture in Romania. The focus is set on dismantling, relocating, rebuilding and reusing a 19th century wooden church with the efforts of the adopting community. In Romania, wood is used as a traditional building material, largely for roof framing elements in urban areas and in most mountainous rural areas for the construction of houses and churches. Due to an ongoing demographic rural-urban migration and emigration many villages have, and are being depopulated, subsequently abandoned and many such structures left behind. Under these circumstances the possibility of dismantling, relocating and reusing these types of structures has become economically viable in comparison to new-built structures. The design for disassembly, inherent to vernacular timber architecture and how the deconstruction and reuse of timber elements maintain their value through efficient reuse, makes it a suitable work frame for a participatory based approach involving communities with basic construction skill levels. Thus strengthening communities, maintaining and developing local identity through heritage and crafts. This type of action shows an increasing potential for saving timber vernacular structures by activating local communities and responding to their needs, in a time where the concern for natural resource management and re-cycling or up-cycling is becoming ever more important. The aim of the project is to increase awareness regarding timber built heritage by formulating a successful example of a participatory design- build project. A desired goal is to shift the architectural discourse by coalescing it with wider views of democracy and alternative visions of a sustainable future.

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LOAD BEARING CAPACITY OF PRECAST CONCRETE SLAB–WALL CONNECTION

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ABSTRACT

Precast concrete slabs and their supporting walls are connected using dowel pins, anchoring loop bars, and cast-in-situ concrete. The design resistance of such connections can be calculated using multiple different methods. The design load bearing capacity can vary depending on the method used and assumptions made during calculation, making it difficult to determine, which methods are reliable and should be preferred. The study ordered by construction company JSC “UPB” discusses two design methods proposed by Eurocode 2 and *fib* Bulletin 43. A semi full-scale loading tests of concrete walls and slab specimens are carried out. The results show that the design methods considering only the contribution of steel dowel pins, underestimates the actual capacity of the connection by 2 to 4 times. On the other hand, the methods, considering both the contribution of the dowels and the friction between concrete interfaces, correspond well with the experimental results.

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URBAN RESIDUAL SPACE IN LATIN AMERICA: REFRAMING THE ROLE OF PUBLIC SPACE IN COLOMBIA

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ABSTRACT

The metropolises of the global south are often understood or considered out of rules as a distinct urban "species" while cities of the global north are commonly recognized for their development, organization, and operation. The duality that arises in Latin American cities between the advancement of its infrastructure and the provision of goods and services manifest themselves physically in urban space as well as the increase of spatial segregation and social inequality. The stains, islands, fragments, patches, archipelagos, and countless denominations that narrow the "disorder" of these cities contrast with the good practices they develop to increase the quality of life of their inhabitants. The interrelationships that occur in cities are manifested among others in public space. For instance, some spaces in Latin American cities are considered remnants, fragments, waste spaces, uncertain spaces, or pieces of the city with undefined uses due to the characteristics of some of these spaces. These spaces, commonly divide the large areas of poverty with the few areas of wealth, providing greater inequality and socio-spatial segregation. It is common to find of variety of literature that Latin America is the most violent and inequitable region in the world. This explains why the research of recent decades in these cities has focused on understanding the causes and find answers to minimize poverty, inequity, and inequality. These phenomena will not find the full answers in architecture nor urbanism; however, actions from these two disciplines are required to materially realize opportunities for all in cities. Thus, in this research, based on literature review, methodological terms, and collection of information on some public spaces of Colombian cities, is developing an investigation on the reframing the role of public space in Colombia. One of the principal results is how the reframing of the role of public spaces is a potential for the articulation in fragments Colombian cities and as a tool for urban restructuring.

DYNAMIC RESPONSE ANALYSIS OF TRAPEZOIDAL BASINS ON NUMERICAL MODELS

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ABSTRACT

The severity and spatial distribution of ground motion are affected by geological and geotechnical conditions as well as earthquake source properties. The characteristics of ground motion at a particular site depend on many factors such as tectonics of the region, rupture mechanism, source distance, geological formations and soil conditions, local surface and subsurface topography. Thus, the estimation of surface ground motion during earthquakes is a challenging issue in geotechnical earthquake engineering. Consequently, the research investigates an answer for the question of how the surface movement would change as a result of combinations of basic wave phenomena in alluvial basins with soil nonlinearity where basin width is comparable to depth. In this study, one and two-dimensional dynamic analyses were performed under different level of bedrock motion excitation by using idealized symmetrical basin models to research the effects of geotechnical site conditions and bedrock inclination of basin edge for soft site class defined by seismic codes. Geotechnical properties of the soft soil layers in the models were defined as site class E that mostly needed site specific dynamic analysis by classification of NEHRP 2015 provisions. The top layers of basin models are soft cohesive alluvium underlain by stiffer material. In the basin models, the soil layers were assumed to extend horizontally and limited with basin edges having a constant slope. The acceleration time histories and response spectrums were calculated at surface points with equal interval on the top of the basin performing one and two-dimensional dynamic analyses by excitation of 22 strong ground motions. The response spectrum values and amplifications calculated for different sections of the basin from the two and one dimensional (2D and 1D) dynamic analyses. Consequently, impact factors of the basin effect could be derived depending on location and periods as Sae(T)2D/Sae(T)1D.

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BURDENSOME LEGACY OF SPORTS AND TOURISM FACILITIES FROM THE TIME OF POLISH PEOPLE'S REPUBLIC

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ABSTRACT

“Unwanted child”, “ill born”, “concrete monsters”, “tendentious” – architecture created during the previous regime in Poland has been called many names. It has been accused of faulty craftsmanship, failed stylistics and dehumanized scale of settlements. However, this seems like throwing the baby out with the bathwater, as the designers of post-war Modernism era took great care both of the stylistics and the functionality of their designs. Even despite having to design in extremely difficult political and economic circumstances. There were shortages of qualified labor and construction materials, and political propaganda interference on a daily basis. But the architects collaborated with painters and sculptors, and at the same time observed the CIAM guidelines, producing some of the most imaginative, celebrated and humane examples of architecture in modern day Poland. There is nothing to be said but praise about architecture for leisure and recreation in the form of the *PTTK Tourist House* in Płock designed by Marek Leykam, *Ustroń-Zawodzie* district by Aleksander Franta and Henryk Buszko or The “Warszawianka” sports centre designed by Jerzy Sołtan and Wojciech Fangor. Architecture is the art most susceptible to ideology, as it cannot be realized without a patron whose interests it serves, and recreational architecture bears the mark of the era of its creation. Sports and recreation were promoted in the People’s Republic of Poland. The employing institution financed employees’ holidays and therefore many of the companies were encouraged to build their own holiday resorts. For the most part these objects were state funded and subsidized when they operated. The large scale complexes, like *Ustroń-Zawodzie*, were intended for collective leisure of workers originating from that same industry branch. They were the means of propaganda and social engineering aimed at consolidating and showing appreciation for specific social classes. For the less well-off and those who preferred closer contact with the nature *Polish Tourism and Sightseeing Society* offered accommodations in hostels. As state owned, they were granted priority locations, like the abovementioned Leykam’s hostel in Płock on the Vistula embankment or the Miramar Hostel in Sopot designed by Stanisław Sowiński on the front shoreline of the Baltic Sea. The architects chose the functionalist approach and stylistics, that allowed them more creative freedom. The authorities gladly welcomed modernist aesthetics. It fitted the ideology of a new forward-looking society, free of historic constraints. The transformation after the year 1989 significantly affected all aspects of architecture. Many leisure objects and resorts fell into disrepair without funding. Some of them were purchased by private investors and adapted to contemporary needs with disregard for the original stylistics or simply torn down. On many occasions, the razing of modernist buildings has been met with applause from the general public, despite the efforts of art historians and architects who strive to educate on the merits of post-war Modernism and preserve the outstanding examples. These objects constitute the so-called “dissonant heritage”, as despite being propagandist, they are also a significant part of modernizing movement in a country worn out by war and prime examples of the style.

INTERPOLATION OF IRREGULAR SOIL MOISTURE MEASUREMENTS WITH MACHINE LEARNING METHODS

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ABSTRACT

Soil moisture is one of the determining variables of the stress on various ecosystems and agriculture systems and a key element of the surface water budget. The measurement of soil moisture by standard methods is carried out by field sampling and its subsequent handling in a pedological laboratory. Due to time demands, high financial costs, a lack of personnel, and weather fluctuations, such measuring of soil moisture are not usually performed daily, particularly if it is done in a location where permanent metering equipment cannot be installed. In this work, a method is proposed that uses machine learning techniques intending to make existing soil moisture time series complete. Authors are assuming and solving the usual situation, in which only data irregularly measured are available. A time series of this variable is useful for an evaluation of the moisture regime of soil and for decisions regarding building irrigation structures. Interpolation models proposed in this paper were verified using data from the days on which the field measurements were available. An area of the Zahorska lowlands was selected for testing the methods described hereinafter. The Zahorska lowlands are in Slovakia and are situated in the west part of the country between the Small Carpathian Mountains and the Morava River. Three basic data sources were used in this paper: 1. manually measured data using a neutron probe, 2. satellite data or data derived from satellite data, 3. climatic data from European Climate Assessment & Dataset. Mainly nonlinear machine learning models are proved to be suitable for a solution to this task. The Extreme Gradient Boosting Machines model and simple ensemble model provided the best results.

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DESIGN & CULTURAL HERITAGE: FUTURE SCENARIOS BETWEEN DIGITAL AND PUBLIC SPACE

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ABSTRACT

The research aims to investigate the themes that relate the discipline of design with cultural heritage, adopting an experimental approach of hybridization between museography and the digital world. The pandemic experience of Covid-19 has distorted the context in which we live; the new standards of behavior, based on the obligation of physical distancing between individuals, have triggered a process of progressive renewal of some institutions in participatory modalities. In the analysis of the recent rediscovery of the possibilities offered by digital technology - such as the virtual use of the museum, the increase in electronic archiving activities, the diffusion of culture through online performances, webinars and live conferences - the lack of the social, material and physical character, that distinguishes the cultural institution in its most emotional connotation, has emerged. Starting from this assumption, the research aims to deepen the concept of city as a museum, a widespread path in which physical distancing, which restricts the possibility of access to existing museum venues, is canceled if it is conceptually translated on an urban scale. The digital world, as well as the transition phenomena that lead the traditional space to dematerialize and converge towards forms of the immaterial, in this sense, acts as an adjuvant tool for the experience of enjoying the widespread exhibition. In summary, a hybridization process would allow the conservation of the emotional nature of the fruition of cultural heritage in the post-pandemic social context. The curatorship of a billboarding path, performances and site-specific installations within the city, designed with a museographic positioning that creates semantic and typological links with the host place, would be functional, in fact, to evoke the materiality of the museum visit as it has been understood so far. At the same time, the accessibility of wayfinding on digital platforms, the use of gamification tools, the access to educational, informative or performative contents through virtual media such as AR, could open up this process of museification of the city and use of public space to new expressive codes and forms of interaction, full of innovative potential and perfectly in accordance with the environmental conditions of our time. In conclusion, the research aims to identify, starting from a state of the art on the behaviors and phenomena associated with the modalities just described, hybrid modes and exhibition systems, in order to open up to new, futuristic and economically valid, scenarios, according to which the sharing of the tools of the digital design and widespread museography contributes to combine the typological innovation of digital with the emotionality of the individual and social experience of the visit.

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INDICATOR SYSTEM TO MEASURE THE QUALITIES OF URBAN SPACE AFFECTING URBAN SAFETY AND COEXISTENCE

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ABSTRACT

Urban space design directly influences its own safety. Sometimes this security is given by urban furniture, lighting or urban facilities, among other aspects. This paper presents a methodology based on the development of a system of indicators that provides the opportunity to assess what qualities of urban space influence street safety. It is important to know what aspects of public space make the citizen consider it a safe place and at the same time, to contrast these data with scientific documents. The first results are shown after applying this methodology to the case study of the city of Malaga, and specifically, to a sample of streets selected based on objective criteria crime rate. For research and obtaining indicators, digital surveys have been carried out on a group of 300 people, using Google Forms and social networks. Likewise, to obtain samples of the streets with the highest and lowest crime rates, registration data has been geolocated by the tolls of the Geographic Information Systems (GIS). The main contribution of this document is focused on defining indicators to characterize and quantify the safety in the streets of the urban public space. These are contrasted with objective data and records of insecurity and crime, and can be applicable to any street in any city. Finally, through these indicators, it is intended to know what are the parameters that influence urban safety for future designs of public spaces, or their renovation, achieving in the future, the existence of streets with a higher level of safety.

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SEMI-AUTOMATED INSPECTION OF INFRAESTRUCTURE THROUGH DRONS, MACHINE LEARNING AND 4D SIMULATIONS

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ABSTRACT

This work proposes a mix between Building Information Modelling (BIM), Drones, Computer Vision (CV), Camera Path Programming (CPP), and 4D sequences (3D BIM models + time). It presents a state of the art in each area and discusses the potential of integrating them for building inspection. Finally, it proposes a theoretical framework that describes an innovative application of advanced digital modelling of buildings. It aims to contribute to quality and productivity in the construction phase of building projects by linking technologies and multidisciplinary approaches in a common environment. The framework addresses the use of BIM models to provide architecture, engineering and construction (AEC) industry objects (walls, slabs, windows, stairs, doors, etc.) in a georeferenced location. This location provides crucial data for the automatic generation of the drone's flight path, which is linked to the 4D construction sequence and locates AEC objects in a specific place (x, y, z coordinates) at a specific time. Raster images taken by drone are finally analysed by using CV routines that allow real AEC objects to be recognised and matched with virtual AEC objects from the BIM model and the proposed 4D schedule. This proposed technology integration directly supports inspection tasks for a building site in terms of quality controls, cost and time.

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TOWARDS BUILDING PERFORMANCE ASSESSMENT THROUGH BIM AND BEAM DATABASES

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ABSTRACT

BIM models are seldom used for energy certification of buildings. This paper discusses the advantages of linking two important fields; Building Information Modelling (BIM) and Building Environmental Assessment Methods (BEAM), better known as a rating system. The state-of-the-art in both fields around the world is discussed, with an in-depth examination of current BIM software and related applications, followed by a discussion about previous research for integrating them. Finally, a new framework is proposed based on database exchange that takes crucial information from BIM to BEAM platforms. The development of this method includes BIM programming, database links, and spreadsheets for building energy certification. This new semi-automatic tool allows architects to model their design in the BIM platform and use this information as an input for the energy certification process. The potential and risks of this method are discussed.

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BIM BASED FRAMEWORK FOR THE DESIGN OF WOOD-FRAME MULTI-STORY BUILDINGS

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ABSTRACT

The work raises the question about the usability of BIM methodologies for wood design and construction. Several academic and research initiatives are reviewed, and the paper aims to establish an appropriate link between two agendas that the architecture, engineering, and construction (AEC) industry, academia, and governments normally handle separately. By conducting several literature reviews (book, journals, and congresses) and extensive software tests (BIM software: Revit, Archicad, Tekla, and Wood plug-ins: AGACAD, Archiframe, Timber Framing 2015, WoodStud Frame, etc.), the state-of-the-art was assessed in both fields, several cases linking BIM and wood are shown in detail and discussed, various theoretical samples are modelled and shown, and the advantages and disadvantages of each technique and stage are explained. It can be concluded that BIM for Wood has been used more frequently in academia and that both fields have several common processes and, in many cases, only a few BIM-wood tools have been used, disregarding the high potential of these methodologies for the complete building life cycle (design, construction, and operation).

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URBAN CODES PARAMETERS AND BIM METHODOLOGIES FOR BUILDING ENVELOPES

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ABSTRACT

All building projects must fulfil several urban codes before having an approval from local government. Visualization of such zoning planning has been an issue for architects, governments and owners for around a hundred years (Hugh Ferris began a series of massing studies in 1922). Designer´s teams (architects, engineers, owner) have to address setbacks, plot area ratio, maximum building height, and other important elements in order to comply with the law, meet the requirements of the client, and follow their own inspiration. This paper outlines the problems of envelope design for isolated high-rise buildings. In addition, a new tool based on a BIM software platform and Procedural Design/Shape Grammar techniques is presented and discussed, it allows various options to be simulated for semi-automatic generation of the envelope depending on the parameters required by urban zoning planning. These options provide reliable data and geometry that can be analyzed in real time by architects, engineers, builders, authorities, and the client in the early stages of building design.

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ANALYSIS OF A DAMAGED BRIDGE OBJECT AS A RESULT OF VEHICLE IMPACT

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ABSTRACT

In bridge construction, prefabricated prestressed concrete beams are widely used. In the case of smaller spans, the prefabricated elements are assembled into a slab load-bearing structure, while in the case of larger spans, T or I beams are used. Due to the number of prefabricated elements, the greatest possible optimization of this type of beams is sought. This is achieved by using the smallest cross-section of the beams with simultaneous increase in height to maximize the use of the prestressing force arm. In addition to less material consumption, additional benefits are associated with the reduction of the weight of prefabricated elements, which facilitates and reduces transport costs. Such optimization leads to a similar cross-section of various solutions - in the case of T-beams, we have a wide upper flange in order to reduce the amount of in-situ formwork needed and to obtain a large area of connection with the concrete, the high and very narrow web widened in the lower part only to the extent necessary for arrangement of prestressing strands. For type I beams, instead of the wide upper flange, a slight widening of the web is used only to the extent necessary to obtain the minimum necessary connection surface. In addition, bridge design solutions using these beams for maximum cost reduction and maximum construction time reduction do not use span cross beams, but sometimes support cross beams. This solution results in very low load capacity when a horizontal load is applied to the bottom of the beam. This is the basic minus of such a solution in the event of impacts caused in the event of transporting loads under objects of too high height (in the event of non-compliance with traffic restrictions or poor load securing, e.g. not lowering the arms of construction equipment during transport). In this case, impacts to the bottom of the beams cause very much damage, sometimes destruction of the beams. The article presents a case of damage to an object caused by a impact of vehicle or load. The bridge over the expressway has a typical structure used in Poland in the 70's and 80's of the last century. Slow-supported spans were made of Płońsk beams (T beams) joined only by locks at the junction of the upper beams' flanges. In the presented solution only support cross beams were used. As a result of impact with the vehicle / load, there was a horizontal crack at the contact of the web with the top flange almost along the entire length of the beam, in the place of the impact there was a complete detachment of the web from the top flange. Visible stirrup deformation indicates complete loss of cooperation between beam elements at the point of impact. The part of strands was also broken. The method of estimating the load capacity of a damaged beam is discussed. When estimating load capacity, the impact of composite action and the order of loading the structure were taken into account. As a result of calculations, it was necessary to protect the damaged object. The article characterizes the temporary protection of a damaged beam and presents recommendations for further handling of the bridge.

EMERGENCY REPAIR OF THE BRIDGE FROM PREFABRICATED POSTTENSIONED BEAMS

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ABSTRACT

In the '70s and' 80s of the last century, bridge constructions with prefabricated pretensioned concrete beams were commonly built in Poland. Beam elements made under controlled conditions in plant and using a good quality concrete show good durability. Despite this, objects made of these beams are characterized by low durability of about 40 years. This is mainly due to the very low quality of joint concrete made on site and the lack of tight expansion joints. In addition, the tendency to optimize solutions also affected the insufficient durability of this type of structures. This problem is particularly evident in the case of objects made of type I beams. In solutions made using this type of beams, the superstructure has a relatively large span. Slab was made on site with very low quality concrete - the strength of the slab concrete is in the range of 15 MPa to 25 MPa. In addition, the superstructure height was very small. The span had very low transverse stiffness. This caused very rapid destruction of the slabs. The destructive processes were accelerated by the penetration of water into the concrete through leaking expansion joints and damaged deck insulation. The article presents the case of failure of an object made of WBS type concrete beams (I type beams). During site inspections, attention was paid to the very poor condition of the platform slab. Unfortunately, the lack of financial resources did not allow for immediate repair or reconstruction of the bridge. The delay caused a failure. During the works related to the current maintenance, while topping up the road surface, the deck slab was damaged. A hole was created in the bridge. A quick analysis showed that due to the condition of the whole superstructure and other elements of the object it is necessary to perform a general repair or reconstruction. Due to the important function of the viaduct, it was also necessary to carry out work that would allow its use until repair or reconstruction. It was decided that due to the condition of the entire slab in the span in which the damage occurred, it is necessary to replace the entire superstructure. Replacement of the slab in the damaged span together with all equipment was designed. The solution was to be targeted - for the state after repair or reconstruction. In addition, temporary support has been used for the time of making the composite slab in order to obtain greater load capacity of the object These treatments allowed to increase the load capacity, but the target load capacity was not achieved. Because after an emergency repair, the load capacity will continue to be determined by the adjacent span and supports, it was decided that the target load capacity will be achieved as part of the repair or reconstruction of the bridge by applying additional external compression.

BUILDING-INTEGRATED PHOTOVOLTAICS FROM PRODUCTS TO SYSTEM INTEGRATION – A CRITICAL REVIEW

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ABSTRACT

This review brings together research on the integration aspect of photovoltaic technologies in the building sector. Buildings are among the significant contributors of negative, yet not avoidable, environmental impact. Two primary drivers are pushing the building industry toward sustainability: a goal of lowering the emission levels emitted by the industry, and new norms and regulations on a zero-energy building. The zero-energy building concept is primarily based on the principle that the amount of renewable energy created on the site will be equal to the total amount of energy used by the building during its operational phase throughout its entire lifetime. As a result, the photovoltaic technology was introduced to the building sector, and from there started a rapid research and development of a merged field, Building-integrated photovoltaics (BIPV). The market of BIPV is still young and is hence constantly changing. A few BIPV product manufacturers are steadily represented on the market, while new products and manufacturers are emerging and others disappearing now and then. A critical review presented herein provides technical information on existing BIPV products and systems, considering their multi-functionality as a climate screen, energy generator and aesthetic component. Therefore, this paper aims to help to understand BIPV products and systems as well as possibilities and challenges associated with their integration into the built environment of today, thus also giving guidelines for the development and design of BIPV components for the future.

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DESIGNING SLAB-COLUMN CONSTRUCTIONS DUE TO THE POSSIBILITY OF A PROGRESSIVE COLLAPSE CAUSED BY A PUNCHING

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ABSTRACT

When designing slab-column structures, one of the most important elements is adequate protection of the support zone. The main problem when designing this zone is the possibility of a punching. This phenomenon is the main cause of failures, damages and progressive collapse of slab-column structures. The article presents standard methods for calculating support zones after a punching. The calculations were verified by a few experimental research.

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DESIGNING OF SLAB-COLUMN STRUCTURES DUE TO ADDITIONAL LOADS

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ABSTRACT

The introduction of Eurocodes in the designing practices led to the change of methodology of floor reinforcement, particularly for slab-column floors. Until now, the most important decisive factor was the determination and arrangement of reinforcement due to limit states; any other problems were treated as additional information. At present designers - constructors of reinforcement in slab-column structures have to follow Eurocodes (PN-EN 1990:2004, PN-EN 1991-1-1:2004, PN-EN 1991-1-7:2008) in taking into account first and foremost the following threats accidental loadings and fires, as they influence further stages of the designing process. The article presents the most important design guidelines for slab-column structures due to accidental loads.

HYGROTHERMAL STUDY OF AN INSULATING CONCRETE TO REDUCE ENERGY CONSUMPTION IN BUILDINGS

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ABSTRACT

In Algeria, the building sector consumes more than 42% of the total energy produced. It is imperative to reduce this consumption. In addition, the variation of outdoor air temperature is very high in Algeria: it varies between 0 ° C (in winter) and 40 ° C (in summer), and can reach 50 ° C in the south of the country. The opaque walls are influenced by this temperature variation and in turn influence the consumption of energy. So, we must look for solutions that take into account the thermal insulation and the accumulation and the return of heat in the building walls. In this context, a hygrothermal study is developed on a composite concrete loaded with polystyrene chips. The choice of this addition is justified by the fact that polystyrene is one of the most abundant materials in Algeria. In addition, it has interesting features, including low thermal conductivity, which leads to a high insulating power. The thermal properties of this material allow compared to a conventional concrete to lighten the basic product, to offer better insulation, to reduce thermal inertia and to recycle some waste. Numerical and experimental approaches are used. For both approaches, the ambient conditions have a direct impact on the behavior of the walls. Studies are therefore conducted in varying climatic conditions on block. In parallel to the experimental approach, a model representative of heat and mass transfer in material: capillaro-porous media (composite concrete), is developed in order to predict hygrothermal behavior of the wall. This model is validated by confrontation of simulated and experimental responses. Finally, a small application shows that using polystyrene concrete, one can obtain a significant rate of energy gain. It is therefore possible to improve the thermal performance and thus save the energy used, especially in heating and air conditioning. In addition, we can avoid the risk of condensation and the adverse effects that result.

ANALYSIS OF PUBLIC SPACE DYNAMICS BASED ON INSTAGRAM AND FLICKR DATA

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ABSTRACT

The general increase in the use of social media platforms since 2010 is related to the growing amount of data collected on the Internet, which can represent an opportunity for urban research. By analysing publicly available geolocated data from social media platforms, it is possible to track changes in the attractiveness and spatio-temporal dynamics of public spaces through their different stages of development. In this paper, we analyse data obtained from the Instagram and Flickr - for both platforms, posting photographs is their main characteristics. Photos taken during daily interactions in public space have a symbolic value, furthermore, as social media posts they contain valuable metadata that can be used for analysis and information discovery. In our research, social media posts are used to measure and identify the attractiveness and dynamics of a selected public spaces using REST API technology. Two case studies are presented that retrospectively analyse the attractiveness and dynamics of selected public spaces from Graz (Austria) and Maribor (Slovenia) in the period between 2017 and 2020. The research results show that the data from the Flickr platform, which allows access to the geolocation of the posted photos, can reveal the attractiveness of the sites, as the popular landmarks in both cities were clearly identified on the generated heatmaps. The maps showed locations that were perceived as important and attractive by the inhabitants or visitors in order to document them, which must speak of a certain motivation or even quality that confirms the expected correlation. The data collected on the Instagram social media platform, namely daily use and frequency of public events/activities, showed that they reflect a certain extent of activities carried out in the public space, even though they do not provide a complete picture by far. Rather, the results can be considered a valuable proxy for determining the general level of social interaction in public space. The methodology presented shows the innovative approach to retrospective analyses of the dynamics in public space. In the future, however, more metadata will be available, which will allow for a more specific analysis and, in combination with other data sources, will also allow for a more effective detection of deficiencies in public space. Finally, there is enormous potential for retrospective research using the comparative method, but also for linking new ICT driven approaches with traditional methods.

Corresponding Author: Kaja Pogačar

STUDY ON THE DESIGN OF PREFABRICATED EXTERIOR WALL INSULATION DECORATIVE BOARD FOR WIND ENERGY UTILIZATION: RESEARCH ON THE DESIGN OF THE EXTERIOR WALL DECORATION PLATE USED BY WIND ENERGY

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ABSTRACT

Human exploration for the realization of a better life building materials has never stopped, this article in the green building thought of the advocacy, explore the outdoor wind environment, the effective use of wind energy in an assembly-type building exterior wall insulation decoration plate, through wind energy conversion verification, show that the plate can effectively compensate for the winter cold wind brought about by the energy loss, with insulation effect; With the continuous optimization of the material and construction of the sheet, I believe that the sheet will be more in-depth study and wide application value.

Corresponding Author: Cao Maoqing

A STUDY ON THE EFFECTS OF UNDERLYING SURFACE ON THE MICRO-CLIMATE OF CAMPUS IN WINTERTIME

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ABSTRACT

The micro-climate of campus environment affects the life experience of teachers and students, while the underlying surface directly determines the state of such micro-climate. Focusing on the wintertime micro-climate of campus environment in north China, this study intends to clarify the specific effects of different underlying surfaces to the micro-climate of campus environment in wintertime by analyzing the actual measurement of different underlying surfaces in a university in north China. Six couples of measurement points were selected according to whether there is sunshade or not on three different typical underling surfaces on campus, which are hard pavement, vegetation and water surface. HOBO temperature and humidity recorder (model: mx1101, ux100-003) and UAV with infrared camera were applied as main equipment for the study. Temperature and relative humidity of the selected points were recorded once per 0.5h for 4 days between December 21 and 25, 2019, including the winter solstice day. Analysis results of the collected data show that, the environmental temperature near hard paved ground is generally higher than that of grassland and water body during daytime, when the people flow is dense on campus ; while the situation of environmental temperatures near grassland and water body are a bit complex which are related to different specific circumstance. Results of this study can provide some useful references for campus planning with consideration of impact of underlying surfaces on the thermal environment of campus in wintertime.

Corresponding Author: Yu Liu

AN INVESTIGATION ON THE IMPACT OF DIFFERENT VEGETATION TYPES ON MICRENVIRONMENT IN WINTER

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ABSTRACT

Carefully designed greening system can significantly improve thermal comfort of a microenvironment. A greening system is usually composed of different vegetation types，which have different impacts on their surrounding microenvironment. In order to evaluate the impacts of different vegetation types on campus microenvironment, four representative plots with different vegetation types (arbor + lawn, shrub + lawn, lawn, bamboo forest + lawn) in a university campus in northwest China were selected for investigation. HOBO temperature and humidity recorder were used to monitor the temperature and humidity of four plots at a level of 1.5m high in for 24 consecutive hours in 5 days in winter of 2019. The results show that, during the observation period, all the four kinds of vegetation types have a certain influence on the microenvironment, and the degree of influence shows a trend of bamboo forest + lawn> arbor + lawn> shrub + lawn> lawn. The results of this research are expected to provide a reference in selection of vegetation types for the design of campus greening system.

Corresponding Author: Yu Liu

HISTORY, PLACE, CULTURE IN THE CITY

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ABSTRACT

This paper explores the relationship between the tangible objects reflecting the use of the space and the cultural aspects expressing the identity of the place. The importance of the public spaces in the communication of identity might be seen as one aspect of the area of research into the meaning of the urban space and its relationship to the physical form of housing in the U.A.E. With the extenuate circumstances, the COVID 19, it examines how people perceive and use their immediate environment and how they modify their spaces differently. It is assumed that the physical form of the urban space mediates and structures gender relations. This will be illuminated by elements of the urban development and particularly of the urban activities, and an explanation of its relationship to changing ideologies and architectural norms. Typically, the urban and public places symbolize accepted notions of the appropriate function of the gathering spaces and preferred public relations, such notions are in themselves profoundly important in structuring gender relations. The city of today differs from its past in several respects: size and scale, street layout, land use patterns, architectural style and type of housing. Traditional urban form and building which would have provided information about regional and national identity have been largely replaced by forms characterizing the international and universal buildings and spaces. These changes have altered the city's form and have given rise to questions about the impact of these changes on the image of the city in terms of size and cultural values. So the concept of urban space becomes a determinant of the ability of planners, architects, engineers and administrators to provide an environment which is adequately structured to avoid chaos and to maintain an acceptable quality of life.

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URBAN PERFORMANCE AND SUSTAINABLE ENVIRONMENT: AJMAN AS A CASE STUDY

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ABSTRACT

Urban Performance is an assessment tool that can achieve a Sustainable Environment, as it can be an effective tool for the decision makers by highlighting the different physical and socio-economic potentialities and impacts of each district or sector, or even city. However, the ability of existing assessment tools to achieve these objectives is limited. This reduces the reliability of the results and sometimes prevents the realization of sustainable environment. In U.A.E, there is an increased recognition of the need for sustainable environment and the development of assessment tools has begun. Therefore, the urban performance of each district is done by looking at the different districts in Ajman, the evaluation of each index is done through after the determination of the categories for each index and through the attributes that constitute each category. The analysis of these attributes leads us to establish a framework for the assessment of the urban performance.

CONDITIONING FACTORS OF BIM IMPLEMENTATION IN THE CONSTRUCTION PHASE FOR THE APPLICATION OF ISO 19650

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ABSTRACT

The AEC industry, unlike other industries that have a chain production system, is subject to different pressures and objectives that are particular to each work, but which can be encompassed in different factors such as economic origin, factors of term, quality factors of the finished work, political factors, social factors (strikes), climatic factors (inclement weather), etc. In construction companies there is a growing trend to adopt BIM (Building Information Modeling) technology in the project execution phase. The adoption of BIM technology is an area studied within, and project companies that carry out their projects in the design phase (pre-construction) with this technology, demonstrate that it is effective, since it reduces time, improves design, and reduces unnecessary costs and supposes a better control about project by having a virtual model of the construction (VDC, Virtual Design Construction). Despite the fact that the BIM theme is very current and relevant to the construction sector, there are still not many BIM studies in the construction phase. This article focuses on the study in the construction phase, to analyze the impact that certain variables have on the performance of the execution project when the construction company carries out its construction project with a BIM/VDC model. These variables can be detected and measured by relationships between Promoter, Construction Management, BIM Manager, Site Manager, BIM Coordinator, subcontractors, suppliers, etc. We want to explain that, although today not all construction companies use BIM in its construction phase, for companies that do not adopt this technology, a study has been conducted to analyze the factors why they do not adapt to BIM implementation in execution phase inquiring into the barriers of technological adoption.

Corresponding Author: Carlos Lucena

URBAN HEAT ISLAND SCENARIOS – A CASE STUDY IN TECHNICAL UNIVERSITY, KOŠICE

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ABSTRACT

Artificial urban surfaces are commonly considered as main direct cause of Urban Heat Island effects. Most urban land covers are dark and impermeable and accelerating excessive heat absorption and storage. The paper characterizes cool surface strategies in criteria of definition, classification and application approach, as well as proposes of a framework to guide applications associate with grey, blue and green infrastructure on urban heat island mitigation. As a case study, analysis of surface strategy and its cooling performance was performed at Technical University of Košice campus. On perspective of economic and ecological feasibility, two proposals were simulated. The results show that both measures have significant impact on surface cooling, although the maximum and average temperature reductions vary between measures. In addition, overall value of each proposal is provided as reference for decision makers to meet their best interests. All these findings can support climate change adaptation strategy in Kosice, should be also applicable for similar projects and proposals in other regions.

Corresponding Author: Zuzana Poórová

ANALYSIS OF INVESTMENT STAGES ALONG WITH THE CONSTRUCTION PROJECT MANAGEMENT FOR THE INVESTMENT TASK FOR CASE STUDIES "COMPREHENSIVE MODERNIZATION OF THE BUS DEPARTMENT IN TYCHY AT TOWAROWA 1"

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ABSTRACT

The article is an attempt to generalize the design procedures and to present diagrams and principles in the implementation of construction investments. These issues are an interdisciplinary approach to managing a construction investment and it has its foundations in the theory of civil, legal, economic, sociological engineering as well as in materials science, engineering of buildings and structures, management and financial basics. The article presents an analysis of investment stages for a project in the construction sector along with the systematization of all factors affecting the result of a construction investment. In addition, the article indicates a number of innovative approaches during the designing investment plans for a selected group of construction investments. The article analyzes the business context of the construction project management and the crucial stages and dependencies of the construction process as well as the aspect of variables related to participants of the construction investment process and the resulting variables. Based on these analyzes, the aim of the article is to develop a project of construction project management for the investment task "Comprehensive modernization of the bus department in Tychy at Towarowa 1" in a variant version with specific risks for individual stages of the project and investment approaches. Both in the analysis of investment stages and in the project of construction project management, the main attention was paid to the elements related to the preparation and implementation of investments, which are essential in both presented variants. The computational and design methodology presented in the article consists in creating two computational models in order to solve the task set out at the beginning, based on the same output data, but for various designed variables having a direct or indirect impact on the result of the examined function of the dependence of a given construction investment management system. Design, implementation, quality, time and financial aspects will be examined in this article. The analysis of the designed variants has a solid empirical basis and appropriate calculation schemes. The calculations present the concept of a construction investment management project in the aspect of tested and calculated significant market attributes for construction investments. In the light of previous considerations, the main thesis of the article can be formulated as follows: "The method of known and used on the construction investment market project management solutions for a given construction project can be modified using a step-by-step analysis system due to current variables that affect the final effect of the project from the point of view of economics, time of implementation and the reliability factor of the task investment for changing real conditions." This thesis will be confirmed in the article.

Corresponding Author: Monika Gwozdz

STABILITY ANALYSIS AND DESIGN OF SLOPE REINFORCEMENT ON LANDSLIDES AREAS

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ABSTRACT

The presented document is aimed at presenting concepts and solutions for landslide protection and slope stabilization at existing damaged road sections. The main design task of this work is to restore to full technical efficiency the analyzed body of the existing poviat road No. 1475S Żywiec - Rychwałd in Żywiec at 0 + 405 km to 0 + 45 km by stabilizing an active landslide in the entire known range of its occurrence and ensuring safety for road users.

Corresponding Author: Monika Gwozdz – Lason

DESIGN AND PERFORMANCE LEGAL REQUIREMENTS FOR MODERNIZATION OF CONSTRUCTION OBJECTS FOR THE CURRENT NEEDS OF THE DISABLED PEOPLE

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ABSTRACT

The purpose of this publication was to conduct a study along with an analysis of current guidelines regarding the adaptation of treatment facilities for the disabled. The study also checked whether the design concept created for this task is possible, illustrating the possibility of introducing changes in the facilities to adapt the building to the needs of disabled people and the needs of medical facilities. The scope of the described tests includes the output data of the task along with a comparative analysis of the compliance of the building construction project and the compliance of the inventory of the existing facility with the current requirements of applicable legal regulations in Poland and in accordance with European methodological guidelines. In addition, the researchers were given the opportunity to rebuild and expand the facility for the disabled. The research method presented was a comparative analysis for the old building and new buildings. The obtained results showed that the buildings from 2010-2020 almost fully meet the applicable provisions on treatment and the needs of people with disabilities, while the buildings of the last twentieth century, largely do not meet the provisions and plates adapt them to the needs of people with disabilities through reconstruction and extension building. Several conclusions were drawn from the conducted research and analyzes, which were described in the publication. The presented project is an attempt to generalize the design and executive procedures for the implementation of construction investments in the form of reconstruction, modernization or renovation of old hospitals, as well as in the form of guidelines for the design and construction of new hospitals.

Corresponding Author: Monika Gwozdz – Lason

RECONSTRUCTION OF ANCIENT STONE ARCH BRIDGE VIA TERRESTRIAL LIDAR TECHNOLOGY

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ABSTRACT

The ancient stone arch bridge is the cultural and architectural heritage of human, the protection of it is a worldwide problem. Considering the problems that some ancient stone arch bridges with a long history lack reliable design data, and it is difficult to identify their detailed geometric features efficiently, a novel reconstruction method of ancient stone arch bridge via terrestrial LiDAR scans is proposed in this paper. Firstly, the terrestrial LiDAR is applied to get the whole point clouds of the ancient stone arch bridge surface, and then the point clouds was preprocessed. The non-uniform rational B-spline (NURBS) algorithm is used to extract, fit and reconstruct the ancient stone arch bridge based on the point clouds. The results show that terrestrial LiDAR technology could be used to get point clouds of the stone arch bridge comprehensively and accurately, and realize the reconstruction of the stone arch bridge model.

Corresponding Author: Yufeng Shi

MODELLING CONSTRUCTION CLIENT RISK PERFORMANCE USING ORGANISATION BEHAVIOUR PARAMETERS

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ABSTRACT

This paper presents work that forms part of an ongoing research that explores the role and behaviour of the client in the management of risk within the construction project. The role of client in inducing project risk has not been adequately covered and the construction industry. A focus on this aspect of risk should enable construction to square up the 'risk circle' for managing projects and contribute to the general development of risk management strategies for construction organisations. The study adopted a competing values framework on organisation behaviour that resulted in an elicitation instrument for testing the relationship between organisational characteristics and risk performance. Data was obtained by surveying a sample of client organisations who are actively engaged in procuring projects in the UK construction industry. The outcome of the research showed that the parameters that are represented in the competing values framework (namely, Open system, Rational model, Internal process, and Human resources) affected the risk practices and attributes of the client in different ways. The outcome specifically showed that the Rational Model has a significant positive influence on risk performance while the Internal Process has a significant negative influence on risk performance. Both the Open system and Human resources showed insignificant influence. This will provide a new innovative approach toward managing risk, where client involvement is transferred to an active risk stakeholder, rather than a passive participant. It will solve problems caused by inflexibility, high rationalisation and defensive mechanism of conventional management of risk. The development will provide an alternative culture to risk management different than a claim culture between the client and contractor which dominates many construction projects.

MODIFIED METHOD OF VARIABLE ELASTICITY PARAMETERS FOR SOLVING PROBLEMS OF DYNAMICS OF ROD SYSTEMS TAKING INTO ACCOUNT PHYSICAL AND GEOMETRIC NONLINEARITIES

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ABSTRACT

The article describes an algorithm for calculating vibrations of rod systems by the finite element method, based on an iterative process that allows taking into account physical and geometric nonlinearity. The iterative process, which takes into account physical nonlinearity, is based on the introduction of the cubic dependence of stresses on deformations into the calculation and the comparison of the secant elastic modulus at each step of the iteration. When calculating the stiffness matrix, an additional term (matrix) is introduced that takes into account geometric nonlinearity. A comparative analysis of the results of the calculation with a linear dependence between stresses and deformations and the calculation with a cubic dependence of stresses on deformations is given.

Corresponding Author: Alexander Shein

CHARACTERISTICS OF EXTERNAL CONNECTION IN CROWD INNOVATING SPACE BASED ON COMPLEX NETWORK ANALYSIS: TAKING JIANG'AN DISTRICT OF WUHAN AS AN EXAMPLE

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ABSTRACT

Crowd Innovating Space is one of the important space carriers for the current and future development of innovative economies in China. As an important intermediary for integrating space and social resources, the enterprise's external cooperation network determines the ability of Crowd Innovating Space to integrate resources. Therefore, this paper uses complex network measurement to systematically analyze the characteristics of the external cooperation network and spatial distribution of the Crowd Innovating Space from the perspectives of node importance, node connectivity, and node functionality. The paper found that the external cooperation network development of Crowd Innovating Space in Jiang'an District is in early stage, and its innovative intermediary role is not obvious. Furthermore, the internal growth of the network is less than the external promotion, and most of the network cooperation's is information exchanges. Meanwhile, the functional combination of the network is more about functionality than geography. And most of the enterprise's external cooperation objects clustered to various functional centers in the city, indicating that they have the dual spatial characteristics of geographical proximity and merit-based. Which can enhance the explanatory power of the inner connectivity of urban space.

Corresponding Author: Ran Yaolin

SPACE BACK TO HUMANISM: RESEARCH ON THE DEVELOPMENT TREND AND COUPLING CHARACTERISTICS OF "INDUSTRY-CITY-PEOPLE" IN LONDON

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ABSTRACT

Human-oriented development is an important issue in the world, and it also has become an important driving force for urban development and industrial upgrading in world's major cities. So the paper takes 33 administrative districts of London as the research object, through judging the current development trend and coupling analysis characteristics of industry, city and people in London, hoping to provide some references for the future upgrade and development of large cities. This paper constructs a human-oriented index system about the development of London's industry, city and people, and comprehensively evaluating the degree of industrial development, urbanization and people development of each administrative district of London by SPSS principal component analysis, while using the physical coupling coordination degree model to analyse the characteristics of the coupling development of London's industry, city and people. It is found that London's industrial development has the characteristics of central agglomeration and development in the direction of west, northwest and southeast. While city development also has the characteristics of central agglomeration, and it is developing towards the southwest and southeast. However, the characteristics of central agglomeration of human development is not obvious. It is developing along the south bank of the Thames and southwest of London. In addition, the coupling results of industry, city, and people systems have prominent functional hierarchy characteristics, which are obviously related to the layout of urban industrial function value areas. Finally, the paper summarizes the revelations for the development of major cities.

Corresponding Author: Ran Yaolin

QUALITATIVE RISK ASSESSMENT OF PASSIVE HOUSE DESIGN AND CONSTRUCTION PROCESSES

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ABSTRACT

Global climate change and increasing energy costs as well as environmental concerns have led to the increased worldwide interests in passive buildings, which have minimal energy consumption and reduced environmental impact. Passive houses design and construction processes are much more complex than it is in the case of buildings developed in the traditional standard and they are associated with many risks. In this work the selected problems related to the design and construction of passive buildings were presented. The risks were divided into three categories: problems with the architectural and construction design, problems with the installations design, and problems at the building site. All in all, 30 risks in design and construction of passive houses were identified. Their causes, consequences and possibilities of detection were investigated. Qualitative risk assessment of passive houses design and construction applying Failure Mode and Effect Analysis was presented. It allowed to gather information for making decisions in the risk management process. The qualitative risk assessment results (the list of the most important risk factors, their causes, consequences and detection possibilities) enhance avoiding undesirable problems and errors, as well as additional costs associated with the project failure and support meeting the deadline for the passive house investment. The qualitative risk assessment results are also the starting point for development of a comprehensive risk management model for the design and construction of a passive building.

DEFINING SUITABLE SAFE SYSTEM PROJECTS IN AFRICA

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ABSTRACT

When dealing with road safety in Africa, one should bear in mind that road safety problems in Africa must be seen in their own context as the solutions proposed to address them. While it is relevant to take into account international good practices, African stakeholders should become owners of the interventions addressing their problems and take the responsibility for developing and implementing the appropriate solutions, taking advantage of suitable technical assistance, if needed. Based on these considerations, in this paper a presentation is made of the process used in the European research project SaferAfrica to define suitable Safe System projects in Africa. SaferAfrica aims at supporting policy makers and stakeholders with evidence on critical risk factors, related actions and good practices drawn from high quality data and knowledge. In the project, road safety and traffic management capacity reviews at the country level were carried out in five countries (Cameroon, Burkina Faso, Tunisia, Kenya, and South Africa), following the World Bank guidelines. After conducting such a capacity review, these guidelines recommend the preparation and implementation of Safe System projects, “stand-alone, multisector initiatives targeting high-risk corridors and areas, with outcomes large enough to be reliably measured.” In SaferAfrica, this approach aims at facilitating the implementation of Safe System projects in the considered countries, by identifying detailed short-term improvement plans, and producing contextualized Terms of Reference for a number of interventions per selected country. These interventions are remedial in nature, they address high-priority concerns and demonstrate the viability of high potential gains within current administrative and legislative frameworks. In order to design interventions suitable to the existing context, the SaferAfrica transferability audit was adopted within a “participative” process, involving all possible interested parties, from the institutions to NGOs. Results from the process are presented and discussed.

Corresponding Author: Davide Shingo Usami

EFFECT OF POLYVINIL ALCOHOL FIBER ON THE MICROSTRUCTURE AND PROPERTIES OF CEMENT COMPOSITE WITH EXPANDED GLASS AGGREGATES

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ABSTRACT

The paper presents the results of the tests conducted with light-weight cement-based composite consisting of Portland cement (CEM I 42,5R), expanded glass aggregate (PSU), waste materials with pozzolanic characteristics (metakaolin generated in glass cullet granulation process (MW) and fluidized bed catalytic cracking catalyst (FCCC), and PVA fibres. Two different types of PVA fibres were used in the specimens tested: fibres of diameter 40±1 μm and length 8±1 mm; fibres of diameter 200±1 μm and length 12±1 mm. Two types of cement-based composite specimens were moulded for the tests containing 0.25 % and 0.5 % of the same type of PVA fibre by weight of cement. The following parameters of the composite were tested: hydration process (differential scanning calorimetry), microstructure and chemical composition (SEM, X-ray microanalysis and ultrasonic pulse velocity); mechanical and drying shrinkage characteristics were measured. The test results showed that PVA fibre reduces the heat release rate in the acceleration phase of the hydration process. SEM test results revealed the formation of dense C-S-H micro-zones around the fibres and a good contact between the fibre and the binder. The development of such a structure increases the compressive strength of the composite modified with PVA fibre compared to unmodified control specimens. However, the tests also revealed that PVA fibre do not have significant influence on flexural strength of the specimens. The drying shrinkage tests showed that after 28 days of curing the shrinkage of PSU modified light-weight composite is about twice lower than the shrinkage of control specimens (without PVA fibre) irrespective of the size and the amount of PVA fibre in the composite.

Corresponding Author: Donatas Sikarskas

TEACHING ARCHITECTURE: FOLLOWING KEY CONCEPTS WITH A SOCIAL IMPACT IN DESIGN STUDIO PROPOSALS

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ABSTRACT

Architecture, as a creative domain, allows its teaching and practice as well to highlight different features, equally important. One may focus upon creating better conditions for living, others upon the role of perception and of letting people experiment and experience space, others upon an architecture that allows its user to grow as a person and make sense of the world. In this context teaching architecture assumes helping the students acquire the needed skills and abilities for the profession, as well as helping them find their own path by exposing them to different challenges and allowing them to experiment and envision various ways of reaching outcomes. Given the status of proposal assumed by most of the design studio assignments, successfully implementing such features in designs depends in a first phase upon theme and context, upon the way they sustain each other, respond to one another, and then upon correctly identifying problems, challenges and needs at various scales, upon envisioning outcomes. The article shall focus upon the role and ways of addressing the potential social impact of architectural design studio proposals by following contemporary key concepts in a way that highlights, as skills acquired by the students, the capacity of understanding, of finding solutions and deciding, of following coherence, of designing an architecture that could change for the best the lives and experiences of its users. The method proposed starts with interdisciplinary bibliographic research besides the common architectural research of the assignment, of the program, of the context in order to identify the particular ways architecture could benefit its users. Research should further inform decision making regarding the key concepts to be followed (as, for example, social equity, accommodation of future growth, facilitation of discussions, exchanges and collaboration, wayfinding) and the coherent architectural responses. The article proposes a method to be applied in the design studio, already tested – as a first phase in a project – in workshops held by the author, focusing on certain contemporary key concepts which highlight the very important role played by architecture in an anthropological perspective. The method proved its usefulness as the results showed the raised awareness of the students towards the potential impact of their design and openness towards understanding and further exploring it.

EXPERIMENTAL MODEL OF PLAN CURVED FOOTBRIDGE SUPPORTED BY ARCH

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ABSTRACT

The new type of plan curved structure with upper deck has been developed within the research of arch structures. The paper describes the process of the research and the design of physical model in scale 1:10 built for testing of the structure type. The design of the structure has been based on observation of static and dynamic behaviour of arch structures of various radii of plan curvature. Internal forces, deformations and natural modes were monitored for different methods of the design. At first, simplified method of designing of plan curved structures with arch situated in the bridge axis has been investigated and the behaviour of structures designed in accordance with this method has been studied. It has been discovered that simplified method can be used for design of structures with plan curvature radius of 250 m or higher. After investigation of other design methods, the method based on inversion of suspension cable has been chosen for further development. The method has been improved with processes that allow the application for plan curved structures. The result is plan curved structure supported by spatial arch. The geometry of the arch corresponds with ideal thrust line of the arch for given permanent loads. The composite structure with steel arch of span of 60,0 m with radius of plan curvature of 37,5 m has been designed and analysed thoroughly in MIDAS Civil software. The behaviour of the calculation model has been compared with behaviour of physical model in scale 1:10 that has been built in laboratory of Faculty of Civil Engineering of BUT. Results have demonstrated that calculations and measurements correspond.

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GUIDELINES FOR ENERGY RETROFIT OF EXISTING BUILDING ENVELOPE THROUGH A PROPOSED DECISION TOOL

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ABSTRACT

A major source of heat ingress in existing-buildings is through the envelopes. Bulk of cooling load in existing-buildings can be reduced by energy-efficient retrofitting of Roof, Walls and Fenestrations. The popular energy simulation software is black-box type requiring specialized technical skills, voluminous data-entries and several iterations which does not automatically select the most energy-efficient envelope retrofitting material out of the available options in the local market. This paper proposes guidelines for energy retrofit of existing building envelope through a user-friendly spread-sheet based model of a tool for automatically selecting energy-efficient envelope retrofit solutions from the available options. The Tool has been developed on the commonly available MS-Excel spread-sheet platform using CIBSE Admittance Method. The thermal properties of existing building envelope systems in combination with retrofitting options and their costs are the most important constraints for decision making. Cooling load has been primarily considered. The developed model is used to find the most energy-efficient solution for retrofitting of a 5-Star hotel in Delhi with minimum heat ingress, initial cost and maximum NPV. To confirm the validity of the proposed model, energy performance of existing building and selected retrofitting materials were evaluated using eQUEST. Parametric studies based on regression analysis of tool results were also done to develop generic guidelines on the effects of decision parameters in energy performance of retrofitted buildings. The equations / models derived give the value of factors by which reduction in U-value, α-value and SHGC-values effect the reduction in heat ingress for the typical existing envelope types. This will enable the users like Architects, Engineers, Builders and Researchers in choosing the right U, α and SHGC Values from various energy efficient Roof, Wall and Glazing retrofitting options to improve thermal comfort and reduce cooling-load in existing buildings.

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URBAN LAYOUT AROUND MARKETS BUILT OF IRON IN THE 19TH AND 20TH CENTURIES. A CURRENT CONSEQUENCE OF THEIR LOCATION SITES IN CASTILLA & LEÓN, SPAIN

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ABSTRACT

Detailed studies have been carried out for decades on the iron markets built in Spain from the late 19th century to the early 20th century. However, until now they have been approached from a historical-artistic perspective. The focus of these studies lies mainly in their contextualization and description, in the use of iron as a novel material and in characterizing their typology and morphology. This research addresses a new line of investigation, evaluating the impact of these singular architectures on the consolidated fabric of the cities where they were implanted. The studio has been focused on the territory of Castilla y León (Spain), because it has many cases that can be studied regarding location of their markets. The criteria analyzed to establish the impact of these constructions on the urban fabric refer to the permanence of the original constructions and use conditions, the type of location and the characteristics of the place. The results show similarities in terms of the characteristics of the chosen plots, with the squares or squares prevailing over the plots between party walls, as well as in economic and functional aspects considered when choosing them, seeking large and airy spaces. It can be concluded that these centuries-old landmarks, both those that remain unchanged, as well as those that were demolished or replaced by other buildings have had an impact on the urban context of these cities in a very significant way. They have managed, not only to modify the urban layout of representative and practically consolidated areas of the historic quarters, but have also managed that its urban configuration lasts until today, despite the difficulties, narrowness and limitations in the current traffic that its existence causes.

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FOOTBALL STADIUMS AFTER THE CORONAVIRUS - A PROPOSAL

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ABSTRACT

As we are writing this article, the first phase of coronavirus has passed but in some countries it seems that there is going to be another phase (increase in the number of coronavirus cases). In general, during the first phase of this Covid-19 pandemic, sports have stopped, competitions were cancelled as many football events (like some from Champions League) were known to have been a reason for the wide spread of this infectious disease. As we'll move on and the cases of patients with Covid-19 will hopefully decrease, sports will come back to life and will once again gather fans (certainly still with a lot of restrictions). In this article we shall present the current solutions applied for football events and the impact they have upon the football supporters, as well as different solutions proposed in order to bring the public once again back on stadiums, keeping our focus on safety for the users. For a football club, to be able to fill its stadium with supporters (based on current physical distancing rules) could mean the difference between winning or losing, between being relegated or champions of that football division. In this tough period, having next to you the "12th player" (the supporter) would mean a lot for everybody (from the supporter who can leave all his problems at the gates of the stadium to the football club that will create, once again, the specific atmosphere of a football event). Football stadiums, through their components and equipment, based on the design re-envisioned by architects and engineers, can decrease the likelihood of becoming infected with Covid-19, the challenge being also re-envisioning a meaningful atmosphere and experience for the supporters.

SMALL STEPS IN PUBLIC CONSTRUCTION

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ABSTRACT

In Hungary there are abuot 700 segregation, mostly their habitans are gypsies. Monor is a small city 40 km from Budapest. We are acquainted with Taban settlement (the segregated part of Monor) because of our frienship with the leader of the Presence Programme at the segregation. He had asked us architects with a few topical problems and long term plans. As we became familiar with the settlement, we soon realized, that the task was not just running an ordinary architectural programme. The rules of the environment, which were unknown to us, made us cautious and patient. Since social architecture became a research area at the Department of Public Building Design of the Faculty of Architecture at the Budapest University of Technology and Economics, a new working group was created by professors and doctorate students. After a slow, six month-phase of „getting to know each other" , the group defined a construction strategy wich build on the already existing results, and moves towards a self-motivated improvement of one's quality of life. While the tumble-down metal barrel vault of the „Hangár", the symbol of the past years was perfect for the first years of the Presence Programme, it has already fulfilled its mission which was the expression of identification and solidarity. As architects, we were wondering how we could create higher quality, while accepting the local conditions and financial constraints. Our mission was to show that the construction can be both a physical and a spiritual development, and it is worth to be ambitious, attentive, thorought and diligent even under these circumstances. In the past years, we dedicated a course at the university for social architecture and designated the settlement for semester long assignments. Analyzing the expiriences of past semesters, the students create more and more meaningful plans. The slowness, the lack of money help to clear the desires and the cast off the unnecessary.It perfectly fits this process, that after two years of preparation, the first element which was materialized was the smallest object we had planned: the building to dry and store bio-briquette.

ROTATIONAL STIFFNESS OF DOWELLED MOMENT CONNECTION AND SPLITTING CAPACITY OF WOOD: EXPERIMENTAL INVESTIGATION RESULTS

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ABSTRACT

Use of dowelled moment connections in knee joints of timber portal frames enable to assembly the structural unit in a building site and makes it possible to overcome transportation limitations. Hovewer after some decades under service loads small rotational displacements develop progressively between the column and beam members, exhibiting consequences of semi-rigid behaviour of connection probably resulting in the loss of functionality of the structure. Rotational movement in a knee joint develops due to fastener's bending deformation and the plastic embedment of the bolt into the wood. For purposes of structural analysis, the rotational stiffness modulus K_{φ} expressed by the moment value inducing the rotation between connected elements on an angle of one radian (kNm/rad) is important parameter to be determined by current research. The load bearing capacity as well as the stiffness of a semi-rigid connection may be increased by increasing the radius of fastener location circles in the connection. At the same time, the tension stresses increase perpendicular to grain direction and shear forces at the external sections of members become more significant. Experience from practice and design promoted to create one more direction of research- splitting capacity of wood. Methods treated: a review of technical and scientific information sources, numerical test of models by Dlubal RFEM software and experimental tests of two type models. The first serie consists of semi-rigid moment resisting connection models tested under short-term and long-term static load for evaluation of rotational movement including creep effect. The second serie of models simulate the splitting behaviour of wood in tension perpendicular to grain when so called open mode loading become real near bolt hole. Theoretical and numerical investigation of models show that development of rotational displacement between elements in connection has been affected significantly by load level and time. Long term load tests prove the moderate increase of rotation due to embedment creep of wood. Tension stresses perpendicular to grain direction generate a brittle fracture mode when design load level has been reached. Connection models were rebuilt a several times following of short term loading test results to gain the best simulation of semi-rigid connection behavior during test. Loading rate during short-term tests influences significantly the load bearing capacity of model. An appropriate experimental setup for long term loading were constructed. The main limitations are for model sizes in relation with available long-term load setup. Long term load test results show that average rotational stiffness of bolted moment connections decreases by 0.035 $kN{\cdot}m{\cdot}rad^{-1}$ per day or 1 $kN{\cdot}m{\cdot}rad^{-1}$ per month. Short-term load test results prove that connection rotational stiffness is dependent on connection design. Rotational stiffness rate is K_{φ}= 90 $kN{\cdot}m{\cdot}rad^{-1}$ if external circle radius (fastener's distance from connection centre) is r_{ex}=60 mm and K_{φ}= 20 $kN{\cdot}m{\cdot}rad^{-1}$ if r_{ex}=35 mm. It is found that by increasing fastener's distance from connection centre with at external load by 1mm, rotational stiffness increases by 2.8 $kN{\cdot}m{\cdot}rad^{-1}$. Results of numerical analysis using Dlubal RFEM software showed that reduction of knee joint rotational stiffness in three hinged timber portal frame (span 30 m and apex point height 14.5m) significantly increases horizontal and vertical displacements at knee and apex points: up to two times greater displacements occur comparing with the three hinged portal frame model with absolute rigid (glued) connection in knees.

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ROAD SAFETY ISSUES ADDRESSED BY AFRICA ROAD SAFETY ACTION PLAN: ARE THEY STILL RELEVANT?

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ABSTRACT

In 2011 the Africa Road Safety Action Plan (ARSAP) established an Action Plan to meet the objective of reducing road traffic crashes by 50% by the year 2020. Despite this effort, the situation worsens year after year and Africa is the continent with the worst road safety performance. To contribute reverse this trend, the SaferAfrica project, a joint effort of 17 partners from Africa and Europe, was launched in 2016. Within the framework of SaferAfrica project, the Crowdsourcing tool was developed and implemented through the African Road Safety Observatory. The Crowdsourcing tool aims to collect opinions and road safety needs of an African country from African citizens; report general road safety issues at country level; and propose ideas to improve road safety in the country of origin. In total, 73 reports were received from 29 countries covering the five African regions. However, Crowdsourcing participants frequently reported more road safety problems in a single report, so a total of 180 feedbacks were received. Thus, the objective of this paper is to perform a comparative analysis between the road safety reports from the Crowdsourcing tool and the ARSAP expected accomplishment and activities, and determine if the road safety problems addressed by ARSAP are still relevant, based on the actions promoted by each of the five pillars and their implementation status in accordance with the mid-term review.

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SHIFTING FROM A RISK MITIGATION PROJECT TO AN ADAPTATION URBAN PROJECT: THE CASE OF CURITIBA'S LAGOON PARKS

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ABSTRACT

Drawing upon the sustainability transitions theory, the paper aims to explore how the risk mitigation project of Curitiba's lagoon parks shifted to adaptation urban projects in the context of tackling climate change. "Urban acupuncture" was the pioneering strategy adopted by Curitiba's Municipality through the introduction, more than 40 years ago, of a limited number of low cost projects in some natural lagoons as innovative experiments that operate as a niche in a multi-level perspective. The projects acted as a way of resisting the pressure of urban intervention trends focused on transforming natural landscapes into new built-up urban areas, or intervention in natural ecosystems with water drainage and engineering solutions. These experiments and their synergy now constitute urban parks with a leverage impact on the capacity the city has to adapt to climate change, creating tension on the institutionalized regime. Through this case study, we examine the importance of governance, leadership and urban networks professionals in addition to technical features of the projects. The findings suggest that a top-down strategy, long time frame, and the exclusion of community participation have a limited likelihood of replicability and are discouraged nowadays in public urban policies. The paper contributes to highlighting the link between experimental urban acupuncture and sustainability transitions through incremental projects in natural areas for climate change adaptation. It contributes to the understanding of transitions in the southern hemisphere where institutions struggle with tight budgets, incremental interventions and specific nondemocratic contexts, and raises concerns about the critical role of governance.

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METHODOLOGY OF LANDSCAPE SURROUNDINGS AN EXAMPLE BY ANYKŠČIAI DISTRICT MUNICIPALITY

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ABSTRACT

The common goal of the research is to contribute to scietific knowledge of Lithuanian landscape. The concrete goal is to create a methodology of the division of landscape surroundings. In Lithuania there is no unanimous moethodology of the division of landscape surroundings so far. So this methodology offers new and summarized method of how to divide landscape surroundings. To realize the concrete goal, these tasks have been set: 1. To analyze literature sources; 2. To present conception of landscape surroundings; 3. To present territory parrameters of landscape surroundings; 4. To present the clasification of landscape surroundings; 5. To present the examples of landscape surroundings territorial differentiation; 6. To present vizual potential of landscape surroundings; 7. To make typological analysis of landscape surroundings. The following methods were used in this work: literature analysis, cartographic analysis, database analysis, mapping method. Considering that the concept of landscape surroundings is not completely clear, this work aims to present the concretized concept of landscape surroundings and to identify landscape features that define the size and boundaries of landscape surroundings. Having discussed all the above mentioned aspects, the author introduces the clasification and methodology of the division of landscape surroundings. Besed on this methodology, author makes and presents cartoschemes of landscape surroundings of Anykščiai districrt municipality. Also the work discusses the diversity of landscape surroundings in Anykščiai district. This area is characterized by landscape features. Thus, this methodology makes it easier to identify and delineate landscape boundaries, define its boundaries and identify landscape differences, and provides landscape cartographic visualization capabilities that could be used to represent different landscape features, such as natural and anthropogenic parts of the landscape. The results of the work are reflected in the maps of Anykščiai landscape areas.

USE OF THE HABU METHOD FOR EVALUATION OF THE BEST BROWNFIELD REVITALIZATION OPTION

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ABSTRACT

The paper is focused on the evaluation of socio-economic efficiency of selected brownfields restoration projects. In recent decades, the revitalization of brownfields has become the focus of urban planning not only in the Czech Republic. The city of Brno has also been involved in the development of these areas for a long time, and the proposal for a new zoning plan, which is currently being discussed, should greatly facilitate the development of such localities. Spatial planning documentation aims to determine the urban concept, the concept of landscape layout and the concept of public infrastructure, defines the built-up area, areas and corridors and sets the conditions for the use of these areas. Given that a significant part of these development sites is located in strategically important parts of the city, their use is key to its further development. It is therefore appropriate to consider what land use alternatives the spatial plan allows and how these alternatives can contribute to the effective use of the area also in the context of its surroundings and in connection with the Strategic Plan for City Development. The main goal of the research is to define the procedure for evaluating individual alternatives for the use of a given area in order to find the optimal solution for both the investor and the city (public). To set the goal, the Highest and Best Use (HABU) method was chosen, which evaluates the development of the area from the point of view of legally permissible, physically possible, financially feasible and maximally productive, supplemented by specific elements of cost-benefit analysis (CBA) so as to evaluate the impact of revitalization projects. The output of the article is a methodical procedure for the evaluation of alternative solutions for the development of brownfields.

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A COMPREHENSIVE APPROACH FOR THE SEISMIC VULNERABILITY OF A BUILDING OF PUBLIC UTILITY

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ABSTRACT

The purpose of research. The paper presents a complex approach performed to identify the vibration natural periods of a building of general interest, in the form of H, with basement, ground floor and 7 levels, built in 1968. Thus, qualitative and quantitative analyzes, topometric measurements, non-destructive tests, vibration recordings from microseisms, in order to establish the general technical condition, the degree of geometric conformation, the determination of dynamic characteristics, as well as static, modal modeling etc. for the validation of those obtained results were made. Finally, proposing several consolidation solutions, because the building is located in Bucharest where the peak ground acceleration (pga) is 0.3g according to the Seismic design code and a further increase to a mean return period of 475 years for pga is taken into consideration. At this moment, this building is in the process of consolidation and rehabilitation and will be included in the national permanent vibrations monitoring program. Principal results: eccentricities and irregularities from nonstructural components, relative horizontal displacements, sclerometric and ultrasonic recordings, spatial structure displacements in the three main directions NS, EV and vertical Z, velocities, accelerations, frequencies and periods, structural damping factors, basic shear force etc. Major conclusions. It is important to obtain correct information regarding the behavior of a structural system, the contribution of each presented technical approaches is consistent, using the advantages of non-destructive methods, ambient vibration monitoring and modal analysis. Reducing the seismic risk of buildings in Romania is a complex action nowadays, of national interest, and in 2020, a national strategy on seismic risk reduction will be finalized (with legislative, normative, investment reforms etc.).

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ENERGY AUDIT OF BUILDINGS COMMISSIONED UPON COMPLETION OF INDUSTRIAL FACILITY CONVERSION PROJECTS

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ABSTRACT

This article deals with the problems of an integrated energy assessment of industrial and civil facilities commissioned upon completion of conversion pro-jects for capital construction facilities located on former industrial sites. It de-scribes the need for updating the regulatory framework that determines the general methodology of this type of works and specifies energy research methods and instruments. In addition, it formulates requirements to professional skills of experts involved in this research. The article reviews European experience of energy saving and enhancing the energy efficiency of this type of buildings. It should be noted that only every fourth subject of the Russian Federation, the largest energy producing country, has an approved energy saving and energy efficiency improvement governmental program for newly commissioned buildings and structures. The article also offers an organizational and methodological structure for raising the energy efficiency level of buildings being commissioned after conversion of industrial facilities.

INFORMATION SUPPORT FOR INDUSTRIAL AREA REDEVELOPMENT PROJECTS

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ABSTRACT

Urban development is not only driven by higher residential density, taller buildings in business quarters and intensive infrastructure development, but also by individual urban areas being repurposed. Industrial areas account for highest potential in terms of area development within a city. Historically, such manufacturing conglomerates formed on the outskirts of cities, but a development of any urban community is tied to its area expanding. Thus manufacturing facilities once located on the outskirts have come to be in the central parts of large cities where they create an excessive burden on the environment; and make products at inevitably higher costs due to additional expenditure because of the high cadastral value of land and buildings within a city, high wages that have to be paid to specialists living in large cities, and other factors. Decisions on the renovation of industrial areas are made by municipal authorities and the main goal of an investor at the initial stage of entering a project is to form the structure of information support for a project making it possible to design, manage, and launch a redevelopment project.

DIFERENT OPENING DEGREE OF THE WINDOWS AND A DOOR - INFLUENCE ON THEIR ACOUSTIC INSULATION

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ABSTRACT

In Romania, during 2019-2020, in project PN 19 33.03.01, concluded with MEC, there were made researches and studies about the different opening positions for a type of glass door and comparisons with different opening positions of some windows studied in 2018 in project 87PED – ACOUPERM. The facades of civil buildings usually are made of opaque construction elements and glazed building elements. Researches have the purpose to demonstrate the façade insulation of a building and the protection against outdoor urban noise, when there are façade walls with doors and windows. Studies were made with acoustics laboratory experiments. The results of the studies show that in case of both glazed elements, the glass door and the windows, the acoustic insulation made by them depends very much of the materials from which they are manufactured, on the type of configuration of glasses and frames and the dimensional characteristics, as well as the degree of sealing on the contour, respectively the degree of opening of them when there are open. In the analised cases, of windows and the glass door, the airborne sound insulation index, Rw, decreases from max.36 dB (for cosed door) and max 32 dB (for the most sealed and closed windows) to min.9 dB (for the most bigger degree of opening that was tested), depending on the type of door or window configuration. Also the acoustical results show that for all analyzed windows and door, the resonance areas, in the graphs of R indices, occur when the wavelength dimensions of the resonant frequencies are in accordance with the size of the air space of the opening and the spacing between the glass sheets of the window and of the door.

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REGIONAL IDENTITY AND ITS CONTEMPORARY FORMS AS IMPORTANT PART OF SOCIAL SUSTAINABILITY

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ABSTRACT

Globalization changes our world too quick and regions can't keep up. This is visible also in material culture. Sense of belonging to community is ingrown and sustain as a result of surviving as a group. This feeling leads to wellbeing even if it is invented or imaginary. Culture is spread by different copying mechanisms. That affects crafted products and architecture and creates specific signs for each region. Understanding that, we can follow cultural concepts and transform them to fit current era and sustain local identity within the communities. Comparing with evolution, identity as part of social sustainability has the same self-regulated mechanisms. Adaptation process can be achieved different ways, but only few are truly sustainable. Preserving local identity has several ways. Only conserve architecture and material possessions is not enough. We need to look how and why evolved to this shape and use, what are vital parts and we can adapt. We tried different methods and tested them so we can see, if our process is on the good way. Sustainability is process of adaptation through small changes. With this in mind we try to maintain local culture and react to tensions of globalism. Paper shows examples how to continue regional and local identity, transform, interpret it on the first results of project IDENTITY SK - common platform of design, architecture and the social sciences, in form of regional concepts for products and services, coming from interdisciplinary literature and field research and storytelling. First of all it is necessary to research about it, respect it, having a lot of respect and empathy by adding something new, use it with the context and telling stories, not to embed in misinterpretation and be stranded in many form of kitsch.

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BIOCITY WATER MANAGEMENT STRUCTURE IN THE CONTEXT OF BLUE-GREEN ENGINEERING SOLUTIONS IN THE SPATIAL OF HOUSING COMPLEX

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ABSTRACT

In the face of climate change, onerous periods of drought or flash-flood phenomena, integrated water management has become an indispensable element of the urban organism efficient functioning. In most of the city municipal systems, water relations are based on the comprehensive distribution of potable water, comprehensive collection of sewage, comprehensive collection of stormwater and on the management of surface water and groundwater resources. A sustainable urban organism should integrate as much as possible with the biosphere by adapting architecture, urban planning and infrastructure to topographic, climatic, ecological and cultural conditions. The conducted Biocity analysis in terms of urban tissue and water circulation in it made it possible to the develop a diagram illustrating relations of the water management between the fractal elements of the urban organism - from the smallest housing units to Biocity. Housing complexes due to the introduction of blue-green engineering solutions (green roofs and walls, green courtyards, water reservoirs, etc.) and due to the effective use of supplied water can become autonomous and cooperating element of urban structure at the same time, in terms of processes occurring within these complexes (synergistic energy and water processes). These solutions may reduce the amount of water flowing through the urban infrastructure system and create the areas of water reserves. The introduction of autonomous housing complexes in the urban tissue will allow for a synergistic effect in both economic and ecological sense (reduction of an urban heat island (UHI), reduction of surface water run - off (urban ranoff)). It is necessary to develop program and spatial guidelines for optimal parameters of a housing complex that meets the conditions of an autonomous unit.

ECONOMIC EVALUATION OF SMALL BROWNFIELD REVITALISATION PRIMARILY FOR SOCIAL USE

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ABSTRACT

The paper is focused on the issue of the economic evaluation of brownfield revitalization, which served as a power plant, but today is primarily intended for society. It is a relatively smaller former diesel power plant in the centre of the town of Piešťany in western Slovakia, which started producing electricity in 1906. In 1996, the building was classified as a national cultural monument and in 2009 began to be revitalized for wider social use, such as exhibitions, galleries, various free children's educational events, as well as commercial events. The building is owned by an energy company, which has decided to revitalize it at its own expense, even though the building will not be used primarily for profit. The investor provided information about costs of reconstruction. Against this value of costs, the value of socio-economic benefits associated with revitalization can be compared, which can be quantified by various methods, mainly using a tool for assessing profit benefits, but also socio-economic benefits, and it is called eCBA analysis. The value of these socio-economic benefits can be added to the value of the benefits that will bring profit. After comparing the value of all these benefits with the value of costs, we can determine whether this project was profitable and whether it could serve as a template for other similar revitalizations of buildings as this, because there are many around, due to the local culture. At the same time, in the case of lack of interest of cities and local governments, these buildings could be used more commercially, which could also attract business entities to investment and revitalization of buildings similar to this one.

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HERITAGE VALUES AND REHABILITATION: ARCHITECTURAL INTERVENTION IN THE ARCHAEOLOGICAL MUSEUM OF SEVILLE (SPAIN)

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ABSTRACT

The present investigation examines the role of museum buildings in their consideration as heritage institutions. A particular interest in rehabilitation processes and conversion of international exhibition pavilions into museums will be assessed. The Archaeological Museum of Seville will be taken as a case study. The Ibero-American Exhibition of Seville (1929) was a paramount event in the city, with a vast development of the southern area of the city as well as a display of flourishing regionalist architecture. Its powerful image has transcended from this temporary event, embracing relevant institutions over decades, such as the Archeological Museum. Plus, historical preservation has enhanced its heritage value. Within the grounds of the historic María Luisa Park, the museum has undergone a remarkable evolution as an institution that requires a new relationship with its building, together with an adequation to new museological perspectives. During the lifetime of the museum, the former exhibition pavilion has experienced a succession of rehabilitation processes in the 20th century, always searching for a continuity with the concept of the original building. However, the evolution of the institution faces new challenges for the 21st century: display of the collection, technological issues, public and community services, network affiliation, etc. A series of cultural heritage protection measures that affect the property and its collections, its immediate environment, and the urban environment in which it is located, condition the building and its urban context. Nowadays, a new architectural intervention is in process, with the main goal of putting together all these requirements. The project also deals with the production of a new architecture of representation, respecting and rehabilitating the original regionalist building but also creating a contemporary image for the institution. The relevance of the museum, together with its urban role, make the Archeological Museum of Seville an important agent of cultural requalification. In conclusion, this paper will show how urban culture has been renewed, experiencing a decisive transformation of public spaces and cultural facilities, for leisure, education, or tourism. A new reconsideration of the Cultural Property in question is an experience that can be extrapolated to other museum experiences that emerged in the 20th century and that are currently undergoing a comprehensive reexamination.

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EFFECT OF SHEAR REINFORCEMENT ON PUNCHING SHEAR CAPACITY OF REINFORCED CONCRETE FLAT PLATES

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ABSTRACT

Punching or two-way shear is a critical failure mode that must accounted for in reinforced concrete (RC) slabs that are not supported by beams, known as flat plates. The often gravity driven failure occurs around supporting columns may also be influenced by lateral forces. This paper presents the findings of a numerical study that evaluated the effect of shear reinforcement bar diameter on punching shear strength, and stirrups distribution length, L, measured from the face of the supporting column. The study was conducted on seven 3D nonlinear finite element models representing RC flat plates subjected to concentric vertical loads. Each of the seven models simulates the punching shear behaviour of interior slab-column connections with different shear reinforcement bar diameters and/or reinforcement distance from face of supporting column. Numerical investigation showed that increasing the stirrup diameter causes a significant increase in the ultimate two-way shear capacity. On the other hand, increasing the stirrups distribution length provides moderate increase in the ultimate punching shear capacity. Furthermore, punching shear assessment using 3D finite element analyses were in good agreement with the mathematical models of the ACI-318-2019 building code.

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COMPRESSIVE STRENGTH, SPLITTING TENSILE STRENGTH, AND CHLORIDE PENETRATION RESISTANCE of CONCRETE WITH SUPPLEMENTARY CEMENTITIOUS MATERIALS

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ABSTRACT

This article presents the outcomes of study that examined the durability and mechanical characteristics of self-consolidating concrete (SCC) mix in which a percentage of the required ordinary Portland cement (OPC) was substituted with either fly ash or ground granulated blast furnace slag (GGBS). The first part of the study evaluates the chloride penetration resistance and compressive strength of SCC mixes in which OPC in a designed control mix was partially replaced in a series of mixes by fly ash in percentages ranging from 10% to 40%. It noted that replacing OPC with fly ash at each of the four percentages studies improved chloride resistance of concrete compared to the control mix made of 100% OPC as binder. The 40% fly ash mix was the best performer in terms of resistance to chloride migration in contrast with the 100% OPC mix. Samples prepared using the 40% fly ash mix SCC mixes had the lowest compressive strength after 7 days of moist curing. However, the 28-day compressive strength of 40% fly ash mix was a healthy 55.75 MPa, only slightly lower than the 100% OPC mix. Tests also showed that adding 2% or less basalt fibers to the SCC mix in which 40% of OPC improves concrete resistance to chloride migration in contrast with the 40% fly ash mix that didn't contain basalt fibers. This paper also reports the relationship between splitting tensile strength and compressive strength of SCC mixes in which up to 80% of OPC was substituted with GGBS. A total of eight mixes were produced by varying the amounts of GGBS used to replace OPC content of the control mix. The fresh properties were assessed through the flow test, visual stability index (VSI), and the T50. An empirical relationship was developped to predict the splitting tensile strength based on 28-day compressive strength, and its accuracy was evaluated in comparison to formulas in various design codes.

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VISUAL INTERFERENCE IN THE GLASS FACADE

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ABSTRACT

The work analyzes issues related to the integration of architecture and art. The aim of the publication is to investigate the phenomenon of visual interference occurring in architecture. This phenomenon is an important artistic issue that opens the way for new compositional values in architecture. The process of creating visual interference is made in two spaced apart layers of a graphic image placed on a transparent substrate or spatial graphic elements arranged in a certain order. As a result of overlapping layers of graphics, the image is compressed to form compositions of lines, circles and polygons. The resulting graphic layouts change as the observer changes position. Thanks to this, mobile surfaces are created visually, reacting vividly to the smallest movement of the observer. The paper will analyse the phenomenon aimed at determining the principles of visual interference. and how it affects the reception of the building. An analysis will be carried out to determine the optimal conditions for their creation. The publication will carry out the typology, systematics and characteristics of selected systems. An attempt will also be made to create conditions for the design of interference systems, which may provide design guidelines for graphic designers and designers. An analysis of the usefulness of the phenomenon of visual interference and the determination of how to use it in the creation of advanced facade systems, e.g. integrated with photovoltaic or illuminated systems, will be carried out. The phenomenon will be studied on the basis of buildings constructed in the last two decades. Due to the global nature of artistic phenomena, no limited research territory has been separated. Examples of implementation placed in the facade and inside the building will be cited. Various materials and techniques were used in the realizations: aluminium systems, plastic elements and facade graphics placed on the glass. It will be a text about art and its integration in architecture, about inspiration and passion.

PIONEER DEVELOPMENT OF FACILITY CONSTRUCTION TERRITORY

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ABSTRACT

Peculiarities of pioneer development of facility construction territory in hard-to-reach and underdeveloped areas are considered. It is given the specificity and variety of work for the implementation of which it is advisable to organize a complex flow. The procedure of technological calculations and the construction of the corresponding cyclogram and schedule of pioneer development of the territory, which should be part of the facility construction schedule of the construction management plan, is disclosed. Such a schedule is the basis not only for determining the need for employees, construction equipment, materials and structures, but also for creating schedules for employees' work and rest periods and their turnover during the pioneer development of the territory. The main goal of this work is to improve in-line construction methods using advanced organizational and technological solutions for pioneering the development of the territory for the future construction of buildings and structures. This approach allows, as a result of the application and implementation of the described principles, to form the optimal organizational and technological scheme for carrying out strip-mounting works taking into account the specifics of pioneer development and the preparatory period as a whole. In addition, the principles being implemented significantly affect the duration of work and minimize downtime of construction flows. As a result of the study, the author provides a generalized system of principles for rationalizing organizational and technological solutions for the pioneer development of construction territories., Which in the future can be used as the basis of an automated apparatus for optimizing the model of building an object in pioneer territories through the use of cyclograms and advanced mathematical methods.

TRAFFIC PLANNING CONCERNING PEDESTRIAN TRAFFIC IN CITIES

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ABSTRACT

The aim of the paper is to familiarize readers with the issue of planning and modelling the urban pedestrian traffic. The introduction describes the factors that must be taken into account before designing new pedestrian roads or during reconstructing existing pedestrian areas. The paper furthermore introduces levels of quality of movement of pedestrian traffic, individual types and categories of pedestrians, including their own traffic behaviour. The final part of the paper summarizes the various approaches to addressing this issue, including the presentation of the possibilities of pedestrian traffic modelling based on computer simulation.

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THE INNER FORCES REDISTRIBUTION OF CONTINUOUS BEAMS

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ABSTRACT

The technical plastic theory is applied for steel structures design in actual standards. This theory and standard calculate procedures assumed the plastic redistribution of internal forces by arising and development of plastic hinges and plastic mechanism failure of the structure. The plastic redistribution of internal forces enables the loading of structure to increase. The plastic redistribution and increasing of the loading cause also changes in the support reactions that are generally needed to consider as the actions on the structural supports. The redistribution of internal forces and the changes of support reactions depend on the elastic-plastic properties of constructive steels that are variable. Therefore, plastic redistribution of internal forces may not be absolute, or may not arise at all. In the paper, the effect of elastic-plastic redistribution of internal forces on the load-carrying capacity and the changes of support reactions for selected continuous beams are analyzed.

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ELASTIC-PLASTIC LOAD-CARRYING CAPACITY OF SIMPLE FRAME STRUCTURES

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ABSTRACT

The efficiency of plasticity for the design of steel frame structures is analysed in the paper. Technical theory of plasticity and standard assumptions and requirements for numerical study are applied. Two types of simple frames (double-sided pinned supporting and fixing) with different loading, geometrical dimensions of the frames and cross-sections of their columns and beams are considered. Some results of the numerical study and conclusions are also presented.

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VOCS OCCURRENCE STUDY IN THE OFFICE BUILDING

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ABSTRACT

There is a growing awareness of the importance of maintaining good indoor environments, and with that awareness, a growing need to understand the parameters contribute to a building's indoor air quality (IAQ) and the effect of IAQ on occupant well-being. This paper gives a brief overview of various volatile organic compounds occurrence affecting IAQ. Volatile organic compounds (VOCs) were measured in an indoor and outdoor air at 10 office spaces of public buildings across the South Czech as a part of the Czech Republic. An ultra-fast electronic nose based on gas chromatography is used for the analysis of individual VOC and a photoionization detector with a UV lamp was used for the determination of total volatile organic compounds concentration. The results from this study provide data on VOCs in office buildings that can be used to compare to the data from other public buildings, to examine the relationships of indoor individual VOCs occurrence to conduct risk assessments and to design more focused studies.

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PERCEIVED AIR QUALITY AND PRODUCTIVITY IN THE OFFICE BUILDING

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ABSTRACT

Problems of perceived quality of the environment find its reason especially when monitoring performance and productivity of work. Thus, verification of the degree of environmental quality impact on employee performance comes into consideration. The results of two independent studies involving 50 subjects, and using similar procedures and blind exposures have shown that increasing the air quality (by decreasing the pollution load or by increasing the ventilation rate, with otherwise constant indoor climate conditions) can improve the performance of simulated office work (text typing, addition and proof-reading). Performance testing was performed in the open space office of an office building at three air exchange intensities: n1 = 0.5 h-1, n2 = 1.5 h-1 and n3 = 2.5 h-1. Other physical environmental parameters that could have affected the assessors' performance were maintained in the range: indoor air temperature θai = 22 - 24 ˚C, relative air humidity φai = 40 - 60%, air velocity vai ≤ 0.25 m.s-1, noise level load L = 40 - 50 dB (A), daylight - diffuse radiation component. The present results document the productivity benefits of providing good indoor air quality and indicate that providing indoor air of a higher ventilation level will increase productivity.

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A SOLUTION OF WHEELCHAIR ACCESSIBILITY IN EXISTING BUILDING – APARTMENT BUILDING IN KRASLICE

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ABSTRACT

The aim of this paper is to provide information about solution possibilities in the design of wheelchair accessibility in the existing apartment building. Given the growing population of the elderly, and the efforts to integrate people with health disabilities into society, greater emphasis is placed on ensuring a barrier-free environment in public places, in public infrastructure and at public buildings. Infrastructure, premises, and buildings without barrier-free modifications make it difficult to use and move around or through it. The government is actively trying to resolve these things by creating new texts of building laws, decrees and building standards and by tightening the rules for issuing building permits for new buildings. At the same time, the building authorities have the power to order the owner of the building or the place its construction modification to ensure the barrier-free environment. An example will be given to the existing apartment building in Kraslice city in the Czech Republic, where the building authority ordered an owner of the building to secure construction modifications for the barrier-less use of the building. The solution of barrier-less use of the apartment building for persons with reduced mobility is based on the building layout, possibilities and needs of persons in a wheelchair and persons with a baby stroller, as well as from the building layout and possibilities of persons using crutches, sticks, walkers or other equipment for walking, pregnant women and persons accompanying children under three years of age. The design of the wheelchair accessibility of the apartment building is based on the applicable building law, relevant decrees and building standards, as well as on the implementation possibilities, taking into account aspects such as the existing layout and its possibilities, structure system design, technical equipment, possibilities of surrounding area and investor's financial options. The result is the realization of barrier-free entrance into the apartment building based on the most feasible design, which best analysed all the above aspects.

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MOBILITY IN PUBLIC SPACES OF SMALL TOWNS IN THE CZECH REPUBLIC

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ABSTRACT

The aim of this paper is to provide information about Mobility in public spaces of small towns in the Czech Republic. This text will not describe the history of the development of public space either on a global scale or on the scale of the Czech Republic or the scale of the small towns. There are several reasons. The first two areas have been described many times by world and domestic experts. Therefore, it would be impossible to bring new knowledge to them in a short time, which is defined. Their summation would also be very comprehensive, or conversely, so concise that it would not be an asset. In the third area – the history of public space in small towns of the Czech Republic, we come across another barrier. This is the fragmentation of development trends of inclusion in regions and the location of the seat in the region, the morphology of the terrain, the historical development of the region and many other factors. An emphasis will be placed on small municipalities of 7,000 to 20,000 inhabitants, which are large enough in terms of having to overcome greater distances, but too small to allow their population to be the commercial operation of local public transport, and with a small budget of the city, to be able to subsidize and maintain this public transport. There will be a meeting with the users of the public space and the transport used by them and their choice of transport around the city or through the city. In conclusion, the findings on mobility in the public space will be summarized based on the current situation of a lifestyle, such as the demands of rapid mobility.

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PROPERTIES OF CEMENT-BASED COMPOSITES WITH CARBON MINERAL ADMIXTURE

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ABSTRACT

In the construction industry, aggregates, in the form of fine powder up to gravel, play a significant role as a stabilizing and filling materials for many applications. With increasing demands on quarrying of this valuable commodity, its natural resources have become to be depleted. This work outlines the potential application of waste carbon-based mineral admixture as a partial replacement of natural silica aggregate in the production of cement-based composites. In addition, the influence of used waste material on hydration products formation in cement pastes was investigated. On hardened concretes stored 28 days under water, material properties were characterized by measuring flexural and compressive strengths. Cement pastes were subjected to X-ray diffraction analysis and scanning electron microscopy observations. Obtained results revealed specific behaviour of an incorporated material allowing its addition in a limited amount. Increased content of ettringite was detected in composites with the highest amount of added carbon-based mineral.

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INDOOR ENVIRONMENTAL QUALITY DETERMINANTS IN THE BUILDINGS

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ABSTRACT

The presented aim of this study is to establish or reject the correlation (relationship) between the individual indoor environmental quality indicators and the total satisfaction with the indoor environment. The subjective satisfactory survey has been performed in 10 standardized university classrooms (Czechia) to evaluate the indoor environmental quality (IEQ). The IBSM SPPS Software Statistics ver. 25.0 was used to assess the Kendall non-parametric correlation analysis. Seven individual different indoor environmental quality indicators evaluating by subjective perceptions of the users were reviewed: air acceptability, thermal comfort, humidity comfort, odor comfort, acoustic comfort, visual comfort, and color comfort. The user's subjective perceptions of the indoor environment were collected by questionnaires. Minimizing the ability to adapt and acclimatize was desirable. The statistically significant correlation ($P < 0.01$) were observed between the air acceptability ($\tau b = 0.249$), the odor comfort ($\tau b = 0.260$), the acoustic ($\tau b = -0.244$), the visual comfort ($\tau b = 0.203$), and the colour comfort ($\tau b = 0.192$) and total satisfaction with the indoor environment. The thermal comfort and the humidity comfort are not statistically correlated with the total satisfaction of the indoor environment ($P > 0.01$).

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VOCS EMISSION SIMULATION OF COMMON FLOORING MATERIALS

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ABSTRACT

The objective of the paper is to investigate the environmental and health impacts of the common flooring materials. The paper presents a numerical simulation of volatile organic compounds (VOCs) emissions from flooring surface covering. VOCs emissions are mostly dangerous pollutants with a negative health impact on the human body and carcinogenic risk. The comparative simulation of emission for single flooring materials under standard test conditions was performed. The significant VOCs emissions from nylon carpet, linoleum, vinyl, laminate and hardwood flooring are compared. The results of a chemical analysis simulation confirmed that commonly used flooring surfaces fall into the category of polluting materials.

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A RELATIONSHIP BETWEEN THE VALUE OF THE WHOLE AND SEPARATE PARTS

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ABSTRACT

The aim of this article is to analyse the relationship between the open market values of real property when the real property is sold in various ways. What is considered is the sale of real property as a whole and by its separate parts. Our conceptions are reflected on a specific real property model. The open market value of the real property is set by a comparative and yield-basis method. The difference in established open market values of the real property when selling the real property in various ways equals to 32%. Individual internal and external value-setting factors that make the difference are indicated and discussed. The discussed value-setting factors are mostly as follows: imposing administrative and organizational duties, the nature of the model real property, a position of the real property market, the economic law of declining demand, a risk of rental losses and the situation in the construction industry relating to the new buildings. A further research might be focused on identifying other value-setting factors related to real property.

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DIGITALISATION IN CONSTRUCTION AS AN EDUCATIONAL CHALLENGE FOR UNIVERSITIES

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ABSTRACT

Digitization in the construction industry has become a reality, and universities have incorporated it into their curricula. There is currently a high percentage of workers in the construction sector who are not familiar with the digital processing of documentation. The Institute of Technology and Business in České Budějovice responded to this demand with a research project of intergenerational education, which is being tested in a large construction company. Research results so far show that construction companies can be helped to educate their workers by guiding the sharing of skills and competences. The paper deals with testing the intergenerational sharing of IT competences in construction production. Testing the managed transfer of IT competences brings a new dimension to the education process that will enable accelerated adaptation of staff to the new conditions. It will help companies to reduce their training costs and enable targeted training for a specific worker. The role of the university is in the professional guarantee of the transferred competences and the management of their transfer process. The article brings experience with this new educational methodology.

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HORIZONTAL FORCES ON THE CRANE RUNWAY DURING THE MOTION OF THE CRANE

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ABSTRACT

During the motion of an overhead travelling crane on the crane runway, horizontal forces between the crane and the crane runway girder occur. Some possibilities were presented in a paper by the author in 2018 and 2019. In the last one, a dynamic model was presented. This dynamic model enables us to determine the behaviour of the crane during its motion and also to calculate the horizontal transverse forces between the overhead double bridge crane wheels and the crane runway girder. This dynamic model consists of rigid parts connected by springs representing the elasticity of the steel structure of the overhead double bridge crane. The dynamic model can be used not only for the calculation of horizontal forces but also for the determination of the crane motion in general. The motion of the crane can be investigated both during its accelerating and during its motion with constant velocity. The basic assumption of this model is that there is no contact between the rim of the crane wheel and the rail of the crane runway. This paper shows the simulation of the motion of a specific overhead double bridge crane which is stationary and starts to move due to the engine's torque. The data of the crane are shown in the paper as well as the result of the simulation. The initial conditions of the crane for the purpose of the simulation are described in the paper. The simulation assumes no contact between the rim of the crane wheel and the rail of the crane runway which is consistent with the model's assumptions.

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THE INFLUENCE OF BIOCHAR ADDITION ON THE STRENGTH AND MICROSTRUCTURAL CHARACTERISTICS OF CEMENT PASTES

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ABSTRACT

Nowadays, many branches of civil engineering begin to suffer from the lack of natural high-quality resources. The cement industry is one of the main consumers of such raw materials and, moreover, significantly contributes to global warming by the release of high amounts of carbon dioxide. In this sense, the incorporation of supplementary cementitious materials may help to reduce global environmental impacts of cement production. This paper is focused on the influence of the partial Portland cement replacement using a biochar. Basic material properties of both Portland cement and biochar were analysed. On hardened samples of cement pastes cured under water for 27 days, physical, mechanical and mineralogical properties were determined using several instrumental techniques. Experimental data showed the gradual decrease of bending and compressive strengths with the increasing replacement of Portland cement, however, significant lightening of produced pastes was achieved and thus the cement pastes additive with appropriate amounts of biochar may find usage in specific industrial applications.

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REPLACEMENT OF POLYMER FIBERS WITH HEMP FIBERS IN CONCRETE

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ABSTRACT

Nowadays, many branches of civil engineering begin to suffer from the lack of natural high-quality resources. The cement industry is one of the main consumers of such raw materials and, moreover, significantly contributes to global warming by the release of high amounts of carbon dioxide. In this sense, the incorporation of supplementary cementitious materials may help to reduce global environmental impacts of cement production. This paper is focused on the influence of the partial Portland cement replacement using a biochar. Basic material properties of both Portland cement and biochar were analysed. On hardened samples of cement pastes cured under water for 27 days, physical, mechanical and mineralogical properties were determined using several instrumental techniques. Experimental data showed the gradual decrease of bending and compressive strengths with the increasing replacement of Portland cement, however, significant lightening of produced pastes was achieved and thus the cement pastes additive with appropriate amounts of biochar may find usage in specific industrial applications.

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SAFE AND SECURE CITIES FOR PEDESTRIANS AND SENIOR CITIZENS

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ABSTRACT

The aim of our project TL02000559, sponsored by Technological Agency of the Czech Republic, Prague, is to develop a new attitude to the mobility of our senior citizens in urban settings, more age sensitive and based on possibilities they have in relation to the urban green mobility. The source of the knowledge is the public participation in the form of questioning the elderly citizens to understand the real problems they face. The procedure is based on a redefinition of urban space and following revitalisation and remodelation of public spaces like streets, squares, parks and embankments. This includes reduction of unnecessary car traffic and environmental pollution and traffic accidents, where the elderly are the most endangered group. Nevertheless, it does not mean any reduction in the mobility of the elderly. Mobility of the elderly is a necessity for their quality of life and should be supported by the improvement of transport systems. This enables their inclusion in society. Green transport like walking, cycling, and public modes of transport like busses and tramways should be modernised and developed.

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CHANGE TO BEDROCK MODIFICATIONS AS A RESULT OF ADDITIONAL GEOLOGICAL SURVEY RESULTS RELATED TO THE RENOVATION OF SPORTS PREMISES

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ABSTRACT

When foundations are uncovered during a construction project, the foundation load capacity is often found not to correspond with the prescribed limit values in the project's documentation after being compared with a given deformation module. This is often the result of a corresponding geological survey not having been conducted satisfactorily according to the given construction project's surface area. The most common method of stabilizing bedrock, i.e. increasing the deformation module value, is lime stabilization. This method represents a suitable technical solution for modifying foundation layers, especially from an economic perspective. However, this modification method may not necessarily represent a suitable technical solution because of either the heterogeneity of underlying layers or the existence of fluctuating groundwater levels at the construction site, which can, when the final work is used, affect the mechanical and physical characteristics of the already stabilized bedrock layer.

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DETERMINING THE AMOUNT OF PAST INVESTMENT PROPERTY USING THE SYNTHESIS OF COST EVALUATION METHODS

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ABSTRACT

During its existence, each property requires specific construction operations to extend its useful life. Such construction operations and related investment are usually carried out gradually in dependence on the durability of the building materials used. To determine the overall amount of investment, a synthesis of selected valuation methods is used in this contribution. The aim of the synthesis is to achieve the most accurate result of the investment made. In selected methods used, the value of the investment made is correlated using coefficient to the price level of the investment year. The resulting investment value determined by means of the cost pricing synthesis methodology provides more accurate results than the application of a specific valuation method for the entire set of items priced.

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MODELLING EFFECTIVENESS OF ENVIRONMENTAL GREENERY SYSTEMS AS A TOOL TO PARTIALLY ELIMINATE URBAN OVERHEATING

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ABSTRACT

The paper describes the first results of modelling the effectiveness of environmental greenery systems as a tool for partial elimination of urban overheating. Environmental greenery contributes to the effective management of rainwater flowing from the paved surfaces of the cities. Technical measures will reduce temperature fluctuations, noise pollution and dust concentration. The new rainwater management will contribute to reducing the temperature fluctuations, especially in summer. The evaporation of vertical environmental greenery will at least partially reduce the negative impact of the climate change. Urban greenery is one of the effective measures for urban heat island mitigation and climatic change. The numerical model gives a first idea of how large areas of environmental greenery need to be installed in order to benefit the above-mentioned benefits.

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ANALYSING THE IMPLEMENTATION MOTIVATIONS OF BIM TECHNOLOGY IN CONSTRUCTION PROJECT MANAGEMENT

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ABSTRACT

Construction project management is a difficult process. It includes a lot of participants in the construction project and the relationships between them. Currently, the construction industry is increasing demands on technology. BIM is a progressive intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently in planning, designing, and buildings and infrastructure managing. The research discusses the issue of implementation motivations of BIM using in construction project management. The main aim of the paper is to analyse and give an overview of motivations groups of BIM in construction project management.

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USE OF A 3D SCANNER TECHNOLOGY TO CREATE AN INFORMATION MODEL OF HISTORIC BUILDINGS - A CASE STUDY

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ABSTRACT

Digitization in construction has become increasingly important in recent years. Digital technologies are a way to facilitate some activities and thus save time and money on construction projects. Creating an information model of an existing building can be relatively time consuming. The 3D scanner allows you to perform personal tasks with time savings, which is very important when managing construction projects. Digital technologies are also an effective tool for these activities. This research discusses the issue of 3D scanning historical building for real state surveying purposes. In this case study, the subject of the study was the chapel of St. Rosalie in Košice. The aim of the research was to describe the course of digitization in the building in question, i.e. the creation of an information model of the building. At the same time point out the possibilities and limitations of a 3D scanner on this specific construction.

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BUILDING ROOFS IN SUDAN

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ABSTRACT

Buildings forms in the hot dry region of the tropics had evolved gradually by process of trial and error, using techniques and available materials. The traditional building construction in the hot dry tropic is of massive load bearing walls and thick roofs. These two elements have a considerable heat storage capacity. The heavy structure absorbs heat during the day and released it gradually during the day gradually whenever external or internal temperatures are lower. They also modify the temperature fluctuation and keep the interior comparatively cooler. The performance is satisfactory up to certain extent.

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