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6th WMCAUS 2021

6th WORLD MULTIDISCIPLINARY CIVIL ENGINEERING - ARCHITECTURE - URBAN PLANNING SYMPOSIUM

ABSTRACT BOOK

30 August-3 September, 2021 - Prague (Czech Republic)

Eco-friendly Symposium - WMCAUS

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Preface

This is the Abstract Collection of WMCAUS 2021 and consists of the abstracts of oral and poster presentations in the "6th World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium" in the city of romance Prague (Czech Republic) during 30 August-3 September 2021. 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 "6th 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 500+ submissions to WMCAUS 2021 from 50+ different countries all over the world for their interests and contributions in WMCAUS 2021. We wish you enjoy the 6th World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium – WMCAUS 2021 and have a pleasant stay in the city of romance Prague.

We hope to see you again during next event 7th World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS 2022 which will be held in Prague (Czech Republic) during the period of 13-17 June 2022.

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WMCAUS 2021

ABSTRACT

COLLECTION

ARCHITECTURE AS A PRODUCT OF TOURIST CONSUMPTION

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ABSTRACT

Actually, one of the first things in human mind when hearing about a particular place is usually a typical building, often a landmark, its architectural expression or even a representative landscape. There are buildings, monuments, cities, not only in Greece, but also internationally, which function as tourist attractions without this being the initial goal of their construction. However, there are other buildings, monuments, which were erected serving this purpose, ie to contribute to the tourist promotion of a country. In short, it is commonplace that architecture is an important axis in shaping a country's tourism policy. Architecture, according to Aldo Rossi, "is at the same time a place, an event and a symbol". Apart from the construction in the "traditional" sense that one perceives, it is also the process by which a building is lined up. It is therefore understood that the concept of architecture is used, depending on the purpose, as a means of representation, use, impression, but also commercialization. In particular, when we refer to the relationship between Architecture and Tourism, buildings and spaces are understood as "products", ie as a series of activities and attitudes that enhance and at the same time complete the image and identity of a place (place branding). The aim of this presentation is to investigate the value of emblematic buildings in tourism, while assessing their economic and social value in tourism by the method of benefit transfer. For example, the Sydney Opera House is exemplary in this respect and is estimated to contribute "US $ 640 million in annual expenses to visitors to Sydney", as it attracts visitors, indirectly encouraging them to spend the night and further. In addition, the use of architecture as a tool for shaping the image of a place (place branding), to become a tourist attraction is part of the presentation. In particular, an attempt is made to investigate the way in which architecture has contributed as a tool of official bodies with the aim of promoting tourism both in Greece and worldwide. Concluding, it is noted that the value of virtual architecture is often attributed to the construction of brick and reinforced concrete, while the wider benefits that a building can offer are often overlooked or underestimated. However, what attracts the most stray visitors is the design of the buildings and the virtual architecture which in turn identify a part (country or city) of these important landmarks. While the goal of architects is not to create tourist attractions with economic benefits, however, many are increasingly aware that successful design and functional buildings become attractions for visitors on their own – which form an external environment that requires appreciation, so in the end to end up like tourist products.

EVALUATING DISTANCE EDUCATION PERFORMANCE WITHIN THE SCOPE OF ARCHITECTURAL EDUCATION

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ABSTRACT

Turkey is affected by the COVID-19 pandemic widely as well as all around the world. There is also a global impact in the field of education. Several precautions were taken for preventing infection from COVID-19 at a minimal level. One of the taken precautions is launching a distance education system (DES). DES started to practice from primary to higher education easily and swiftly. This system is an alternative to the existing education system. However, universities' architecture departments that have theoretical courses besides applied courses, are known that they are hard to put to set, moreover, most of them hesitate to start distance education due to characteristics of architectural education. Architectural education teaches codifying phenomenon, concepts, thoughts visually with the help of symbols and teach to analyze these codes. This tenet involves different processes from a student's former education life. Therefore, to reach the aims of architectural education features' and actualization level of learning is essential. Schön (1987) claimed that professional schools give privileged status to systemic, preferably scientific knowledge, and the schools' prevailing epistemology of practice, treats professional competence as the application ok privileged knowledge to instrumental problems of practice. According to Habraken (2006), learning a skill demands exercise, and exercise demands failure and time to try again. When architectural education is considered as a process to gain essential skills, it can be seen that how active learning is important. It does not seem possible to perform "active learning" requirements with the distance education system's existing opportunities and architecture students will perform "passive learning" during DES is thought. This study focuses on how DES is made productive for architectural education which started to use due to the COVID-19 pandemic. The main aim of this research is to determine problems of architecture students and instructors related to distance architecture education and offering solutions. Additionally, this research goals to contribute to the limited distance architecture education system. To reach these aims questionnaire forms were constituted toward interviews with both architecture students and instructors and from the literature review. Questionnaires were prepared separately for students and lecturers. This procedure aims to offer an integrated solution by gathering different perspectives of participants. Data of the project were acquired by applying online questionnaires to participants via e-mail. Obtained data were analyzed statistically using SPSS 22.0 software. This research will make a remarkable contribution about how active learning at applied courses can be increased during DES at architectural schools by presenting qualitative and quantitative findings.

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ROBERT LISOVSKY'S GRAPHIC DESIGN DURING THE PRAGUE PERIOD OF HIS WORK

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ABSTRACT

The problem of the receach of Robert Lisowsky's graphic design within the European context, in particular, during his stay in Prague, where the artist spent more than sixteen years, is still relevant nowadays. The driving force in the development of his creative concept was the training in the workshop of the reformer of Ukrainian graphics - Georgy Narbut. The artist came to Prague after finishing his studies in Berlin, and receiving an invitation to the position of Professor of Graphic Arts in the newly created Ukrainian Studio of Plastic Art. The Prague period of the artist's creative career, along with artistic and pedagogical work, is characterized by active social participation. The favorable conditions of democratic Czechoslovakia were fortunate to the fate of the Ukrainian immigrant culture. At the initiative of the President of the Republic, T.G. Masaryk, a plan to assist the emigration from the former Russian Empire was developed at the government level, which became a unique phenomenon of world diplomacy due to its active humanism. In this favorable atmosphere, a wide avenue for self-realization opened up to artists and creative intelligentsia. The Ukrainian art community actively integrated into the artistic environment of Czechoslovakia. Lisovsky's graphic design works of this period represent impeccably thoughtful, balanced and integral compositions, the presentation of which retains the inherent refinement, nobility and virtuoso performance. The modernist interpretation of national-romantic motifs permanently penetrates the whole graphic work of the artist and, in fact, stylistic fluctuations towards expressionism or constructivism could be typically seen in the book covers of the 1920s-1940s. Regardless the appearance in these works of a whole range of the contemporary European art's style innovations and formal-content searches, this colossal graphic design work demonstrates the priority of the "national" form in the artist's creativity. Applying styles that are close and understandable to the Western European viewer, R. Lisovsky steadily appeals to the bearers of historical memory, motifs and symbolic images of folk and church art, to the culture of the Baroque era, the charms of ancient Ukrainian traditions, the strength of which took on a new era of new forms and modern sound. As an artistic phenomenon, the pre-war design of Lisovsky did not fall out of the general context of the development of Ukrainian Art. Moving to Prague was R. Lisowsky's first significant step towards final emigration to the West. The artist's active involvement in public and pedagogical activity did not affect the quality and quantity of his graphic design. At the same time, the artist's physical detachment from Ukraine did not radically touch his artistic concept. It is impossible to interpret R. Lisowsky's work beyond the context of the Narbut School.

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NATIONAL REPRESENTATION THROUGH VISUAL FORM: THE PHENOMENON OF NATIONAL STYLE IN ARCHITECTURE

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ABSTRACT

The formation and development of national ideas in society stimulates the manifestations of the phenomenon of national style in architecture, which suggests that architectural forms help to visualize and affirm these ideas in society. The purpose of this article is to identify the relationship between the development of the national idea in society, and the emergence of forms in architecture that would represent it. The article shows, that the processes of nation-building and state formation are always accompanied by the need to express oneself in cultural and material values, which is directly reflected in architecture. The problem of national self-determination has become key in the development of societies since the eighteenth century - the time when theoretical ideas about the nation began to form. The concept of a nation began to be understood especially actively as a result of the revolution of 1848. The specificity of this concept at that time was, that it acquired an ethnocultural color, which grew out of the mythology of common ancestors, blood ties, common language, national soul. A key factor in determining the membership of a community, that presented itself as a nation, was a sense of common ethnic origin. At this time, the search for national forms in architecture began. Domestic variations of the Renaissance or Gothic (England, Germany, France) are "brought to life", and forms of folk architecture (Ukraine, Russia) are used. In cases where the arsenal of their own architectural heritage was not suitable for interpretation of prototypes, architects turned to other areas of creativity: literature, epic, creating on their basis a mythologized image of folk tradition (Finland, Sweden, Denmark). An important stimulus for the search for and formation of national styles in architecture are the processes of establishing or restoring an independent state (Poland, Czechoslovakia, Romania). This encouraged the development of "national style" in contemporary architectural works, which could represent a new national country in the global context. Formative sources are becoming important for the creation of forms of national styles. The architecture of these sources is mostly associated with the periods of the "golden age" - the times of the greatest previous political and cultural prosperity of the countries. "National style" in architecture is expressed by means of historicism (appeal in the current work to the forms of the past), because historicism appealed to its own architectural heritage. Thus, the formation and development of national styles chronologically coincides with the processes of nation-building: the development and growth of national identity, the formation of national movements, the creation of independent states, etc. At the same time, architectural forms are given special semantic characteristics that should embody specific national values.

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A MATHEMATICAL MODEL TO PREDICT DELAYS IN INNER CITY STREETS IMPROVEMENTS PROJECTS: A CASE STUDY FROM ATLANTA, GA

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ABSTRACT

This paper presents a comprehensive analysis of the factors responsible for delays in inner city street projects and provide a tool to predict potential delays in these projects. The paper analyzed results from 10 previous research projects that analyzed 30 delay factors in street projects. A matrix of potential delay factors was generated which provides the probability effect of each factor, and the potential mitigation to avoid project delay and cost overrun. As a proof of concept, we applied the results of this analysis on a current project under construction in Metro Atlanta area, USA. The project is an inner-city streetscape that includes shifting traffic, demolition of existing street and landscape, rebuild new hardscape and softscape, and road resurfacing. The research goal is to examine the predictability of potential delay based on inner city street projects and suggest proactive measures to mitigate potential delays. The research proved that having a holistic approach and understanding of potential delays in inner city street projects and a mathematical tool that can provide a prediction of potential delay will allow for early mitigation, reduction on project delays and avoid expensive errors.

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IVTH RAILWAY CORRIDOR ALONG THE ROMANIAN DEVELOPING REGIONS

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ABSTRACT

In the declared European Year of Rail and with the European Green Deal approved and in effect an overview of the partially finished and modernised IVth Pan European Railway Corridor along Romania it is presented and analysed. Also, the IXth Pan European Railway Corridor is presented and correlated with the Romanian Developing Regions, for which is made preparations in order to be modernised for the maximum circulation speed of passenger trains of 160 km/h and 120 km/h for freight trains. In the end, conclusions are drawn regarding the impact of the almost modernised IVth Corridor and are made proposal regarding the future rehabilitated rail.

RESTORATIONS IN CHILE IN THE MID-TWENTIETH CENTURY: THE NATIONAL MONUMENTS COUNCIL AND SOME OF THE FIRST ARCHITECTURAL HERITAGE INTERVENTIONS

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ABSTRACT

This paper presents the initial results of an ongoing historical research project that addresses some of the first architectural restoration interventions led by the Chilean State through the National Monuments Council, the institution responsible for management of the country's cultural heritage. The National Monuments Council was created in 1925 by Decree-Law No. 651, the first long-standing legal provision to cover this aspect of cultural heritage. It remained in place for several decades before being superseded in 1970 by the current National Monuments Law (No. 17,288). The State's first steps in regard to architectural restoration were made possible by this legislation, and by the mid-twentieth century, the National Monuments Council was working systematically to register, analyse and take action to restore the country's architectural heritage. In 1949, a Conservation Commission was formed as part of the Council, and this body played a key role in the promotion of restoration projects at the time. The National Monuments Council worked in partnership with the General Directorate of Public Works, and efforts on the part of the two public institutions resulted in the creation of an annual budget for architectural restoration. By the 1950s, numerous buildings and sites considered relevant to the national identity were being restored, and efforts were made to emphasise their cultural significance and value. These early interventions were some of the first of their type to be funded by the State and were fundamental to the local architectural historical context. Work focused primarily on religious and military colonial buildings, including churches, chapels and fortresses located the length of Chile. Archival material from the time, such as National Monuments Council session minutes and institutional bulletins drafted under Decree-Law No. 651, provide a record of these early interventions. Analysis of these sources from a technical and theoretical perspective provides insights into the motivations and selection criteria used to establish an order of priority for the restoration of buildings and sites. This paper presents the main actions taken at a time when architectural restoration was first being promoted by the Chilean State and explores how these provided the foundations upon which future development of the local discipline would occur.

FRICTION COEFFICIENT OF LOAD-BEARING ELEMENTS OF BUILDING TECHNICAL FACILITIES

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ABSTRACT

The engineering activities in construction are a set of a wide range of activities that are performed, for example, for the purpose of the installation or mandatory replacement or modernisation of lifts. On the territory of the Czech Republic, there are standards that strictly prescribe what is required to repair and replace on an existing lift in order to ensure the greatest possible safety when riding the lift, but also the high reliability and dependability of the lift. Polyurethane lift belts were developed and used for the vertical movement of lifts at the turn of the millennium. Due to patent rights, they were reserved solely for selected manufacturers of lifts. The classic ropes with a circular cross-section are currently being replaced more and more frequently in construction engineering by flat ropes or belts due to their undisputed advantages. This paper describes the construction design and implemented equipment on which it is possible to determine, in the laboratory, the value of the rope friction coefficient in the given type of traction disc grooves. To be specific, this paper describes the friction coefficient determined in a laboratory, in dry and clean conditions, of a flat rope with a polyurethane sheath on the circumference of the traction disc. The friction coefficient values were acquired indirectly, i.e. by measuring the tractive forces in the approaching and receding rope branches on the rotating traction disc powered by an electric drive. The friction coefficient was determined from the measured values of both tractive forces during the course of a single experimental measuring through a calculation from Euler's relation. The value of the receding force was obtained using two methods that differ from each other in the manner of attachment (by a screw or compression springs) of the end of the rope to the load-bearing construction of the measuring device. The information obtained from the experimental measurements made it possible to compare the measured values of the rope friction coefficients with the values given by the manufacturers and to make the conclusion that the method used to determine the friction coefficients and the set of laboratory activities and procedures for determining the friction coefficients on the testing equipment is suitable and usable in practice.

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THE ARCHITECTURAL EKPHRASIS: AN EXPLANATORY DEVICE FROM ANTIQUITY TO MODERNITY

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ABSTRACT

The Ekphrasis as a rhetoric exercise is conducted by two main principles: the visibility and the ernergence. The former aims at bringing to sight and vision what is being put into description whether the latter has in its core the aim of elivening either the foreseen concepts or the ever existing, or once existing objects. From the Arms of Achilles forged by Hephaestus in Iliad's Book XVIII to the Corbusian notion of houses as dwelling machines, this paper will aim at trekking a path through the ages, which major standpoints show the Ekphrasis, along with its functioning, as a way to legitimate the artistic, technical and cultural values of architectural endeavours.

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SHAPING THE IMAGE OF A CITY ON THE EXAMPLE OF A DEVELOPMENT OF PARTS OF WATERFRONT IN BYDGOSZCZ - A RELATION OF ROTHER'S MILLS AND NORDIC HAVEN BUILDING

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ABSTRACT

According to Alexander Wallis, the city's cultural values relate to its historic and architectural, symbolic and religious, artistic and prestigious values. They are represented by individual buildings, monuments, sculptures, street furniture and entire urban complexes - streets, squares, parks, engineering works, and finally entire districts and urban landscapes. In Bydgoszcz these values are represented by the Mill Island. After years of neglect, together with its immediate surroundings it has been re-incorporated into the city's structure, becoming a full-fledged, attractive and highly prestigious social area. The article presents a history of creation, functions and mutual relations of revitalized historic Rother's Mills complex and Nordic Haven - a modern residential and commercial development and also aims to analyze the impact these buildings had on the space and surroundings of the Mill Island. The two architectural ensembles, arranged in mutual spatial relations, shape the landscape of the downtown, river bank part of Bydgoszcz on different principles. These buildings, as part of a historical urban layout of the city, represent extremely different methods of developing its areas requiring special protection and attention.

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FROM 'ORTHOGONAL' SPRAWL TO 'CURVILINEAR' DENSE: ASSESSING ACCESSIBILITY INDICES FOR URBAN NETWORKS OF SOCIAL HOUSING IN UAE

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ABSTRACT

The shift towards designing more dense urban social housing neighbourhoods has started with the embracing of urban sustainability principles by the UAE government since the beginning of the 21st century. The assessment of the recent neighbourhoods designs still lacks concrete evidence about their expected performance especially for pedestrian mobility networks. This concern is gaining further significance with the noticeable tendency of most of the recent urban designs towards developing organic and curvilinear networks instead of the conventional orthogonal grids of the mobility networks that distinguished the traditionally designed neighbourhoods in the country. To bridge this gap, the research comparatively and quantitively analysed the accessibility performance indicators of both of the traditional and the modern urban network designs. The research adopted the Case Study method with quantitative investigation tools that are fundamental to Urban Network Analysis, especially in relation to Accessibility. The simulation of the urban networks of two selected urban social housing neighbourhood forms, representing the networks of both the traditional urban orthogonal sprawl and the recent curvilinear dense one, were utilized employing the UNA toolbox. Three complementary Accessibility Indices were analysed including: Reach, Gravity and Straightness. Through this analysis, the aspects that affected the accessibility performance of the two urban form paradigms and the problems that have been associated with the designs of the urban networks of the new social housing projects, have been revealed. It became evident that the denser urban form was not sufficient in enabling more accessible facilities in the recent neighbourhoods designs. The orthogonal grid, even with its very low Floor Area Ratio showed better performance of in the three accessibility indices especially the Straightness index, if compared with the much denser curvilinear grid with it 'naturally longer' pattern. The inefficient number and the inappropriate distribution locally provided facilities in relation to the pedestrian mobility networks have contributed to these disappointing results. So, it is essential to include this and/or similar urban network quantitative simulation tools to help develop genuinely sustainable urban forms for this significant type of urban development in the UAE cities.

WIND ENERGY COLLECTION SYSTEM BASED ON PHASE CHANGE SYSTEM AND DEFORMABLE MATERIALS

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ABSTRACT

The purpose of this paper is to design and discover a new system, which can realize the collection, transformation and storage of energy from wind energy in the environment → temperature / physical deformation → material phase change → energy storage, so as to achieve the effect of green energy saving. At the same time, it can provide theoretical support and design basis for the design of high-rise Garden residential suite in cold region. Wind energy is collected through the narrow channel effect. With the help of deformation induced ferrite phase transformation technology and memory alloy materials, the collected energy is stored in the new colloid / graphene battery equipment. With the help of the relevant content research parameters, a systematic digital model is formed, and the basic database is established to simulate the external environment of high-rise Garden residential buildings in cold areas. Through the design of a new wind energy collection system and embedded in the simulation environment, the wind energy utilization in cold, low sunshine, low wind speed or unstable wind speed areas is realized, and the green energy conservation, environmental protection and sustainable development in such areas are realized. Then, the feasibility and effectiveness of the system are demonstrated according to the experimental results, and a systematic theory is formed.

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TRANSFORMATION BY METHOD OF SANATION – UNREGULATED RESIDENTIAL SETTLEMENTS OF SARAJEVO

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ABSTRACT

In the second half of the 20th century, the industrialisation and de-agrarization of Bosnia and Herzegovina had a strong impact on the dynamics of urban development and economic growth of the post-war Sarajevo, which intensified immigration from its relatively underdeveloped regional environment. This was accompanied by accelerated housing construction, and it encouraged the spatial expansion of the city. Planning guidelines were set by the city administration and were based on the long-term development plans. They identified the disposition of urban functions necessary for housing, work, recreation and traffic, and the policy of building multi-residential buildings was aimed general social interest. At the same time, the planning activities neglected the actual socio-economic status of immigrants who had lesser opportunities for housing through the social distribution system of apartments, began the process of self-organized unregulated settlement construction with single-family houses on the city's slopes. This began an era of two parallel but controversial actions within town space: planned and unregulated housing construction. Spontaneous possession of the city's territory with unregulated construction today is characterised by: complex property-legal relations, high degree density of construction, absence of public space, pedestrian communications and service functions, low quality of the infrastructure network, and that settlements are formed on unstable terrains and on active landslides. Since the consequences of the complexity of the situation cannot be addressed through radical urban transformation, we see an alternative in the idea of partial spatial interventions – transformation by method of sanation. Starting with the premise that building is always deeply connected to society's understanding of the function of space and the place of man in it, we have opened up a central question, and searching for answers is the basic goal of this paper: Is it possible to alleviate problems accumulated by decades within Sarajevo's unregulated housing settlements through means of transformation by method of sanation? Or: Can partial spatial interventions improve the overall quality of individual and social life? For the purpose of finding answers, we conducted an analysis of the causes of the formation and genesis of these settlements, as well as a series of problems produced by the accumulation of separate spatial interventions without elementary professional guidance. The results of this analysis showed that the answer to the questions asked can be positive, by establishing a critical relationship with the potential of the space of specific settlement sites, in terms of the degree of functional usability, correlation with utilities and user interactions with the environments they inhabit. We have concluded that it is precisely the potential of individual sites, by logically applying the transformation by method of sanation, will enable dual achievement – the merging the solution within the technical and structural aspect of potential landslides with the articulation of the public on new pedestrian communications. Also, it has been shown that the application of this method enables the typification of technical solutions, functions, contents, activities, urban design, and even the public itself. And this means that the conclusions on the characteristics of individual Sarajevo unregulated residential settlements, endangered by landslides, can offer general guidelines for design concepts, within them, an overall improvement of individual and social life.

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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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IMPLEMENTATION OF BIM METHOD AND MENTAL HEALTH CRISIS IN THE AEC INDUSTRY

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ABSTRACT

At the ages of the fourth industrial revolution, digitization is everywhere around us. It represents the new way of living, generally. This huge milestone carries such a huge change that many people can feel uncomfortable. It is because the human nature, fear of the unknown, laziness, and many other typical general characters. We feel comfortable in things we know well, things we get experienced. New things can make us feel stressed or afraid if we can succeed in it. BIM method, or BIM thinking, represents “walk into the blue” for many people. There can be many causes of stress in connection with BIM implementation. This paper reveals the main causes of mental health crisis in the AEC industry. This crisis can be viewed from many angles, positions, and phases. Due to the current process of implementing the BIM method in the AEC industry, we encounter mainly fear of a new and modern approach, which is however necessary in the digital age of the 21st century. The crisis of mental health affects all persons involved not only in the construction sphere. Starting with high school and university students, through their teachers, it ends, of course, in practice, from the relevant state administration bodies throughout the entire life cycle of the building from design, through construction realization, operation and maintenance, and possible removal of the building. What is the crisis most connected to? It is mainly the fear of the unknown. The term BIM is already very widespread in the AEC industry. However, its knowledge begins with the "three-letter abbreviation, which means a new way", through "the digitization of construction within Industry 4.0, hence Construction 4.0", to the IT core of the whole matter. For some, BIM means 3D model, for others, SW enabling the creation of a digital information model - BIM (ArchiCAD, Revit, etc.). This contribution speaks openly about currently perceived barriers in the implementation of the BIM method, their possible impact on the mental health of participants from the AEC industry, and how we can deal with it.

VERTICAL URBANIZATION: THE TERRITORIAL CRISIS OF AN UNIVERSAL MODEL

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ABSTRACT

This research aims to examine, from the perspective of the urban design, the necessity and appropriateness of writing an architectural manifesto that questions, or rethinks, the vertical city model based on the orderly accumulation of slender and free columns –housing towers– where society must fraternize and develop life. The journey through the skyline of the main megalopolitan concentrations in countries such as China, India, Brazil, Mexico or those of the Pacific, shows us a landscape of dense residential conglomerates whose spatial and urban configuration was conceived almost a century ago. Vast extensions of vertical developments conquer, as a final and universal solution, plots without attributes between huge highways, old rice fields, deserts or even impossible topographies. With man's desire to live close to the clouds fulfilled and the technical challenge of rising in a vacuum having been overcome, the challenge should now point to the search for strategies that place the inhabitant again at the centre of the debate. By making the city taller, denser and faster, it increases the difficulty of social participation for certain sectors of the population in their environment. Thus, the research will deepen in the experiments of the avant-gardes of the second part of twentieth-century to find alternatives growth strategies to the city of towers. Given that the phenomenon of verticalism will be an inevitable consequence in our near future, both due to overpopulation and the massive movement towards cities, as well as due to the necessary reduction of our footprint on the planet, the construction of a new story about verticality would seem appropriate.

THE PERSPECTIVE OF COWORKING OFFICES IN THE CONTEXT OF THE SMALL BUISNESS DEVELOPMENT

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ABSTRACT

Basing on the experience of countries where coworking is developing dynamically, the study assesses the development prospects of coworking in Poland. It identified the opportunities and threats as well as strengths and weaknesses of this form of approaching office space in the conditions of the Polish real estate market. SWOT analysis is used as a methodology to capture the advantages of new concept of business office. To this end, statistical and econometric tools were used. The study revealed strong entrepreneurs' attachment to the ownership of office buildings used for their own purposes and the correlation between the number of coworking facilities and the number of small companies, especially in the service sector. The advantages and disadvantages of coworking offices were also pointed out, in the context of the expectations of modern lessees. The opinions of women and men about the features typical of coworking offices vary considerably, which also may be a subject for further research. The existing surveys from the local market were also referred to, which may serve as a premise for further studies. This requires a global research to capture the change and its implication on real estate market in Poland and its impact on office market. The study recommendation is to celebrate and entrepreneurial activity and introduce entrepreneurial studies at schools to influence a positive change. Research indicates that the working culture is changing, which are reflected in the use of office space, and that after a period of social distancing the approach to shaping social relationships within office work will change as well. The research might therefore assist in revealing further “understanding” forms of interactions and mechanisms of decisions about best form of office space. The study findings fill the research gap in the field of office space sharing. They are also an important indication for potential investors who are looking for new investment areas in the times of pandemic. Moreover, the analyses results will allow lessees of traditional office space to consider alternative solutions for the future while seeking to improve their business situation after restrictions imposed in 2020. In this study, has enabled new insights into the coworking office and social role this form of work, which capture the behavioral and cultural factors.

PREDICTION OF MODEL BEHAVIOR OF CONSTRUCTIONS IN HAZARDOUS CONDITIONS

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ABSTRACT

There are two different methods for prediction of structural dynamic properties of dams. One is to use finite element numerical and analytical models. Second method is to prepare statistical analysis on full-scale in situ measured data and propose empirical formulas. By using the microcomputers it is enabled to prepare detailed finite element ment models of different hydraulic structures to measure the dynamical behaviour and response in earthquake and in other natural hazardous conditions like tornedo or heavy rain disasters. It is also feasible to establish a simulation system in laboratory which contains adequate design information of a building for accurate prediction of structural dynamic properties which contains natural period and model shape of hydraulic constructions. The detailed structural design and the available model information are always incomplete at the design stage. This results as the lack of properly correct construction of the shape of hydraulical river navigation weirs.

GAZİANTEP OĞUZELİ-DOKUZYOL VIILAGE REUSE PROPOSAL: EXAMPLE OF EZOGELİN BARAK CULTURE CENTER

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ABSTRACT

Dokuzyol village is a settlement 17 km away from Gaziantep Oğuzeli district, that is within boundaries of the Barak plain. The old name of this village is Uruş, in additional it is also known as the village of Ezo Gelin because it is the birthplace of the legendary Ezo Gelin in folklore. There are traditional abode buildings in the village but some of them have been abandoned and village people have started to prefer reinforced concrete buildings. Rural architecture is an embodiment of cultural heritage therefore, preserving and transferring it to future generations are an important element of cultural continuity. The main reason for choosing this village is that are examples of traditional abode architecture and in order to maintain the Barak Culture, an abode cultural center named Ezo Gelin was built in 2018. Cultural center seldom is used and haven't served its main purpose. The aim of this research is to develop a renovation for Ezo Gelin Barak Culture Center, which was built with great investment but not used and to draw attention the abode building in the village. In this research adobe buildings of Dokuzyol village were documented with traditional method and function suggestions for the protection of buildings have been developed within scope of the Interior Architecture education survey course. It has been suggested that some of the unused abode building in the village to serve for the new function of Ezo Gelin Barak Culture Center. The proposal developed for Ezo Gelin Barak Cultural Center aims to contribute to rural tourism and cultural heritage.

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CHANGING THE LIGHTING CONDITIONS IN THE ATTIC BY CHANGING THE SIZE OF THE TRANSPARENT SURFACES

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ABSTRACT

The aim of the paper “Changing the lighting conditions in the attic by changing the size of the transparent surfaces” is to compare different openings of skylights in relation to the level of daylight in the attic in order to optimize the use of the attic for visual activities. In addition to daylight, indoor air temperature also has a general effect on indoor comfort. In winter, the situation is not critical. The thermal insulation properties of packaging structures are insufficient. The situation is bad in summer because the heat storage properties are undersized and the indoor air overheats. Several variants of roof windows and their influence on the overall microclimate in the attic are compared. The version without roof windows is a suitable solution with regard to minimal overheating, but the worst situation is for daylight. To get even more light out of the window by moving the windows to the top of the roof, we can use larger skylights. The paper seeks optimization between the size of the transparent part of the roof and its impact on visual activity and the overall microclimate in the attic space. The size of the transparent part of the roof is changed by means of roof windows, which are arranged in one row, in two rows one above the other. Roof windows are also combined with windows in a vertical position in the perimeter wall of the attic. The result is the optimization of the size of the window area in order to achieve suitable conditions for visual activity in the selected room in the attic space after renovation.

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COMPARISON OF DAYLIGHT LEVELS USING DIFFERENT CALCULATION TOOLS

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ABSTRACT

The subject of the article is light comfort in a selected attic space. This comfort is ensured by windows in the perimeter wall but also in the roof. Daily factor values were calculated in a CIE cloudy sky using two different Velux Daylight Visualizer 3 software and Dialux software. The aim of the paper is to compare different skylight openings in relation to the level of daylight in the selected space in order to optimize the use of this space for human residence. In addition to daylight, indoor air temperature is also affected by indoor air temperature. In winter, the situation is not critical, because the thermal insulation properties of packaging structures are sufficient, they have sufficient thermal resistance. The situation is worse in summer, because the heat storage properties of all packaging structures are undersized and the indoor air is overheated. Four variants of the size of roof windows and their influence on the overall microclimate in the attic are compared. The version without roof windows is a suitable solution. This is the case when the light falls only through the windows from the side, i. from the perimeter wall and not from the roof. It's good in terms of minimal overheating, but it's the worst situation for daylight. To get even more light out of the window, we have to move the skylights to the top of the roof, that is, to the top of the roof. Based on a combination of daylight calculations by different calculation tools, the graphical dependence and confrontation of differences is expressed. The whole prediction process was assumed without shading the windows. The result is the determination of the differences between the results found for different simulation tools and their justification.

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CONSTRUCTABILITY IMPROVEMENT IN BRIDGE CONSTRUCTION IMPLEMENTING VALUE ENGINEERING APPROACH

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ABSTRACT

The inter relationships between the erection method implemented and material behavior make the constructability of bridges more complex. The problem is getting complex due to the impact of loads, in addition to the environmental influences. The objective of this research is to demonstrate decision support model to assist designers in deciding proper alternative that improve the constructability of bridge project based on the principles of value engineering. This model uses super decision system by applying the analytically network process (ANP) system. The implementation of this system is carried out through integration of value engineering with the ANP. The implementation of the system developed is tested virtually. The results attained confirmed the possibility of applying this system to such studies of infrastructure and bridges. This study was be adopted with regard to the use of the same method of construction. which is "Precast Segmental, Balanced Cantilever Construction (Cantilever Carriage System)".

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INTEGRATED FRAMEWORK FOR PROPER CONSTRUCTABILITY IN BRIDGES USING VALUE ENGINEERING AND ANALYTICAL NETWORK PROCESS (ANP)

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ABSTRACT

Due to recent environmental and Political requirements, and regulations of the construction industry, in which bridges is one of its important categories, deciding its proper constructability is becoming vital. Therefor the objective of this research is to develop a decision model for selecting proper constructability of green bridges constructions. This model based on analytical network process integrated with value engineering approach. Different parameters are identified and ranked to be implemented for the decision model developed on the biases of survey conducted in this study. Model validation is carried out using the analytical network process (ANP) using case study which is a cable bridge project constructed in Egypt. ANP proves to be an effective framework for assessing readiness to adopt and facilitating TQM. The result of the study illustrates that the proper constructability alternative in green bridge is the concrete box girder type. In addition to there is a possibility of applying this decision model to such studies of infrastructure projects.

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FRAGILITY ANALYSIS AND RISK ASSESSMENT OF PRECAST CONCRETE FRAMES WITH "DRY" CONNECTIONS: A COMPARATIVE STUDY

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ABSTRACT

Precast concrete frames (PCFs) with "dry" connections and self-centering capacity have been proposed as a new kind of earthquake resilient structural system alternative to conventional cast-in-situ concrete frames. The damage mechanism of PCFs are concentrated at the panel zones under earthquake excitations, so as to avoid damage to beam and column components. Through reasonable design for the PCFs, not only the structural and life safeties can be guaranteed, but also the earthquake loss and social impact can be minimized. This paper conducts a comparative study between PCFs with "dry" connections and conventional cast-in-situ concrete frame. A generalized beam-column connection analytical model is utilized to predict the seismic behaviour of PCFs with energy dissipation devices, with an emphasis on the opening behaviour at beam-column interfaces, the self-centering capacity provided by prestressed tendons and the hysteresis behaviour provided by energy dissipation devices. The accuracy and applicability of the model are validated through previous experimental results Prototype buildings with PCFs or cast in situ frames are designed to achieve similar seismic performance in Chinese highly seismic fortification zone. Probabilistic seismic capacity analyses (PSCA) are conducted based on the results of probabilistic pushover analyses and Latin Hypercube Sampling. Incremental dynamic analysis method combined with nonlinear time history analyses are utilized to conduct probabilistic seismic demand analyses (PSDA). Fragility functions of different structural systems are derived based on the convolution of PSCA and PSDA. Finally, the seismic risk is evaluated based on the fragility functions and the developed Chinese seismic code compliant hazard functions. The results indicate that PCFs with energy dissipation devices have larger seismic reliability along with lower seismic risk.

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ESTIMATION OF SEISMIC ECONOMIC LOSS AND DOWNTIME OF PRECAST CONCRETE FRAMES WITH "DRY" CONNECTIONS

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ABSTRACT

The seismic loss of buildings comes not only from the damaged structural components. Much more loss may be induced by non-structural components, the demolition loss and social impacts associated with excessive downtime. One of the main characteristics of a resilient city is that the buildings in the city should be able to recover to their pre-earthquake functionalities with minimized economic loss and downtime. For this purpose, a comparative study regarding seismic economic loss and downtime is conducted between the conventional cast-in-situ reinforced concrete frames (RCFs) and precast concrete frames (PCFs) with "dry" connections. The results show that the PCFs with prestressed tendons (PTs) can effectively reduce demolition loss given their extraordinary self-centering capacity provided by PTs. By adding web friction devices at the beam ends, the economic loss of structural components and drift-sensitive non-structural components can be effectively reduced. The downtime of PCFs is reduced at given hazard levels compared with RCF given their rapid repair speed and easy assemblage. In view of the rapid post-earthquake repair and lower earthquake loss, the PCFs are worth further investigation and application to develop resilient cities.

HISTORICAL BRIDGES IN MASONRY: FROM KNOWLEDGE TO CONSERVATION: PROPOSAL FOR A PRELIMINARY INVESTIGATION ON THE DAMAGES

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ABSTRACT

Historical masonry bridges constitute an evidence of an ancient expertise which has to be preserved and, in the managing process of these historical structures, it's necessary to balance the need to preserve them as a historical-architectural testimony and that to adapt "strategic points" of the road infrastructure, taking into account both safety and security aspects, in the general field of “conservation strategy”. Indeed, according to recent statistics (2007), over 40% of railway bridges in Europe (around 200,000) are arch masonry bridges and it is an impressive datum if we add to these many other road bridges which populate our landscape and infrastructural network. Given the importance, historical and functional, of these peculiar structures, the present paper aims to define an expeditious strategy for their damage survey, which, starting from the real knowledge of masonry bridges structural functioning and damages, can help in setting up a reliable list of priority for the most suitable interventions. Indeed, an expeditious, but targeted, survey is important to optimize the (few) economic resources available, making the most of the historical and empirical knowledge on masonry bridge constructive types and crack patterns, each other strictly related. As a matter of fact, in the construction of masonry bridges, we can observe a permanence of proportional rules, which had remained almost unchanged from the ancient treatises (Vitruvio, Alberti and Palladio) until the mid-19th century. This permanence in constructive types and in dimensions of main structural elements composing them, results in a similar crack pattern, which can be observed in almost all these structures and easily (and effectively) surveyed and testified, once correctly indentified. İn this study, a rather large sample of masonry bridges (over 50 bridges in Parma district) have been analyzed and surveyed. Starting from a comparison between literature (Jurina 2007, Franchin 2009, Boothby 2020), and existing regulations and current procedures by law (in Italy and Europe, with some incursion in the international field), a data sheet for the damage survey has been developed and some further considerations on the most recurrent damages in these structures have been advanced. Moreover, recovering the typical classification of the Italian DPCM 2011 for heritage conservation (with particular reference to the "great arched structures") the paper aims to define a proposal for the expeditious survey of damage and crack patterns of historical masonry bridges, considering their dimensional and material peculiarity, which can be the base for the development of a reliable bridge management system (BMS) for existing masonry bridges.

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TESSELLATION IN ARCHITECTURE FROM PAST TO PRESENT

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ABSTRACT

Tessellation, which has examples of use in art and architecture, is the covering of a surface using one or more geometric shapes without overlapping or gaps. Based on Roman mosaics, the tessellation has an important place in architecture since the ancient times. Through the history, different patterns have been used by many cultures for various applications ranging from decorative covering elements to multi-functional latticework screens. As in the past, the tessellation has still been used in contemporary architecture since it not only allows creating the geometrical surface in an order but also provides multi-functionality to the surface when applied as shading elements. The tessellation can be reviewed under three categories such as regular, semi-regular and demi-regular tessellations. Two- and three-dimensional examples of these tessellations can be seen in contemporary architecture either as façade elements or patterns used for structural elements. Because the tessellation plays a significant role in architecture in terms of geometrical or structural design, the interest on this topic has been increased in recent years. Due to their great potentials, more studies should be conducted on the tessellations. For this reason, within the scope of this paper, the applied examples of the tessellations in buildings from past to present are examined which include both static and movable ones. In this paper, the geometric design principles, combination methods and iteration processes of the examples are also presented. As well as providing a deeper understanding of such tessellation methods, this study will serve as a basis of reference for future studies in this field.

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DATA ORGANIZATION ISSUES IN CIVIL ENGINEERING

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ABSTRACT

In today's organization of data in civil engineering there remains ambiguity, diversity of terminology and consequent lack of clarity. The daily reality is to work with hybrid data sources in a variety of software programs. In CAD programs it is possible to import and convert elements from GIS, but they will be classified only into layers. Or, attach external references from CAD files in BIM, but there still remains the problem of finding your way around the confusing list of layers, and their abbreviations. Also broadly used filesystems as place for store and organise data on disk into files (entities) and hierarchical structure of folders (categories) is limited by reductionist categorisation approach. Another problem shows with absence of multilingual approach. The limits are in the methods of data organization, and so only partially portable. Therefore, if there is a common denominator to all problems, it is the absence of a unifying organizational environment. In current computer applications used in civil engineering, methods of data classification are implemented that do not allow multiplicative or faceted categorization and thus inevitably create an antagonistic environment with any previous or future classification system. Unfortunately, even if a software tool implements a modern multiplicative categorization or domain ontology, it will not significantly solve the overall situation, because it will still not be possible to use such a method of categorization in other applications. Therefore, if there should exist a solution that would significantly facilitate cooperation and orientation in the data, it must inevitably work independently, across diverse software applications, with the ability to link the functions of the application with such a separate categorization system.

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CO-OPERATIVE CATEGORISATION IN CIVIL ENGINEERING

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ABSTRACT

In the paper we indicate the way to allow the coexistence of multiple structures that are mutually supportive, but not mutually exclusive. It allows less organized users to classify entities according to their suitable structure, whilst leaving the possibility for specialised users to classify these entities into related field classification systems (e.g., OmniClass, Uniclass, Cuneco, CoClass, etc.) or domain ontologies, in mutually beneficial cooperation. Replacing the reductionist enumerative structure with multiplicative categorization should bring organizational and terminological flexibility that will allow future updates without disrupting the existing categorization. The assumptions of the indicated data organization system are multiplicative categorization and external application-independent structure. It allows one to use parallel hierarchical branches of categories according to aspects and classify the entity into several branches at the same time. It should allow users the freedom to create their own structures without disrupting the structures of other user groups. Such structures could coexist happily side by side. The independence of the system is based on the assumption that entities will be able to retain the categorization attribute. That's means the categorization is carried by the entities themselves and the categorization persists throughout their existence. Host entities (files and elements) must support the retention of attributes that contain the written IDs of the categories to which they belong. If entities with attributes were converted, their categorization would be preserved. The aim is to design data's model of an independent data organization system in building design in a multilingual environment, connected through diverse CAD, GIS, BIM, CAFM applications, ECM, CDE, emails, databases and file systems.

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IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON ARCHITECTURE STUDENTS' CREATIVITY

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ABSTRACT

Architecture is a multidisciplinary, multiskilled, multidimensional, and multimedia practice. Designers need to know about many crafts, technologies, and theories and to have the ability to communicate with specialists in many fields. This is also true in the education process for the discipline. Architectural education is not simply vocational education achieved by training. The educational process is usually not just about teaching how to solve problems but about finding what the problems are. In this respect, architectural education has its specifications, and it is distinct from both the practice of architecture and the education of other disciplines. The multifaceted structure of the architectural field leads to the development of a wide spectrum of courses in the architectural curriculum. The distribution and classification of architectural courses in the curriculum, states that the courses in the curriculum of contemporary architectural education institutions can be classified into four categories. In the first category, some courses develop an architectural orientation; second, some courses provide the scientific foundation of architecture; the third category consists of the courses that strengthen the base of architectural design and expression; and finally, there are the design studio courses that synthesize the concepts of the previous three categories. Every design is a problem at the beginning of the design process. Creativity is a fundamental aspect in design problem-solving since the development of new design solutions demands to put into practice creative skills. Creative thinking enables the frame of a problem from unconventional viewpoints. It allows gifted designers to go beyond predictable solutions, and explore innovative ideas. Limited researches showed that different attitudes and characteristics of students affect design creativity. This study focuses on the demographic characteristics of architecture students impact their creativity. Therefore, the main aim of this research is to determine the effects of differences of demographic variables on creativity and offering solutions. To reach this aim a questionnaire was constituted by researchers and sent to architecture students at Hasan Kalyoncu University during 2020-2021 fall semester via e-mail. The Kaufman Domains of Creativity Scale (K-DOCS; Kaufman, 2012) was employed in the current study to measure participants' creativity. Obtained data were analyzed statistically using SPSS 22.0 software. This research will make a remarkable contribution to architecture students to produce better, more satisfying, and more creative designs.

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REALISM NOT REQUIRED: LOW QUALITY DESIGN ASPECTS OF WORLDS IN VIRTUAL REALITY ONLINE PLATFORMS

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ABSTRACT

Virtual reality online worlds have been given a significant boost in populace and popularity due to two major factors in the past year; the development of wire-free head mounted displays and the global pandemic with its online home office and home school solutions. Affordable and high quality headsets have given users the chance to interact with and build new online worlds for the several most frequently visited VR platforms. A rapid influx of new online VR players has driven content creators to design worlds and their associating architecture of buildings and scenery to match current trends of the real world entertainment venue, thus including new games, movies and fashion trends. With this, a visible movement of design focus has been shifting into playability and interactive possibilities rather than focusing on higher quality and the improvement of existing worlds that could be regarded as “out of date” graphics. Pre pandemic players chose worlds of higher graphic quality with traits resembling real world scenes and photorealistic 3D models, while the new home office populace has shown great interest in worlds with lacklustre assets, low quality textures, simple lighting and overall design not representing real world traits. While a situation like this could be explained by the fact of lack of skill and design experience throughout the new player base, it is actually the older generation of creators that has rebalanced the ratio of quality vs playability. Several multimillion dollar triple-A titles of games released in the past few years have been widely regarded as boring, linear and predictable, with a general lack of interest prior to a few months after release. Online communities have loudly outspoken their opinions about these games and now demand new releases of lower graphics quality but of better playability traits. It is important to note that the online communities of virtual reality platforms are spending longer periods of time plugged in and socializing in different worlds throughout the day. Those worlds consist mainly of peer designed digital representations of buildings and scenery, in which people commute, communicate and interact with one another. The mentioned shift in design focus is mainly affecting the architecture of the online worlds, with changes happening within the complexity and functionality of the building modules as well as their form. Provided that this trend continues, architects working in the digital realm could be facing a major change in design expectancy of players. While some may regard this as a step backwards, a new design trend may give birth to a new optimized style of architectural design.

RELIVING – RETHINKING THE INTERIOR ARCHITECTURE DURING AND AFTER PANDEMIC SITUATION

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ABSTRACT

Architects are currently facing the understanding of the transformation of the work practices of people, teams and organizations in response to COVID-19 pandemic. Europe is still in the gloom of this pandemic and it can be seen changes in the office-domestic workplaces. These places have been mutating during the last year, they have been transformed according the new requirements. Individuals have adapted their homes and companies are already thinking the office space according the new reality. This study aims to determine how the interior space could adapt in order to provide comfort and well-being in contemplation of the contemporary and near future situation. The principal objective of this project was to create a tiny piece of space which contributes to create our "existence maximum" in a small space. To test the hypotheses that with the creation of a piece of furniture it can help us in the transformation of the domestic and office interior space is the key to make sure that people feel safe and work comfortably. Contemporary source material was used to examine the evolution of the pandemic and how it affects the individuals' psychological behavior during this time. The findings provide a solid evidence base for the future will be a hybrid reality, where knowledge employees will continuously be working from home most of the time. It is evidently clear from the findings that as modernist architecture could be understood as a consequence of the result of some diseases of that period. Nowadays, architects have the responsibility to think how the interior architecture could be improved in order to make the people feel safe, comfortable and well connected where individuals could learn to live together confronting of our own homes and our own workspaces. The result is the design of an ergonomic workstation which contemplates the users' requirements for working, providing adaptation to different working positions, mobility within the space and transformation according to individual needs. In addition, it has been considered the sustainability of the materials and the easy assembly with the possibility of the addition of accessories.

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FROM SEISMIC INSTRUMENTATION TOWARDS DISASTER PREVENTION AND MITIGATION

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ABSTRACT

The present paper describes the current technical achievements in seismic instrumentation and monitoring within a national network and the role of this developed concept in disaster prevention and mitigation, in particular case of Romanian seismicity. Many studies are being conducted in the field of structural health monitoring, for seismically instrumented/monitored buildings, based on existed sensor technology, seismic data acquisition systems, data communication and information flow, computer hardware/software engineering, new solutions for seismic data transfer etc. Seismic records in free-field and on buildings are capitalized in anti-seismic design, development of technical and technological solutions in construction, seismic evaluation and rehabilitation of buildings, as well as in the process of education and earthquake preparedness. It is aimed also to create a virtual seismic network (through Internet, WAN property networks, public analogue telephone network). It is a national priority creating a preventive culture in order to mitigate the seismic risk, starting with the sstrengthening of buildings, upgrading of the code for seismic design, seismic instrumentation as a usual practice and continuing with public communication and information actions, empowering communities and decision-makers related to the risks, prevention measures, what behavior to be adopted. The efforts of last years' show that Romania has taken important steps in preparing a response according to the challenges induced by the existing seismic sources from the entire territory of the country.

Corresponding Author: Claudiu Sorin Dragomir

COMBINED BUILDING-ENERGY SYSTEMS WITH HEAT TRANSFER CONTROL BY BUILDING CONSTRUCTIONS USING RES

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ABSTRACT

Energy systems built into one of the building structures that serve to capture solar energy, geothermic energy, and ambient energy, or which have the function of end elements of heating, cooling, and ventilation system, we generally call combined building-energy systems. Among combined building-energy systems we include solar roofs with built-in pipe absorbers, building structures with active thermal protection (ATP) - active heat transfer control, which have a multifunctional purpose – a thermal barrier, low-temperature heating, high-temperature cooling, recuperation and accumulation of heat, solar and ambient energy collection, large-capacity heat storage (ground heat accumulators built simultaneously in the foundation slab of the building), or heat exchangers used for recuperative ventilation of buildings built into the foundation slabs and wall structures. The research of combined building-energy systems at the Department of Building Services, Faculty of Civil Engineering, Slovak University of Technology in Bratislava has been carried out continuously since 2005. Within five research projects (responsible researcher: Kalús, D.) HZ 04-309-05, HZ 04-310- 05, HZ 04-142-07 (research and experimental measurements took place in the years 2005 to 2007), HZ PG73/2011 (research and experimental measurements took place in the years 2011 to 2013), [13,] and HZ PR10/2015 (research and experimental measurements have been carried out since 2015), two experimental houses IDA I. and EB2020, a mobile laboratory designed for measuring and optimizing a compact heat station using renewable heat sources, were designed and built by the research team at our workplace, and also a research of a fragment of a perimeter wall with built-in active thermal protection was carried out in the climatic chamber of the Faculty of Civil Engineering STU in Bratislava, Slovak Republic. Significant contribution to the research was provided by doctoral students Ing. Martin Cvíčela, Ph.D., (supervisor: Kalús, D.), Ing. Peter Janik, PhD., (supervisor: Kalús, D.) and Ing. Martin Šimko, PhD., (supervisor: Kalús, D.), who described the results of the research in their dissertations. At present experimental measurements in the mobile laboratory are performed by doctoral student Ing. Matej Kubica, (supervisor: Kalús, D.). In the area of combined construction and energy systems, research and optimization of suitable solutions continues, which have been transformed into one European patent and three utility models.

Corresponding Author: Daniel Kalús

EXPERIMENTAL VERIFICATION OF ENERGY EFFICIENCY OF ENERGY ROOF, GROUND HEAT STORAGE AND ACTIVE THERMAL PROTECTION

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ABSTRACT

The basic of our research is combined building - energy system which using solar and geothermic energy. During its operation, this system uses the heat obtained from solar radiation, which is stored in heat storages, to actively reduce heat loss through enveloping constructions with active thermal protection. During the heating season, water is supplied to the pipes from the heat storage (in our case from the ground heat storage), the average temperature of the heating water is in the range of 15°C to 20°C. Cold water from the underground pipeline register is used for cooling in the summer. The paper describes experimental measurements and verification of energy efficiency of energy roof, ground heat storage and active thermal protection on a real building of the experimental family house EB2020.

Corresponding Author: Daniel Kalús

DIRECT FOUNDATION OF THE ROAD EMBANKMENT ON SOFT ORGANIC SOILS

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ABSTRACT

The paper presents the problem of embankment foundation during reconstruction and extension of regional road 110 on the section Witomierz - Grądy. On this section the road crosses the valley of meltwater formed during the last Weichselian glaciation. It is a watershed area between the streams Stuchowska Struga and Otoczka Reska. In the Holocene a 961 ha raised bog called Wielki Smogorze has been formed. In this area there are favorable conditions for the formation of raised bogs. The thickness of the peats is over 4m, reaching almost 8.0 m in its peak. Since 1964 the Przybiernówko-Grądy II deposit (402 ha) is continuously exploited. Currently, the deposit is being used by a company called "Lasland". Extraction is conducted on the basis of a relevant concession within a designated mining area of 242.9 ha. The mining concession is valid until the end of 2030. The pits are deep and are located on both sides of the regional road 110. Peat is transported by narrow-gauge railroad to the nearby processing plant, where it is sieved, sorted and packed. Based on the analysis of available archival materials, the road as found today was functioning already in the middle of the 19th century. In the 1970s the road was widened to 6.5m. In 2003 due to the bad condition of the surface the asphalt surface was renovated by applying a grid and new asphalt layers. During the renovation longitudinal cracks have been reported and there were problems with the compaction of the mix. The direct cause was the shallow layer of peat located just 1.1 - 1.3 m under the road. Conducted renovation did not bring expected results, so in 2019 the documentation for the reconstruction of the road was prepared. Different methods of road foundation were analyzed, from soil replacement through the use of piles. In the end the decision was made to directly settle the embankment with the use of geosynthetics. This study presents a selected solution and shows the results of calculations. Changes during the execution of the reconstruction were discussed. The applied solution allowed for simultaneous functioning of the mining plant and reconstruction of the regional road on the section of 1.2 km.The paper presents the problem of embankment foundation during reconstruction and extension of regional road 110 on the section Witomierz - Grądy. On this section the road crosses the valley of meltwater formed during the last Weichselian glaciation. It is a watershed area between the streams Stuchowska Struga and Otoczka Reska. In the Holocene a 961 ha raised bog called Wielki Smogorze has been formed. In this area there are favorable conditions for the formation of raised bogs. The thickness of the peats is over 4m, reaching almost 8.0 m in its peak. Since 1964 the Przybiernówko-Grądy II deposit (402 ha) is continuously exploited. Currently, the deposit is being used by a company called "Lasland". Extraction is conducted on the basis of a relevant concession within a designated mining area of 242.9 ha. The mining concession is valid until the end of 2030. The pits are deep and are located on both sides of the regional road 110. Peat is transported by narrow-gauge railroad to the nearby processing plant, where it is sieved, sorted and packed. Based on the analysis of available archival materials, the road as found today was functioning already in the middle of the 19th century. In the 1970s the road was widened to 6.5m. In 2003 due to the bad condition of the surface the asphalt surface was renovated by applying a grid and new asphalt layers. During the renovation longitudinal cracks have been reported and there were problems with the compaction of the mix. The direct cause was the shallow layer of peat located just 1.1 - 1.3 m under the road. Conducted renovation did not bring expected results, so in 2019 the documentation for the reconstruction of the road was prepared. Different methods of road foundation were analysed, from soil replacement through the use of piles. In the end the decision was made to directly settle the embankment with the use of geosynthetics. This study presents a selected solution and shows the results of calculations. Changes during the execution of the reconstruction were discussed. The applied solution allowed for simultaneous functioning of the mining plant and reconstruction of the regional road on the section of 1.2 km.

INFLUENCE OF ARAMID-POLYALPHAOLEFIN FIBERS ON THE PROPERTIES OF BITUMINOUS MIXTURES

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ABSTRACT

The use of additives in bituminous mixtures such as fibres has been the subject of various studies. Different fibres including cellulose fibres, steel fibres, basalt fibres, glass fibres and aramid fibres can be used to improve the properties of bituminous mixtures. Depending on the type of fibres used, different characteristics can be changed. The paper contains results of comparative tests of bituminous mixtures with aramid-polyalphaolefin fibres. Asphalt concrete used for wearing course with maximum aggregate size of 11 mm was evaluated in the study. Reference mix with an average penetration grade of 50/70 was chosen as a base for modifications. Due to difficulty in preparing mixtures with fibres in a laboratory mixer, test specimens were obtained from a stationary plant. The fibres and aggregate mix was prepared before adding the asphalt. The fibres were added at a rate of 0.5 kg per 1000 kg of finished bituminous mixture. This allowed to obtain an even distribution of fibres in the mixture resulting in a homogeneity necessary for planned tests. This allowed to omit the scale effect, that could occur due to differences between laboratory and stationary mixing. Stiffness modulus tests were performed using the IT-CY (Indirect Tension to Cylindrical Specimens) method for a wide temperature range of 0-30°C. The specimen resistance to permanent deformation was evaluated. Obtained results has shown a clear increase in the resistance to permanent deformation of mixtures with aramid-polyalphaolefin fibres, which is especially important for mixtures used for wearing course. The results has also shown a significant increase in the stiffness modulus regardless of temperature range. Results of conducted experiments has shown that it is possible to reduce the thickness of bituminous overlay in case of reinforcement of the existing pavement structure. The analysis of results has shown that the application of aramid-polyalphaolefin fibres in bituminous mixtures can improve the functional features of the pavement and be beneficial to the investors.

Corresponding Author: Bartosz Budziński

HYDRAULIC ANALYSIS OF DESIGN OF FLOOD PROTECTION MEASURES IN LOWLAND CONDITIONS

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ABSTRACT

The goal of the contribution is to analyse and review the possibilities of flood protection in hydrological, morphological and geological conditions of the East Slovak Lowland, specifically the flood protection of the county city Trebišov. The flood situation is caused very often by the Trnávka stream flowing along the city. The analysis was performed by mathematical modelling using HEC-RAS software. Based on Trnávka drainage basin reconnaissance, own measurements in situ and study literature relating thereto a proposal of several technical measures for safe run-off in the Trnávka river bed has been elaborated and consequently evaluated from hydraulic point of view. The Trnávka stream is a 36,6 km long right-hand tributary of the Ondava River. First water management modifications were carried out after establishing institution called Water society for the Ondava River in 1848. Activities of the Water society were closely connected with the development of the run-off conditions on the Trnávka stream. The main problem was that flood situation occurred mostly in the period of simultaneous flood situation on the Ondava River. Mitigation of flood discharges was ensured through lateral spillway structures directed the excessive water flow towards existing drainage system connected with Hraň pumping station into Ondava River. There were several floods during last 150 years in this region, example for such critical situation was the flood in May 2010 when all neighboring rivers and streams have reached their maximum records of water levels and discharges, as well. Presented contribution includes a detailed analysis of the flood situation in 2010 and recommendation for mitigation of the flood wave introducing technical measures to protect the Trebišov city.

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HYDRAULIC REVIEW OF FLOOD PROTECTION IN BARDEJOV CITY

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ABSTRACT

The contribution is dedicated to hydraulic analysis of the flood protection of county town Bardejov in the north-east part of Slovakia where after numerous floods on the Topla River the flood protection has been constructed just partially in the central residential area of the city (phase I.) Next phases II. and III., which append to phase I. upstream and downstream are currently in a process of evaluation, so the flood protection of town is far from being complete. The submitted article deals with hydraulic assessment of realized flood protection measures and their impact on proposal of phases II. and III. Authors have solved the given problem using mathematical modelling of open channel flow for steady and unsteady conditions of flood discharge at really measured flood wave in the year 2010 which was very close to the value of Q_{100} water. At the same time, they have proposed flood protection measures on the Topľa River in localities which are not considered and not solved by present realized flood protection. Proposed flood protection measures downstream and upstream of the realized flood protection were proven by mathematical modelling in HEC-RAS software program and they should get under control even the historical flood which appeared in Bardejov City in 2010.

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EMBODIED CARBON IN CONSTRUCTION: ESTIMATE OF EMISSIONS ASSOCIATIED WITH NEW SOCIAL HOUSING IN BOGOTÁ, COLOMBIA, 2020-2030

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ABSTRACT

One of the sectors that has great responsibility in the generation of Greenhouse Gases associated with Climate Change is the construction industry. Many of the studies that assess its environmental impacts have focused on the emissions associated with the operation of buildings. However, in recent decades, researchers have begun to study another fundamental aspect: the embodied carbon in buildings, which corresponds to the Greenhouse Gas emissions associated with its construction and materials. In Colombia, due to a large housing deficit, it is expected that during the next decade numerous units of social dwellings will be built in the region of the capital, Bogotá. The quantification of the embodied carbon in these dwellings is the main objective of this thesis. The study utilizes housing prototypes that seek to model the different building typologies and morphologies based on their height and construction system. The housing prototypes are based on seven case studies that are assessed using a simplified Life Cycle Analysis methodology. On the other hand, statistical data from the region's built environment is used to characterize the housing projections. Among the main findings, it is highlighted that the embodied carbon in the prototypes varies between 158 and 231 kg CO_{2eq}/m^2 and that most of the emissions are concentrated during the product stage (81.6%), followed by the construction stage (9.6%), use stage (7.0%) and end of life stage (1.8%). On the other hand, the construction of social dwellings in the region of Bogotá during 2020-2030 is estimated between 27.4 and 28.8 million m^2, projecting total emissions between 5.6 and 5.9 $GtCO_{2eq}$.

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UNIVERSITY CAMPUS SUSTAINABILITY: HOW STUDENTS SEE IT?

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ABSTRACT

Environmental sustainability of the built environment has been receiving considerable attention from researchers; however, less is known about the management practices and cultural influences associated with environmental sustainability of buildings. Furthermore, university campuses are considered as high consumers of natural resources, but also play an important role as leaders for diffusing sustainability concepts and behaviour. This research aims to address the gap in existing literature towards better understanding of, and further addressing the intersection between the micro (individual beliefs and actions), and macro (organizational programs and management practices) of environmental sustainability in university campuses. This is achieved through the investigation of students' perception of the environmental sustainability of the UAE University (UAEU) campus. The research employed interview, observation and an administered survey as data collection methods, and engaged the students as researchers and respondents through an exploratory case study of one building in the UAEU campus in Al Ain, UAE. The analysis shed lights on the students' knowledge about, and interest on environmental sustainability in general, and their perception of the sustainability practices for: energy conservation, water conservation, recycling of waste, sustainable landscaping, and sustainable transportation program for the case study building. The data shows that the students views on these sustainability aspects are based on their experience and use of space. Finally, the implications of the findings of this research are discussed in relation to research and practice along with the future directions for this research.

APPROXIMATION PROCEDURE FOR DETERMINING OSCILLATION PERIOD OF FRAME STRUCTURE

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ABSTRACT

Dynamic analysis can be used to find dynamic displacements, time history, and the frequency content of the load. One analysis technique for calculating the linear response of structures to dynamic loading is a modal analysis. In modal analysis, we decompose the response of the structure into several vibration modes. A mode is defined by its frequency and shape. Structural engineers call the mode with the shortest frequency (the longest period) the fundamental mode. Holzer and Stodola's approximate methods for determining the forms and periods of oscillation for frame structures are presented in the paper. An approximation method, based on approximate relative stiffnesses of the storeys and the ground floor, is analysed and proposed. The results obtained by the proposed approximate procedure do not greatly deviate from those obtained by more accurate calculations. It is therefore emphasized that the method can be used both in practice and for checking computer-based analysis of complex systems. At the end of the paper was given a comparison of the results obtained by approximate methods and some engineering softwares.

Corresponding Author: Faris Trešnjo

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BENDING MOMENT MULTIPLICATION FACTOR FOR AASHTO LIVE LOADS ADOPTED IN JORDAN FOR THREE UNEQUAL SPANS WITH ONE LANE

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ABSTRACT

The main objective of this study is to calculate a fixed multiplication factor for AASHTO LRFD live loads that will be recommended to give the same results of bending moments due to 1.8 AASHTO LFD live loads for three unequal continuous spans with variable bridge lengths of [10,20,10] [10,25,15] [20,30,20] [25,35,25] and [30,40,30] meters respectively. This study is based on the analysis of [20] three-dimensional finite element models, with one lane and using CSi Bridge 2015 software. All models were subjected to AASHTO LFD loading and AASHTO LRFD loadings. Results obtained are from combination loads and live loads show that all bridge responses values for one lane increase with increase of span length, and these values for AASHTO LFD are higher than those for AASHTO LRFD. For one lane, all maximum factors were obtained in bridge length equal to 40m [10, 20, 30], where the bending moments factors are 1,51, and 1.76, due combination loads and live loads respectively.

Corresponding Author: Samih Qaqish

MATHEMATICAL MODELING TO CONTROL THE CHEMICAL COMPOSITION OF BLAST FURNACE SLAG USING ARTIFICIAL NEURAL NETWORKS AND EMPIRICAL CORRELATION

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ABSTRACT

Portland cement additions have been used for many years with the main objective of reducing the amount of clinker. Among the additions, blast furnace slag, resulting from the production of pig iron, that is, reusing this by-product, reduces the emission of carbon dioxide as well as decreases the exploitation of natural limestone and clay reserves, which are raw materials for Portland clinker. In order to reduce these emissions and increase the availability of raw materials, research has been directed to study clinker-free binders, as is the case with activated alkali cements and supersulfated cements. In this way, alkali-activated cements can only involve the reuse of industry by-products and do not require the calcination of the raw material, thus reducing the emission of polluting gases into the atmosphere. Supersulfated cement are composed of up to 90% blast furnace slag, in addition to 10 to 20% calcium sulfate. One of the most important characteristics of blast furnace slag is the ratio of the content of CaO and SiO_2, also known as the simplified basicity index (B2). This paper proposes the mathematical modeling of an artificial neural network to predict the final chemical composition of the blast furnace slag to be produced based on the operational parameters of the blast furnace aiming its use in the production of special cements such as alkali-activated cements and supersulfated cements. The high values of (R) associated with low values (RMSE) show the good statistical performance of ANN demonstrating that the mathematical model is efficient to carry out the forecast of the production of blast furnace slag.

Corresponding Author: Wandercleiton Cardoso

POLISH HOUSES OF MUSIC. APPROACHING EUROPE

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ABSTRACT

Music has always accompanied man – in a city, it has been present on the streets, squares, and in selected salons, for the greater glory of God, it was played in churches. It is no coincidence that one of the first buildings rebuilt in post-war Poland was the building of the National Philharmonic in Warsaw. Also important is the age-old need to meet, accompanied by the phenomenon of identity and ennoblement, combining the cultural and center-making dimensions of architecture and music. Used in a competitive urban space, it gives the city a new image. This is testified to by examples of "architecture for music" which sometimes in the formal layer are far removed from the iconic works of historical significance, but at the same time, their supralocal significance cannot be undervalued, often possessing an almost phenomenal dimension. After Poland's entry into the European Union, many Polish cities began the long road to "catch up" with their Western European counterparts with the construction of cultural facilities, of which numerous were devoted to music. To name but a few, the last years have seen the creation of notable examples: the Stanisław Moniuszko Podlasie Opera and Philharmonic—European Art Centre in Białystok, the Krzysztof Penderecki European Centre For Music in Lusławice, the Karłowicz Philharmonic in Szczecin, the National Forum of Music in Wrocław. the Polish Radio National Symphonic Orchestra (NOSPR) in Katowice, the Centre for the Meeting of Cultures in Lublin. Buildings designed by foreign architects were also erected in Poland, an example being the aforementioned Philharmonic in Szczecin (designed by Fabrizio Barozzi and Alberto Veiga) awarded the highest European architectural prize, as well as the Cultural and Congress Centre *Jordanki* designed by Fernando Menis in Toruń. In addition, world-renowned musicians and composers are involved in the creation of exceptional concert halls in Poland. The famous pianist Krystian Zimmermann influenced the search for optimal acoustics of the NOSPR hall. Krzysztof Penderecki (1933 - 2020) was the founder of the European Music Centre in the small town of Lusławice. He created a unique place where musicians can educate themselves and give concerts. Polish buildings for music have won important European prizes and awards. They serve for the experience of music and influence the urban tissue changing its character and even changing the identity of the city. For our presentation, we have selected four facilities: The Philharmonic in Szczecin, Krzysztof Penderecki European Centre For Music in Lusławice, The NOSPR in Katowice, and the Symphony building of the Academy of Music in Katowice.

Corresponding Author: Jakub Świerzawski

THE IMPACT OF WOOD WASTE ASH ON PHYSICAL MECHANICAL PROPERTIES OF CONCRETE

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ABSTRACT

In this work is analysing the impact of wood waste bottom ash (WWBA) on the physical mechanical properties of Portland cement concrete (PCC). WWBA is a waste generated in power plants during burning forest residues to produce energy and heat. In 2019, about 19,800 tons of WWBA was generated only in Lithuania. Usually, WWBA is disposed of in landfills, only 26% of WWBA is used in the construction or maintenance of local roads, because of that it is useful to know properties of such WWBA and to analyse possibilities of using it in cement concrete. In the chemical composition of such WWBA type was fixed a big amount ~50% of CO_2. It is known, that C retards cement hydration. Due to stabilisation this process, it was used in the same amounts catalyst waste from oil cracking (FCCCw), which could accelerate hydration processes. Oil refineries worldwide generate more than 800,000 tonnes of FCCCw per year, of which around 20% in Europe and it is the big problem to landfill. In the investigation the amount of Portland cement (5-20% by mass) was replaced by mentioned wastes and properties of fresh PCC (density, slump, flow diameter) and physical mechanical properties of hardened PCC (water absorption, capillary water absorption, ultrasound pulse velocity, density, compressive strength after 28 days and 2 years curing, SEM) were established. It was determined, that by increasing amount of waste (till 20%) the workability of concrete decreases, because used wastes had higher water requirement. The best results were obtained, when 5% of cement was replaced by WWBA. Then compressive strength after 28 days curing comparing to control sample decreased 8%, but after 2 years curing it increased 9%, also the capillary water absorption decreased, denser structure was formed. The obtained results of hardened PCC density, ultrasound pulse velocity and water absorption are similar to control samples.

Corresponding Author: Marija Vaičienė

MAINTENANCE MANAGEMENT OF INFRASTRUCTURE SYSTEMS: ORGANIZATIONAL FACTORS IN TERRITORIAL PLANNING

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ABSTRACT

The issue of the maintenance of the infrastructure systems (e.g., viaducts, roads, bridges and highways), built some decades ago, is increasingly becoming a central argument. Within this topic, the safety assessment represents a fundamental as well as basic analysis that underpins a sustainable territorial management of the infrastructure systems. In fact, many structures are often affected by functionality, aging or safety problems and need specific interventions to avoid undesirable impacts in terms of social implications. In addition, the reference stakeholders, in terms of institutions and public actors, play an important role in relation to both the administrative and economic planning procedures. The present study has the preliminary aim to illustrate some possible contributions and improvements to achieve a more sustainable territorial planning, especially for the maintenance of the infrastructure systems. In detail, the present preliminary investigation highlights the possible advantages deriving from the use of the technology (i.e., remote sensing technique by means of satellite data - Differential Interferometry Synthetic Aperture Radar “DInSAR”) within an analysis at territorial scale. Indeed, the activity of monitoring all the overall infrastructure system can represent a useful approach to have a territorial vision of the safety of the infrastructures and can lead to a more sustainable planning. In fact, the involvement of all the reference stakeholders, in relation to this specific territorial issue, can lead to a more organised administrative and economic process. Some preliminary results, shown through thematic maps using the Geographic Information System (GIS), are described for a case study in a sample area in Italy.

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COMPARISON OF CARGO SECURING REQUIREMENTS FOR TWO TYPES OF OFF-ROAD VEHICLES

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ABSTRACT

The paper deals with the comparison of two off-road vehicles on three different types of surfaces with regard to cargo securing requirements. As primary data, the values of acceleration coefficients are used as obtained from the transport experiments conducted on the Tatra 815 and the Tatra 810 trucks. The goal of the paper is to identify the differences between the operations of both the vehicles in terms of cargo securing in the context of EN 12195-1:2010 standard requirements. An elementary statistical analysis was carried out to evaluate the measured data (values of acceleration coefficients). The results of the performed analysis show that there are statistically significant differences between the vehicles, and in several cases deviations from the EN 12195-1:2010 standard assumptions were identified as well. The conclusions above have influence on the cargo securing selection, and primarily on the lashing capacity of the securing means used. The results are usable in the optimisation of the fastening system for the tested vehicles aiming to prevent risk situations related to the loosening of the cargo during transportation.

Corresponding Author: Martin Vlkovský

EFFECT OF HEAT TRANSFER BETWEEN POTABLE WATER COLD AND THE ENVIRONMENT INSIDE BUILDING ON WATER QUALITY

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ABSTRACT

In the face of a coronavirus pandemic, many buildings or facilities are closed. The sudden closing of schools, factories or offices has caused a reduction in the water consumption inside buildings. The lack of chlorinated water flowing through the pipes, combined with temperature changes, poses a real risk to potable water from the bacteria multiplication point of view. The contribution focuses on the requirements for the temperature of potable water cold (PWC) in the water pipeline system inside buildings. The temperature of PWC should be optimally in the range of 8 - 12 °C and the limit value regarding the multiplication of undesirable bacteria in the water is set at 25 °C. The main goal of the research is to evaluate the effect of heat transfer between the PWC and the surrounding air during the water stagnation. Temperature differences between the PWC and the indoor air in building are leading to the heat transfer by convection. The result of the heat transfer is an undesired increase of the PWC temperature. The paper assesses the increase in PWC temperature over time using two methodologies - mathematical analysis and computer simulation. The mathematical analysis of the effect of heat transfer between the PWC and the surrounding environment is based on the calculation of heat gains. The heat gain in a circular pipe is caused by heat transfer of the environment to the individual layers of the pipe and insulation. The calculation was performed for steel and plastic pipe with different diameters and different insulation thicknesses. The results show that with an increasing pipe diameter and insulation thickness, the temperature of PWC during stagnation increases more slowly. The article points out the fact that the first 10 mm of insulation has the greatest impact on preventing the heating of PWC from the surrounding environment. Regarding the material design of the pipeline, only small deviations in the results were calculated between steel and plastic pipe. The second method used to calculate the change in PWC temperature over time is a computer simulation. The simulation was performed for the same boundary conditions as the analytical calculation and the results obtained by both methodologies are very similar. The benefit of the simulation is the view of the exact course of the temperature field in the pipe, which shows that the water temperature is highest at the inner surface of the pipe. At the inner surface of the pipe is also the highest density of biofilm, which in combination with a water stagnation should cause the microbiological contamination of water. Mathematical analysis and computer simulation show that the issue of PWC stagnation in the pipeline has a significant effect on the temperature and thus the quality of water in buildings.

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STRUCTURAL HEALTH MONITORING ISSUES USING INCLINOMETERS ON PRESTRESSED CONCRETE GIRDER BRIDGE DECKS

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ABSTRACT

In the last decades, assessment and rehabilitation of the existing built environment constitute one of the major challenges for engineers, practitioners and code-makers all over the world. Aging, deterioration processes, lack of or improper maintenance, and increasing occurrence of extreme events have led to the need of more efficient methods for the safety assessment and retrofitting/rehabilitation of existing concrete structures like bridges. New approaches deriving from research should be able to provide solutions devoted to reduce and/or avoid the necessity of interventions, verifying the safety conditions for human life and performances for serviceability on aged infrastructures. Structural Health Monitoring (SHM) of existing bridges has become a key issue in all western world as most of the infrastructures of each Country are reaching the end of their design life. SHM can be divided classically in two approaches: static and dynamic. Static SHM is based on the measure of displacements and their derivatives like rotations or strains regardless of the dynamic behaviour of the structure. Clinometers are among the most used devices to measure angles on structures; they can provide high accuracy when used in static mode as advanced techniques of signal processing can be used to reduce the noise of the signal working on acquisitions that can last several seconds to provide one single accurate measure of angle.
Nevertheless, many issues one the affidability and the correct use of measures done with clinometers have to be addressed to achieve a trustworthy SHM using such devices. In this paper the most relevant issues related to the use of clinometers on prestressed concrete girder bridge decks are presented providing explanation using a test case bridge that has been under continuous investigation for many months. A complete process for data cleaning and interpretation is provided stressing out the limits of the technology and the possible outcomes.

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INFLUENCE OF SLENDERNESS ON THE EVALUATION OF EPISEMIC UNCERTAINTY RELATED TO NON-LINEAR NUMERICAL ANALYSIS OF RC COLUMNS

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ABSTRACT

The use of non-linear numerical analyses to design and assess reinforced concrete structures and buildings is one of the most important development of the last decades for structural engineers and practitioners. With the advances in computer-assisted design tools, several structures will be designed and assessed using NLNAs in the future and the next generation of design codes will make possible to use such kind of tool extensively. This paper aims to quantify the epistemic uncertainty related to the non-linear analysis of slender reinforced concrete columns subjected to buckling using numerical codes. The adoption of finite element analyses able to take into account both mechanical and geometric non linearities, requires to adopt assumptions and approximations with respect to reality. In reliability analysis, these simplifications lead to additional uncertainties which are of epistemic nature. They may be reduced by the analysts increasing the refinement of the geometrical model and/or increasing the knowledge of used materials, however, every model, even the best ones, are affected by some level of epistemic uncertainty. This work presents the quantification of the model uncertainty related to non-linear numerical simulations of slender RC columns. Forty experimental tests respecting Eurocode specifications are considered. Several structural models are defined for each experimental test, changing the finite element code (f.e.) used and the material models available in each f.e. code. Numerical results are compared to the experimental ones. Then, a statistical treatment of the resisting model uncertainties is performed, following a Bayesian approach. The mean value and the coefficient of variation, which characterize the resisting model uncertainty, are identified and the partial safety factor related to the resisting model uncertainty is evaluated.

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MECHANICAL AND THERMAL ACTIVATION OF MORDENITE-RICH TUFF FOR ENHANCING ITS EFFECT ON CEMENTITIOUS MIXTURES. PART 1: CHARACTERISATION OF TREATED MATERIALS AND CEMENT PASTES

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ABSTRACT

The raw mordenite-rich tuff has several advantages but also performance deficiencies in the partial replacement of Portland cement in cement paste. In order to overcome these deficiencies, the present research aims to propose and study different treatment and improvement techniques. The tuff was subjected to thermal and mechanical treatments. Thermal treatment was performed by calcination of the raw material at 300 °C and 500 °C. As for the mechanical treatment, it was divided into three parts: prolonged grinding to large specific surface areas, co-grinding with Portland cement and separate grinding/co-grinding with GGBFS to a specific surface area close to that of Portland cement. The resulting materials were initially characterized by the monitoring of changes in the treated materials, including density, the particles shapes and the particles size distributions. Subsequently, blended cement pastes containing 0%, 5%, 10%, 15% and 20% of raw or treated tuff were prepared and tested by monitoring the water required for normal consistency, setting time, hydration process by isothermal microcalorimetry, degree of hydration, non-evaporable water content and the consumption of calcium hydroxide by TGA-DSC analysis. From the results obtained, it can be reported that the activation techniques have somehow reduced the deficiencies for which they have been developed.

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ANALYSIS OF WATER RETENTION POSSIBILITIES BASED ON PROGRAMS, STRATEGIES AND SELECTED PROJECTS IN POLAND

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ABSTRACT

A particularly important and topical issue in contemporary urban planning and urban design is to prevent the current climate threat. The scale of the problem and the forecast of the effects of climate change are shown in the publication of numerous research centers such as NASA and the IPCC. The Report of a temperature increase of 1.5 degrees relative to the pre-industrial era has shaken public opinion, however, a less optimistic scenario assumes an increase of 3 degrees. Local governments often face the challenge of rapid and effective response to the effects of climate change. Adaptation strategies to climate change have been developed at the EU level since 2009, in which so-called White Paper has been passed, recognized as one of the first documents to define goals and measures, and on the national (Polish) level from around 2010. On the basis of strategic documents and research of scientific institutions, many local government units adopt programs aimed at implementing specific solutions. In the light of climate reports, it turns out that one of the most sensitive areas to climate change is water management. Therefore, effective adaptation measures include those aimed at rational management of rainwater. As a result, there are created comprehensive adaptation programs focusing on various sectors of the economy. Some of them are based on elements such as: green infrastructure, support for biodiversity or the implementation of activities in the field of blue-green infrastructure and the idea of "sponge city". They have been analyzed by the authors in terms of their usefulness and compliance with higher level documents. The aim of the study was to look at what actions are undertaken by cities in order to implement adaptation postulates. Selected activities undertaken by local government units of the cities of Olsztyn, Bydgoszcz and Gdańsk were analyzed. For educational purposes there are prepared information brochures for investors, residents and officials. They present the available tools and methods for sustainable rainwater management and increasing the city's resilience to the effects of climate change by increasing retention based on natural-based solutions. Equally important are the projects themselves, which is why another objective of the research was to analyze the implementation for compliance with the stated goal of increasing the retained water and adaptation to climate change of the city. The research methodology is based on desk-research and indirect inventory. A representative example of the research carried out is the implementation of the programs: "Rainwater management systems in the city of Olsztyn" and „Expansion of the rainwater management system in the city of Olsztyn". The authors conclude that the adopted programs and strategies, as well as the implemented investments, are examples of both beneficial measures to improve water retention in the city, but unfortunately, they are also examples of "tools" to raise funds for investments, there are many in which rainwater is treated as sewage and still go directly to the sewage system.

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THE BUILDING AS AN URBAN GARDEN. A POSSIBLE SCENARIO FOR BUCHAREST

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ABSTRACT

Situated on the banks of the Dâmbovița River, Bucharest has a millenary history but is known as an urban settlement for over five hundred and fifty years. It was the capital of Walachia since the XIV-th century and became the capital of the Romanian United Principalities in 1862. It was a patriarchal community, where agriculturists were mingling with wine growers, furriers with brick makers, saddlers with merchants from Leipzig. In fact, although the crafts disappeared in time, they remained as street names, in the historic part of the city: The Vineyards Way, The Agriculturists Street, the Saddlers Street and so on. Houses of the local nobility were situated on the main street, the Mogoșoaia Bridge (indeed a bridge, as it was all covered with wooden planks, leading from the Mogoșoaia Palace, in the country, to the Court of the prince, on the riverbanks). Surrounded by orchards, these ”courts” - buildings, spaces and inhabitants - were a mixture of oriental and occidental source, as was in fact the whole settlement. As the United Principalities grew into the modern kingdom of Romania, administrative buildings were constructed, to accommodate the new functions of the state. At the turn of the Century, Bucharest was referred to as The Little Paris, with a specific Romanian architecture but also with beautiful examples of Classicist architecture, Art Nouveau and later, in the 1930s, with Modernist residential buildings with Romanian stylistic particularities. Slowly the meadows disappeared, while the brick, concrete and asphalt took over more and more of the green side of a city that was wounded also by earthquakes, wars and large-scale demolitions. The paper focuses on some possibilities that may provide benefits at the scale of the building as well as on the city scale, if vegetation is used as a building envelope component.

DURABILITY, RESILIENCE AND SUSTAINABILITY IN THE BUILDING REHABILITATION PROCESS

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Where buildings are concerned, the term “sustainability” has been used for more than 30 years. It represents a process of designing, constructing and operating the building considering its environmental impact. A year after the major nuclear plant catastrophe from Chernobyl, the Brundtland Report defined sustainability as the actions that meet “the needs of the present without compromising the ability of future generations to meet their own needs”. A different disaster, a natural one – the Katrina hurricane – led, two decades later, to the additionof another building characteristic: “resilience”. It represents the capacity of a system to adapt after a shock. “Durability” may refer to different issues: the building materials, the building structure, its functionality of aesthetics. The more durable a building is - the more it lasts - the less it affects the environment. The more it lasts, the more resilient it is (as it withstands different types of stress). Technical durability, provided by building materials and structures, prevails over the functional durability. A good example is the case of the industrial buildings of the nineteenth century: constructed with solid masonry structures, these buildings have lost the original functions decades ago and they were subject of conversions that provided them a new life-cycle. Withstanding the action of natural and anthropic agents, these buildings proved to be resilient and, by saving the natural resources, they can also be considered sustainable. Considering that in the next 30 years we will still face 70% of the current building stock, it is important how we deal with them, in order to provide, by rehabilitation, a new life-cycle to the existing constructions. The paper tackles, from a critical perspective, some examples of good and bad practice in the building rehabilitation process.

FIRE SAFETY MEASURES REGARDING THE COSERVATION OF HERITAGE BUILDINGS IN ROMANIA

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ABSTRACT

The research aims to give practical ways to improve the fire safety practices regarding built heritage in Romania. The Romania's accession to the European Union in 2007 meant, for the construction field the beginning of free trade of construction goods and products. The abundance of new materials has given the architect wider tools of expression, which are not always judiciously used, especially in the case of buildings of historical value. Once with to the easy access to new materials came the legal issues related to the use of products and the lack of rules of intervention on historical material. From here resulted the strong misfit between construction materials that have completely new features, Romanian norms and regulations in the field of construction, in force since 1999. Apart from this, new functionalities and destinations have appeared or evolved from old Romanian legislation, which makes them very difficult to incorporate into such outdated norms and regulations. In the same time, the constructions periodically change their functionalities and compartments. In addition, there are continuous changes of the international recommendations regarding the interventions on the heritage buildings. Thus, the dynamics of user occupancy and evacuation have evolved greatly and are not easy to manage in a building of historical value. The study and research include both theoretical analysis on legislation, guidelines, national and international protocols on fire safety of heritage buildings (but not necessarily historical monuments), and also current technologies, practical research which is applied to case studies. Even though the international research on fire safety is at the highest level, what the study intends to do is to extract what suits the Romanian context and can be adapted to local technical possibilities or capabilities, in order to have practical recommendations for us. The above mentioned study and research in the field of heritage, is intended to be included in the broader framework of the Romanian fire safety regulations, which is currently being developed.

SEARCHING FOR THE IDENTITY OF THE POMERANIAN HOUSE THROUGH EDUCATIONAL ACTIVITIES

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ABSTRACT

Architecture is a universal phenomenon and is a culture-creating field closely related to other fields of art. Hence, experiencing identity and feeling of it are also conditioned by the proper formation of architectural objects. Buildings are carriers of specific values which participate in deciding on the possibility of this experience to occur in connection with a specific place and participate in the fulfilment of a specific need in it. In the era of ubiquitous thoughtless consumption and common avoidance of the written word, objects belonging to the material culture that architecture co-creates become essential in the process of conveying ideas and specific content. Belonging to a place, cultural group, community or regional community is reflected in consciously designed spatial forms. However, in order to ensure this awareness, the above-mentioned issues should be included in the general education as part of expanding knowledge about regional planning, but also the knowledge of regional architectural forms and settlement systems. The Pomeranian home experience can be related to two contrasting situations. First of all - a former Kashubian village with its regional buildings, where the house came in the form of a wooden Kashubian cottage. This form of architecture, as it arose from local conditions and was culturally embedded in the consciousness of Kashubians, strengthened the sense of identification with the inhabited region and a specific place. Secondly - a contemporary Pomeranian housing estate, built up with multi-frame, prefabricated blocks. It seems that this type of development, devoid of cultural roots in regional traditions, impoverishes personal identification with the inhabited building/apartment. The space of housing estates, as well as neglected buildings in some villages awaits revalorization. A lost identity can be searched for by caring for valuable housing based on knowledge of architecture and regional settlement. The authors will present a publication made as part of the project entitled "ZASPA: house in a block of flats. The spaces of architecture." In line with its assumptions, the issue of the residence of inmates in the region was raised. The book entitled "Block and hut: wandering" serves as an educational material for children in higher grades of primary schools. It provides knowledge about the regional form of the Kashubian house and settlement forms typical of the area. At the same time, contemporary settlement forms are shown - housing estates with blocks of flats as the houses that fill them.

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EFFECTS OF SUBSTRATE TEXTURE AND MOISTURE CONDITIONS ON ULTRA-HIGH-PERFORMANCE CONCRETE AND SILICA FUME CONCRETE OVERLAY BOND STRENGTHS

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ABSTRACT

Laboratory direct tension (pull-off) tests were conducted to investigate the effects of substrate moisture conditions and texture on ultra-high-performance concrete and silica fume concrete overlay bond strengths. Improper substrate surface preparation (moisture condition and texture) can result in inadequate overlay bond strengths and, in severe cases, lack of bond. To demonstrate the importance of surface preparation, a series of pull-off tests were performed on overlaid laboratory slabs. The first part of the study investigated two extreme surface moisture conditions which included pre-wetted and dried prior to overlay application. Pre-wetted slab specimens had a tined, tined-light sand blasted, or tined-medium sand blasted substrate surface texture. The dried slab specimens had either a tined or an exposed aggregate substrate surface texture. Pre-wetted specimens with tined, tined-light sand blasted, and tined-medium sand blasted surface textures achieved average direct tension bond strengths of 0.924 MPa, 1.45 MPa, and 1.95 MPa, respectively. Specimens with dried substrate surface conditions prior to overlay placement had zero bond strength. The second part of this study investigated surface moisture conditions that ranged from saturated to dry. This was achieved by allowing the substrate surfaces to dry for a predetermine amount of time (15, 30, 45, and 60 minutes) prior to application of the overlay. The surface texture used for these specimens was a tined-light sand blasted texture. Slabs overlaid with surfaces that dried for 15, 30, 45, and 60 minutes achieved average bond strengths of 1.77 MPa, 2.01 MPa, 1.59 MPa, and 0.165 MPa, respectively. Results from this study showed that pre-wetting was essential for achieving adequate overlay bond. Tined-light sand blasted specimens with proper pre-wetting achieved adequate bond strengths, and properly pre-wetted, tined-medium sand blasted specimens produced excellent bond strengths. Results from this study expose the drastic consequences of not maintaining a saturated substrate surface prior to overlay application. Results from the timed drying investigation revealed that delaying application of the overlay up to 60 minutes can drastically reduce bond strength.

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MODELLING OF FUTURE DEVELOPMENT OF SOIL EROSION PROCESSES BASED ON THE CLM MODEL SCENARIOS

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ABSTRACT

The study presented the investigation of the future behaviour of soil erosion processes by years 2050-2100 under the changes in climate and land-use management practices. The consequences of climate change are known and visible via the vital sign of the planet, i.e., loss of sea ice, global temperature rise, sea level rise, distribution of species and alters ecological processes, extreme events, ocean acidification, changes in precipitation patterns and soil properties. However, the range of the long-term climate change effects is difficult to measure if not impossible. The modelling of future scenarios provides gentle insight into the future development of processes modelled with an amount of uncertainty that has to be carefully included in the outcomes. A related issue is the relationship between the climate change and soil properties and noticeable through the influence of physical and chemical soil properties that further affect the processes below and above the soil surface. Since the soil represents essential element in balancing the climate, the changes in the soil substances are linked to other processes with direct impact on living organisms, including humans. The study deals with the extreme events, changes in precipitation patterns and soil properties. The study investigates the future development of soil erosion processes based on the continuous future precipitation data scenario provided by CLM model. The erosion calculations were performed in the physically-based EROSION-3D model using long-term simulation tool. It is assumed that the impacts of land use, soil management practices on soil water erosion are higher than the effects of changed precipitation patterns; therefore, two scenarios were modelled in the study (current and possible future scenario). The results show changes in soil erosion processes by the years 2050-2100 quantified by comparing scenarios of soil management practices used.

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IMPACT OF THE APPLICATION OF GRINDING AND GROOVING OF A CONCRETE ROAD PAVEMENT ON NOISE LEVEL IN THE ENVIRONMENTY

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ABSTRACT

The growing number of cars and trucks moving around on our roads contributes to the rise of noise level to which people in their immediate vicinity are exposed. The regulations in force impose on road managers the obligation to limit road noise to the permissible level in compliance with the applicable regulations. The obligation to ensure protection against traffic noise applies equally to newly designed roads and to the existing ones which are being extended or modernized. This type of noise is generated principally by the interaction between tires and road pavement. Therefore, the design and construction of quiet pavements plays a very important role in reducing environmental noise and may in some cases be an alternative to other noise reduction methods. The article undertakes the task of assessing the impact of grinding technology and grooving technology of the existing concrete pavement on the reduction of noise propagation in the environment. The article involves the tests of road pavement made of cement concrete. The tests were carried out on the road section before and after the above-mentioned works using a method similar to the Close Proximity Method (CPX) and the noise measurement method at road edge at a distance of 10.0 m and a height of 4.0 m. The obtained results were illustrated with a noise range map for the modified and standard road pavements.

Corresponding Author: Rafał Żuchowski

ACOUSTICS OF A SCHOOL BUILDING MADE IN WOODEN TECHNOLOGY ON THE EXAMPLE OF BUILDING FROM THE SECOND HALF OF THE 19TH CENTURY

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ABSTRACT

The Władysław Matlakowski School in Zakopane was established in 1877. After the war damage, during the Communist rule in Poland the school was rebuilt and renovated. As a result, the original character of the classrooms was distorted. Fiberboards used for interior finishing changed the acoustic climate of those rooms. The reverberation time of the tested rooms considerably exceeds 2 seconds for low frequencies and is below 2 seconds for medium frequencies. Thus, the reverberation conditions do not differ from typical school classrooms in Poland. The tests of the reverberation conditions were supplemented by the measurements of acoustic insulation of partitions separating school classrooms from each other and from the corridor. The studies allow to infer that the noise possibly comes from the corridors or adjacent rooms.

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EVALUATION OF THE WATER MANAGEMENT ACTIVITY IN THE IMPLEMENTATION PROCESS OF THE WASTE TRANSFER STATIONS IN ROMANIA

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ABSTRACT

Transfer stations are used for the short-term transfer or storage of waste, for loading and pressing in large pre-containers (36-40 m³), and their transport to sorting stations or ecological landfills. The design and construction of transfer stations is carried out in accordance with the requirements of the waste management plans, and their operation will be carried out by operators only after obtaining the permits and authorizations required by the regulations in force. The authorization and regulatory procedures from the legislative point of view are harmonized with the subsequent legislation at European level and imply an approach to the management of wastewater generated from the site so that the impact on environmental factors is minimal. The paper presents models of good practices from the situations encountered in the implementation of the transfer stations in Romania in accordance with the waste management plans.

BETWEEN REDEMPTION AND RESILIENCE

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ABSTRACT

The present paper focuses on the built environment as a means of succeeding in the effort to rehabilitate convicted people, highlighting the psychological repercussions of the correctional framework. The research involves the study of both national and international institutions and it is meant to provide a polyvalent understanding of the complex prison environment and subculture, in order to emphasize change. The paper reveals the fundamental issues of the criminal backgrounds regarding the custody conditions of people sentenced or deprived of liberty. The prevailing disciplinary architecture in the design of the Romanian prison (mainly used as a form of control), the improper conditions assured by the detention facilities, the damage that prison atmosphere causes to individuals, as well as the low number of studies on these topics lead to a (re)thinking of architecture in a sustainable way (both in terms of environmental damage and lifestyle - expectations, needs, priorities), in order to provide an advantageous rehabilitation environment for incarcerated people, bringing benefits not only to individuals but also to society. The study joins international struggle to identify ways of improving punitive human habitat, given the current endeavor made for the preservation of the planetary environment and also considering the current European criminal policies on developing the capacity of prison systems to fulfill their dual mission: to exercise social control over the custody of prisoners and to support them in the process of social reintegration. In order to achieve these targets, the elements of architectural language that shape the built environment are identified. New methods and techniques for approaching the detention environment that positively influence, equally, the life of inmates and the activity of workers are studied. The research aims to identify the most sustainable solutions for the design of detention environments, based on the scientific literature in the field and according to the European legislation, in order to improve the correctional conditions and the quality of inmates` lives, as well as to reduce the recidivism rate among criminals.

STUDY RESULTS AND ACHIEVING HIGH VENTILATION AIR QUALITY IN ARCHITECTURE FOR A PUBLIC UTILITY BUILDING – SHOPPING CENTRE IN MIELEC, POLAND

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ABSTRACT

The subject of this paper is the study of a public utility building, specifically a shopping center in Mielec (Poland), carried out as part of the programme of "Research for achieving high air quality in architecture and urban planning" by a team from the Institute of Architectural Design at the Department of Contemporary Architecture of the Faculty of Civil Engineering and Architecture, Lublin University of Technology since 2018 (with two other studies published in 2019 – item 12, the "WICA" Academic teaching building at a higher education institution, Lublin University of Technology, item 13, the Historic Potocki Palace in Radzyń Podlaski)). The purpose of the current study is to utilise a novel technology that is expected to bring reductions in electrical and heat energy consumption and cut CO_2 emissions in the shopping centre public utility building in Mielec. The building is equipped with systems for obtaining heat and cold from groundwater and features the energy consumption level of a passive building with the lowest primary energy ratio (PER) in Poland. This state-of-the-art, innovative, energy-efficient and environment-friendly FCH system with BMS control was subjected to numerous tests and analyses, the details of which will be presented further in this paper. The design assumptions were confirmed and all work parameters were recorded for the system under extreme conditions, including the determination of final energy (FE) and primary energy (PE).

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STUDY RESULTS AND OBTAINING HIGH VENTILATION AIR QUALITY IN ARCHITECTURE FOR AN OLD SHOPPING CENTRE PUBLIC UTILITY BUILDING WITH MODERNISED EL. HEATING IN WARSAW, DISTRICT, POLAND

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ABSTRACT

The subject of this paper is the study of a public utility building, a shopping center in Warsaw / Targówek, carried out as part of the programme of "Research for obtaining high air quality in architecture and urban planning" by the team of the Institute of Architectural Design at the Department of Contemporary Architecture of the Faculty of Civil Engineering and Architecture, Lublin University of Technology since 2018. Other studies were published in 2019 (bibligoraphy item 12, the "WICA" Academic teaching building at a higher education institution, Lublin University of Technology, and item 13, the Historic Potocki Palace in Radzyń Podlaski). The purpose of the study of the building is to utilise a new technology which will lead to reductions in electrical and heat energy consumption and cuts in CO_2 emissions in the modernised Shopping Centre Public Utility Building in Warsaw. The building is equipped with systems for obtaining heat and cold from groundwater and is adapted to a low electrical energy consumption level with the lowest primary energy ratio in Poland. It is located in Warsaw and, in addition to the energy sourcing system, features a highly modern control system (BMS). The objective of the study is to demonstrate operating costs for a building with low exterior wall and roof insulation parameters. In addition, the building uses a heating system based solely on electrical heating due to its lack of access to gas and district heating. The conducted studies and analyses allowed a comparison of the operating costs of old buildings following modernisation with those of new buildings.

Corresponding Author: Jan Wrana

PROCESS OF DEVELOPING COMMUNITY-BASED GUIDELINE IN RESPONSE TO TOURISM GENTRIFICATION CAUSED BY SIMPLE ACCOMMODATIONS: A CASE STUDY OF THE SHUTOKU DISTRICT IN KYOTO CITY

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ABSTRACT

This paper aimed to clarify the process by which the local community in Kyoto City worked to develop community-based guideline in response to tourism gentrification caused by simple accommodations (SAs), as a case study of the Shutoku District. Kato (2020) defined the gentrification as a phenomenon where traditional communities are destroyed as part of tourism gentrification. The gentrification is one of social problem that has emerged in tourist cities across Japan: a conflict between tourists and residents. The method was an action research method. Specifically, the author emigrated to the Shutoku District and became a member of the Shutoku Machizukuri Committee. Then, The author analyzed the dialog process based on regular meetings' minutes, workshops, and questionnaire surveys. As a result, it was determined that the whole process could be divided into four phases: (1) the research period; May–August 2017, (2) the measures against SAs; September 2017–July 2018, (3) the coexistence with SAs; August 2018–May 2019, and (4) the guideline development; June 2018–February 2020. In phase (1), the committee surveyed the accommodations in the district. As a result, the committee established a policy to work with the government to correct accommodations that operated illegally. However, the committee found that some of the legally operating accommodations were also considered community problems. The accommodations were the SAs. In phase (2), the committee began to consider whether to regulate the location of SAs in the district. As a result, the committee decided not to regulate the SAs location. That is because the committee discussed that community problems were the declining population of residents rather than an increase in SAs. Therefore, the committee decided to change the measures to reduce the number of residents by coexisting with SAs, rather than regulating it. In phase (3), the committee engage the SAs as new residents and encourage them to become active community members. The committee conducted projects such as sightseeing tours and creating guide maps for tourists. However, despite the committee's activities, the number of SAs increased excessively. The situation led to an increase in the number of residents who opposed the committee's coexistence activities. In phase (4), the committee developed ideal images of SAs as the Shutoku Machizukuri Guideline. In the guideline, to have a good relationship with the SAs as residents, the committee requires them to join the neighborhood association, clean the streets, and greet them daily. The committee requested them because the committee aimed to coexist with the SAs in Phase (3). The major conclusion is that the committee has progressed with a shift in policies, taking advantage of dialog. However, the process was not easy, but one that proceeded through a process of trial and error, sometimes involving conflicts among residents. The process will hopefully help to other tourist cities globally.

A NUMERICAL APPROACH FOR THE DESIGN OF RC BEAMS SUBJECTED TO AXIAL AND TRANSVERSE LOADS

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ABSTRACT

The combination of axial and transversal shear loads may be encountered in a number of practical cases, such as in columns of frames under high seismic action, or in continuous beams rigidly connected to columns (where axial loads may result from the restrain of thermal deformation of concrete members) or even in post-tensioning reinforced concrete (RC) elements such as bridge girders. Historically, the influence of axial loads was not taken into account in the shear design of RC elements. However, an incident at the Wilkins Air Force Depot warehouse in Shelby, Ohio in 1955 had raised questions about the accuracy of shear provisions in design codes. Indeed, the accidental collapse of continuous RC beams without shear reinforcement was attributed to unaccounted axial tensile stresses due to restrained shrinkage of concrete. The oldest published experimental results on this subject (the work of Elstner and Hognestad, 1957 which followed the incident) showed that shear failure of a RC beam may be very sensitive to an even relatively slight increase of tensile stresses. This may be the reason why most of the actual design codes propose empirical or semi-empirical approaches which are very conservative in the case of shear-tension loading. On the contrary, design codes suggest that compression increases substantially the shear resistance of RC elements. However, the quite recent incident of the Sleipner offshore platform in 1991 showed that design codes may be non-conservative by overestimating the beneficial effect of compression on the shear capacity of these elements. In this context, the present contribution deals with a numerical approach for the design of RC beams subjected to axial and transverse loads. It is based on the finite-element implementation of the kinematic approach of the yield design (or limit analysis) theory combined with a “mixed modelling” where the concrete material is regarded as a classical two-dimensional continuum while the longitudinal reinforcements are modelled as one-dimensional elements working in tension-compression only. For the beams reinforced in shear, stirrups are incorporated in the analysis through a homogenization procedure. An optimization problem is formulated, then solved using conic quadratic optimization method. As a result, an upper bound estimate to the yield strength domain of RC beams may be drawn in the plane of axial and transversal loads. For illustrative purpose, calculations will be conducted on typical RC beams with different longitudinal and transverse reinforcement degrees. Furthermore, it will be shown that such numerical predictions prove to be in good agreement with the results derived from other numerical simulations of the same problem using a finite element-based limit analysis commercial software as well as with those predicted by a semi-analytical solution. In order to assess their practical validity, these predictions are also compared to some available experimental results published in the literature.

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STUDY ON THE DESIGN OF HIGH-RISE GARDEN RESIDENTIAL MODEL IN COLD REGION USING WIND ENERGY

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ABSTRACT

Wind energy is a renewable energy with the advantages of low carbon, environmental protection and energy saving. In the cold regions of China, the design and research of high-rise residential condominiums using wind energy is in a blind spot. This paper studies the effective layout of total plane greening to guide the wind, the reasonable orientation of the building position to accept the wind establishing the platform of the hanging garden to effectively organize air ducts and using narrow tube effect to improve wind speed and other aspects of research measures on the basis of low wind speed wind power generation, Wind power conversion equipment is effectively installed through the aerial garden platform. It is used for high-rise residential model in cold regions exploring a design set of high-rise garden residential model in cold region using wind energy. Furthermore, it provides a new method for green building design in cold regions.

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IMPACT OF BUILDING LOCATION ON ITS ENERGY DEMAND

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ABSTRACT

The paper presents the analyses involving energy demand of a single-family building located in various climatic zones. When designing buildings, special attention is paid to material and technological solutions, but often the climatic zone in which the building is to be located is not taken into account. Therefore, the article considers the location of building in five climatic zones in Poland and it investigates the impact of the location on its energy demand. It turned out that the location of the building in zone V, i.e., in the north-east of the country, determines the highest energy demand for heating compared to the rest of the country. The work demonstrates the impact of a climatic zone in which the building is located on its energy demand.

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ELASTIC ANALYSIS OF STEEL-CONCRETE COMPOSITE BEAMS WITH PARTIAL INTERACTION

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ABSTRACT

The paper presents an exact analytical method for the elastic analysis of steel-concrete composite beams with partial interaction. Accepting the basic assumptions of the Newmark analytical model and adopting the axial force in the concrete slab as the main unknown, the second order nonhomogeneous differential equation of the steel-concrete composite element with partial interaction is derived. Further, the complete solutions for simply supported and fixed-ended composite beams subjected to concentrated and uniform loads respectively, are developed. The solution of the homogeneous equation is determined by imposing proper Dirichlet or Neumann boundary conditions depending on the static scheme of the element. The particular solutions are then derived for the considered loading conditions. It is shown that the internal axial force in concrete slab associated to composite beams with partial interaction can be expressed as a fraction of the axial force in concrete slab under full interaction through a non-dimensional function f(αL) which takes into account the connection's stiffness, the mechanical properties and also the length of the element. Moreover, the solutions are included in a flexibility-based approach to derive the force-displacement relations of the beam element with partial interaction. For the resulted 2-noded beam-column element with 6DOF, the stiffness matrix is derived, showing that the partial composite action maybe included at the element level by means of a series of correction factors applied to the standard full-interaction stiffness matrix coefficients. A numerical example is provided to demonstrate the accuracy and performance of the proposed method. Within the elastic range, the predicted load-midspan deflection curve is in very good agreement with both experimental and other numerical results retrieved from international literature. A parametric study was conducted to investigate the influence of the shear connection degree on the beam's midspan deflection and the results were compared with those computed by using code provisions.

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STRATEGIC AND SPATIAL REGULATION TOOLS FOR HARMONIZING LAND USE INTERESTS IN THE CARPATHIANS – EXPERIENCE FROM SLOVAKIA

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ABSTRACT

Carpathian ecoregion is one of the last strongholds of biodiversity in Europe. The area spreads across several European countries and contains thriving populations of large carnivores and other species, while staying some of the least-fragmented areas in Europe. At the same time, it is under growing pressure to develop its infrastructure endangering this natural uniqueness. In this paper the pressures to develop the area are described in the light of the existing planning policies in Slovakia. We focus on one of the TransGREEN and ConnectGREEN project cross-border pilot areas located between Czech Republic and Slovakia 'Beskydy-Kysuce' where we discuss the pressures to develop the infrastructure and the measures to retain the fragmentation as low as possible. The paper discusses Slovak planning policies on national, regional and local levels. In its second part the focus is on examples of development in this pilot area demonstrating the growing pressure for more infrastructure being built improving the transport connection between Slovakia and Czech Republic. The measures to ease the conflicts between the interests of nature protection and green infrastructure, and the interests of developing the grey infrastructure in this area are presented. Lastly, we review the planning policies and tools in the Slovak national spatial planning system aimed at regulating the development considering all interests in the territory and managing this growth while keeping it in the lines of sustainable development, biodiversity protection and enhancing resilience of this area. The aim is to demonstrate in this pilot area the approach of Slovak planning policies and tools in the Slovak national spatial planning system leading to find the way how to anchor the regulation or adaptive measures so as to create a unified strategic framework for the Carpathian region with a set of recommendations to regulate a massive development in this unique area to avoid the conflicts between green and grey infrastructure.

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CITIZEN ENGAGEMENT WITHIN THE PROCESS OF REALISATION OF THE CITY ENERGY TRANSITION PROJECTS

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ABSTRACT

Public participation and citizen engagement in the decision-making processes in urban and spatial planning have become natural part of the planning process and significantly affects its outcome. The emphasis on energy transformation of our cities opens new fields of citizen engagement regarding the large city energy projects, as well as the smaller energy transformation project on individual level. Current debate about the climate change and the overall raising of general awareness of the individual energy consumption and environmental footprint may become the driving force regarding the motivation of citizens to be engaged and involved in cities energy projects or to reconsider their own behavioural patterns related to the sustainable energy. While the cities are able to implement such strategies related to the city owned properties, there is an urgent need to properly address the individual property owners and to try to include them in the planning processes, and thus to assure better acceptance of the energy strategies. Mutual consensus and effective collaboration of all the participating actors is an underlying assumption for successful energy management in any given city. Therefore, the focus of this paper is to provide literature review of the citizen engagement regarding the city energy project, it 's possible threats and benefits and rising challenges for the planning process as a whole. The paper is summarising experiences derived in Horizon 2020 project Making City focused on promote Positive Energy District (PED) planning and methodology aiming at development of new integrated strategies to address the urban energy system transformation towards low carbon cities, with the PED approach as the core of the urban energy transition pathway.

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WIND-INDUCED VIBRATION OF AN IRREGULAR PENTAGON LAMELLA

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ABSTRACT

At present, there are increasingly encountering use of lamellar structures, for example on the roofs of buildings, which, in addition to their visual function, also fulfil the function of reducing the flow of wind into the roof space. These structures are often designed as long and subtle structures and therefore their very common problem is unwanted vibration. In this article, the main focus is to show the methodology of the determination of the effects of wind on the lamella of the shape of an irregular pentagon. A real-size model made of steel with a total length of 2 m and a weight of 7.4 kg was used. Its size and shape were influenced by several factors which are specified in more detail in the paper. In the wind tunnel experiment, it was very important to ensure the exact position of the model and also to secure both ends of the model against shifting (to replicate fixed ends). Dynamic response of the structure in two directions together with wind speed were measured simultaneously. To investigate the wind effects by numerical analysis, fluid-structure interaction software simulation (FSI) on a full-size model was used. The main pitfall of the software solution was to get as close as possible to the conditions of the wind tunnel. The actual wind speed measured under laboratory conditions was used as the input wind speed for FSI simulation. The material of the model and the shape of the model was set in software simulation to be as close as possible to the real structure. Subsequently, other boundary conditions were set and the solution process was executed. The biggest problem, especially in terms of comparing the results of both approaches which greatly affected the results, was the very high stiffness of the model. Due to the extent and interconnectedness of results, findings are presented in more detail in the conclusions of the paper. The methodology of setting up a relatively complex FSI simulation, its results, as well as new findings that we came up with if the measurement of the dynamic effects of wind is the matter of interest are presented in this paper.

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THE REVITALISATION OF OLD FACTORIES AREA ON THE CHOSEN EXAMPLE FROM LODZ

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ABSTRACT

Lodz (Łódź) is one of the major urban centres in Poland - and a city of unique historical and cultural heritage. The city is continuously changing and developing, respecting its identity and tradition or declaring that. The article goal is to present field and case studies of three examples of the revitalisation of neglected areas in Lodz. These postindustrial spaces lost their functions in the last decade of the XXth century. These three projects in different parts of the city with other characteristics and ownership situations represent three different approaches to revitalising historical objects and adjusting them to new functions. Given cases are compelling examples of the various methods used to postindustrial heritage protection and conservation activities and the outcome of those entirely different strategies. As it seems the private entrepreneur has reached the best result in raising activities at the neglected old factory plot but at the same time while placing the responsibility of the space on its new users. Simultaneously, the public financed project oversight by towns authorities introduces the most changes to the historical tissue and seems not reaching its goals as far as a revitalisation of the area is concerned. In this light, the last project joining both private and public funds and introducing a new design solution with extreme care for historical tissue seems to reach the goals of both at a satisfactory level. The examples show how different strategies for cities to redeveloped their image and function work in Mid-European post-communism countries' realities and how other types of public life participants embrace this heritage.

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FROM TRADITIONAL TO SMART BUILDING MATERIALS IN ARCHITECTURE

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ABSTRACT

Building materials from traditional to contemporary and from traditional to high-performance materials in architecture and their implementation in energy-efficient constructions. Can be compare with smart ones? Can we bring these materials to superior performance? Building materials in general, either smart, energy efficient or with new performance, are based on the same traditional materials. A material is considered to have special properties only when it contributes to the improvement of construction criteria. With all these advances in construction techniques and architecture, along with end-user demand for 2021 buildings, as architects we will need to introduce something new and smart to meet their requirements and needs. We can build intelligently and at the same time use traditional materials or current construction needs guide us to a new era of building materials, high-performance materials, smart, etc. This abstract wants to make a comparison between the high-performance direction that is foreseen in the future in building with intelligent materials and returning to nature by using traditional building materials to build just as efficiently. This transformation is possible and to what extent the new requirements can bring traditional materials to these standards. The paper is an overview of the types of materials that can be used in construction and architecture, thus offering a new perspective on innovative techniques that will be available or are already available that improve this field. The comparison between classical concrete and concrete that changes the image of architecture through the created image or between traditional and performance materials for building envelopes are only a small part of the options available for use in construction and architecture.

POPULAR HOUSING ON THE OUTSKIRTS OF SÃO PAULO AND RIO DE JANEIRO: DESIGN FOR A BETTER ACOUSTIC, THERMAL AND LUMINOUS PERFORMANCE

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ABSTRACT

With the social isolation imposed by the pandemic, vulnerability directly related to aspects of housing were highlighted. Public health policy was limited to the isolation of the population in their own homes as the main way to contain the spread of the virus. The strategy, however, brought to light the lack of infrastructure for houses in Brazilian slums. Locked down in their own homes, slum residents realized how they lack minimal infrastructure in terms of thermal, acoustic and environmental comfort. On last 2nd October, Rio de Janeiro registered a maximum temperature of 43.6oC (110.48oF) with a thermal sensation of almost 50oC (120oF). Researchers from Technology and Visual Programming created an original strategy to develop remote diagnoses of the homes of favela residents. These diagnoses helped to develop a list of suggestions for improving the thermo-acoustic performance of homes. Residents of regions in a vulnerable situation were trained during online remote workshops to register — by pictures from their own smartphones — the built environment in which they live. A team of researchers on acoustic, thermal and luminous comfort analysed the iconographic data. These diagnoses resulted on reports that were presented as a list of improvements that could be supported and implemented by them. The experience of reimagining those communities was performed according to the following fields (United Nations Sustainable Development Goals): poverty eradication; health and wellness; reducing inequalities; sustainable cities and communities. The anonymous photos and the result of the diagnosis, which can be replicated to most houses in Brazilian slums, were published on the digital platform ArqXP.com. The suggestions published on the platform remain available to the entire community. Examples and unpublished data from the research will be presented in a possible submission of a full article. To access the visual results of the applied methodology, go to: https://arqxp.tumblr.com/

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EFFECT OF THE FEMTOSECOND PULSE LASER ON THE WETTABILITY OF THE BUILDING STONES OF THE MAIN FOUNTAINS OF PASEO DEL PRADO (MADRID-SPAIN)

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ABSTRACT

The main sculptural sets of *Paseo del Prado* in Madrid (Spain) were designed by the architect Ventura Rodríguez in 1777. They have a neoclassical style to form part of *Salón del Prado*, originally with three aligned fountains: *Fuente de Cibeles*, at the northern end; *Fuente de Apolo*, at the center; and *Fuente de Neptuno*, located at the southern end. The objective of this study is to evaluate the effect of femtosecond laser structuring on the surface of the fountains' main stones (crystalline microcracking, hydrophobicity and dissolubility) for preventive conservation by means of the modification of the surface wettability. The historical quarries of the three fountains were located and eight cubic samples of each stone were cut to calculate the hydric properties (effective porosity, water absorption and bulk density) according to UNE-EN 1936. Colour measurements of the stones were taken with an X-Rite colourimeter, using the chromatic coordinates of CIE-L*a*b* system. Contact angles were measured with a Phoenix-300. To characterise the stones petrographically, thin sections and two micromosaics have been obtained, with more than 100 microscopic images each. A femtosecond pulse laser system from Spectra Physics (1040 nm wavelength and pulse width < 400 fs.) was used for structuring of thin sections and polished stone-surfaces. Colour difference (before and after the laser treatment) was calculated in polished stone-surfaces, and laser-treated thin sections were observed under microscope, obtaining two micromosaics, in the same area as the previous ones, to evaluate the laser structures with ImageJ software. Contact angle on the stone surfaces was also measured before and after the treatment. A continuous flow of water has been applied for 10 days to the treated and untreated surfaces of the two stones to evaluate the dissolution with SEM. *Cibeles* and *Neptuno* Fountains are built mainly with Montesclaros marble and *Fuente de Apolo* is built with Redueña dolomite. Their historical quarries have been located at coordinates 40.078141, -4.933181 and 40.80208, -3.5914 respectively. Petrographically, Montescaros is a dolomitic marble with crystals visible to the naked eye with coarse equigranular blasts and granoblastic texture. The blasts' boundaries are sinuous, and microcrystals fill cracks and blast boundaries. Redueña dolostone is massive, formed by rhombic dolomite crystals, and fossils. The matrix crystals are microcrystalline, equigranular and poikilotopic and blocky mosaic cements predominate. Calcite fills in the moldic porosity of fossils. The ability of the femtosecond pulsed laser to provide hydrophobic character to both stones was evaluated. Besides, the analysis of the treated surfaces in terms of roughness and colour was accomplished to characterise the eventual changes in the appearance of the surface and consequently to properly selecting the process parameters that ensure minimal modification. However, to optimise texturing results in the Redueña dolomite, the parameters for moldic calcite must be different from the matrix.

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OPTIMIZATION OF WASTE POLYMER ADDITION USING PLACKETT-BURMAN DESIGN PLAN

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ABSTRACT

At the present time, the utilization of waste polymer materials belongs to one of the most important challenges where global economies have to tackle. This article concerned the modification of petroleum road bitumen with waste polymer. The bitumen modification process with the use of polymeric materials was carried out considering a number of other quantitative factors, such as: mixing time, mixing speed, bitumen temperature and qualitative factors such as: waste polymer content, type of grain size, type of neat bitumen and type of waste polymer. Two kinds of waste polymers (PET, PP) were used in the research, which served as a modifier. Two petroleum bitumens were used: 20/30 (hard) and 70/100 (soft). Based on the divalent Plackett-Burman experiment plan, the number of variables and the number of combinations of mixtures were determined, which were required to determine the final response surface model. The following features were tested as the output variables: penetration, softening point, Fraass breaking point, dynamic viscosity 60°C, 90°C, 135°C, deformation energy and maximum elongation. The use of the experimental design methodology allowed to identify the factors that had the greatest impact on the bitumen modification process. The assessment of the significance of the parameters also allowed to identify a significant model allowing to find the optimal bitumen and waste polymer composition. Based on the test results, it was shown that the consistency of the modified bitumen was influenced by the type of bitumen, its amount, mixing speed and mixing time. With regard to the softening point, the type of polymer was also an important factor. Ultimately, the optimization process allowed for the determination of such a combination of both qualitative and quantitative input factors, which resulted in bitumen showing higher utility than input 20/30 and 70/100 bitumens. Moreover, it was found that the increase in mixing time did not result in an excessive increase in bitumen stiffness caused by the mixing process. Thus, the low-temperature properties left unchanged significantly.

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A NON-DESTRUCTIVE TESTING METHOD FOR ASSESSING THE STRENGTH CONDITION OF A CYLINDRICAL BUILDING ELEMENT

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ABSTRACT

Bearing elements with a cylindrical shape are of common occurrence in buildings and bridges. However, with the factor of ageing and the influence of environmental agents the strength characteristics of these pillars may deteriorate compromising thus their bearing capacity and which may result in the collapse of buildings and, in the worst case, in loss of lives. The present work presents the results of a preliminary study concerned with the introduction of a non-destructive method for assessing the strength conditions of a cylindrical pillar through investigating its response to a mechanical stress excitation. The study focuses on isolating a specific mode of vibration, namely the so-called “ovalling” mode, and which exhibits its presence locally on the cylinder, that is with a negligible influence of the axial extent of the cylinder. The method builds on inducing vibrations in the cylinder through a short mechanical stress excitation in the radial direction and then collecting the response of the cylinder by means of two vibration sensors mounted on two diametrically opposed positions on the cylinder. The two signals thus recorded, and being in phase, are added for enhancing the presence of the ovalling mode. The natural frequency of this mode depends on the Modulus of Elasticity, MoE, of the material of which the cylinder is made and a change of the MoE value affects the frequency at which the cylinder vibrates under this particular mode. The results from tests conducted on a solid cylinder and on a hollow cylinder are presented and discussed.

USE OF CONSTRUCTION PROJECT SCHEDULING METHODS IN THE CZECH REPUBLIC

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ABSTRACT

This article deals with research in the field of construction project scheduling in the Czech Republic. The aim of the research was to determine the scheduling maturity within project management in selected medium-sized and large companies and the change in the use of these methods during the global COVID-19 virus pandemic. The research presented in this article consists of three consecutive steps: determining the research area and the research question, designing a research plan, conducting data collection and analysis and compiling research results. For the purposes of this research, the research question was defined as follows: How do the project management scheduling methods differ depending on the company size in the selected companies in the Czech Republic? For understanding both the context and the situation in the surveyed companies, qualitative approaches to data collection and analysis were used, particularly in-depth interviews and encoding method. This approach was chosen mainly due to the fact that in case of quantitative research, the results tend to be improved by the respondents or irrelevant respondents are questioned. The semi-structured interview questions which were created based on the findings of the current state of scientific knowledge and literary research were used for the needs of in-depth interviews. Open questions (topics) related to the respondents' experience, perceptions and opinions were created as a part of the preparation process. The aim was to get more reliable and relevant answers to the questions asked. The research, which lasted for 6 months, involved 10 medium-sized and large companies from the Czech Republic. The change in the use of scheduling methods took place mainly in medium-sized companies. Large companies emphasized scheduling even before the pandemic, medium-sized companies often neglected this area - planning was not documented, linked to other projects, suppliers or customers. The pandemic has changed this situation. Companies that participated in this research have started to understand integrated scheduling approaches and are going to invest or consider to invest in complex software solutions in the near future.

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THE APPALACHIA STUDIO: A CASE STUDY OF USING APPLIED RESEARCH INTO AFRICAN AMERICAN HISTORY BY A MAJOR SCHOOL OF ARCHITECTURE CAN CREATE ECONOMIC DEVELOPMENT

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ABSTRACT

This proposal presents a case study of the Appalachia Studio, which grows from an upper level class of architecture students at the University of Tennessee College of Architecture and Design. The purpose is to use the research methods, analytics and resultant design to serve as a catalyst for the revitalization of underserved, traditionally minority districts in small towns in the East Tennessee region of the United States. The coursework originates through community participation that produce solutions challenging conventional thinking and racial stereotypes common to this region. A significant outcome is greater participation in the entire process and inclusion of our ideas into town planning decisions. This particular class (13 students AR 374 course, spring semester, 2021) has the task of researching McReynolds High School, an African American institution that burned by arson in 1965 during the height of the Civil Rights movement. McReynolds grew from a unique partnership where, at the urging of Booker T. Washington, the Rosenwald Foundation (a private company) matched the finances of public governments to build and support buildings, faculty salaries and curriculum development. Over 6,000 schools throughout the country; mostly in the American south resulted from this commitment. The success of this crucial philanthropic effort laid the foundation for the immense cultural contributions by African Americans' in the last century, including the civil rights movement, arts, sciences and literary achievements. Research clearly indicates that this vital history should be more apparent to the community as a whole and especially to the current leadership. These latent histories can and must become monetary drivers for economic development such as housing, greenways and tourism. The principle results of the Appalachia Studio are research data that the class interpreted into image sets, design solutions, illustrations and presentations that are positively swaying public opinions-especially as these opinions relate to America's complex racial history. In addition, the work demonstrates how design proposals by architecture students from a major public university can be essential lucrative development. This work meets the goal of the Appalachia Studio by using creative interventions to leverage our racial history into positive economic outcomes. In conclusion, the success of this work and the research methods we are using will soon apply to other similar, small towns in the region. This fall, 2021, approximately 20-30,00 people visit the community for a food festival. The work of the Appalachia Studio will become part of the opening ceremonies and the exposure will visually augment and reinforce the importance of McReynolds a crucial moment in time and thereby link it to the larger discussion of Black History in America-which is certainly a relevant topic in today's world.

ARCHITECTURAL AND AESTETIC ASPECTS OF THE WORKSPACE AT HOME – A NEW DESIGN CHALENGE IN THE AGE OF A PANDEMIC

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ABSTRACT

The article deals with the issues of spatial changes taking place in the office work environment during a pandemic. It also raises issues related to the space intended for work at home or in an apartment. At present, the traditional model of office work is undergoing significant transformations. These transformations include, in particular, the spatial aspect. Large office spaces, especially those of the open-plan type, do not work well during a pandemic, as it is difficult to keep an appropriate social distance in them. Therefore, we spend less and less working time, whether for safety reasons or the sanitary and epidemiological regime, for work in the office. This phenomenon is particularly visible in city centers, where many large office buildings have become deserted. We spend more and more time working remotely (home-office). Therefore, it is necessary to adapt the space of our houses and apartments to the conditions in which we live and work today. The very concept of remote work or work from home is not new, many companies have already introduced it before, but most often for a limited time, which in principle could take place without major changes in private apartments. However, the pandemic has forced office workers to work remotely full-time, and thus to organize a workplace in their own home. This is often associated with the need to introduce additional furniture, equipment or lighting to a private interior. The problem of many people working remotely is the lack of an additional room that can be used as a study or office. Then we are looking for a place for our home office in rooms that have so far performed other functions (most often a bedroom or a living room), trying to introduce a place to work with them as possible. The issue of acoustics is also of great importance here, especially when there are more people working or learning remotely in the house or apartment. Moreover, many, especially young office (corporate) employees, own one-room apartments in the studio type, in which it is not possible to separate such a room. Then we have to add an additional office space to the space that already serves several functions (living room and bedroom). The author is a researcher and designer of this type of space, and the cases presented in the article show the changes taking place in spaces previously perceived as typically private.

ANALYSIS OF THE INFLUENCE OF REDISPERSIBLE POLYMER POWDER ON WATER AND FROST RESISTANCE OF RECYCLED COLD MIXTURE WITH ASPHALT EMULSION

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ABSTRACT

The subject of the research presented in the article is to evaluate the effect of redispersible polymer powder (RPP) on water and frost resistance of a recycled cold mix with asphalt emulsion (BE-RCM). Base layers made in the deep cold recycling technology are a proven method used to improve the parameters of degraded pavements structures, while using materials from demolition. At present, additives are sought, the interaction of which may contribute to the improvement of the physical and mechanical properties of these mixtures. One type of such additives may be polymers. Their positive effect is known from their use in polymer cement concretes (PCC). The article presents the results of research on the influence of polymer powder EVA based on polymer (polyethylene-co-vinyl acetate) on the properties of recycled cold mix with asphalt emulsion (BE-RCM). The impact analysis was determined using the assumptions of the Box-Behnken experiment plan in which three components are controlled. In this case, the variables were the content of: polymer, cement and asphalt emulsion. All ingredients were does in steps of 1.5% of the percentage share in the mixture composition. Polymer and Portland cement in an amount of the 0.5% to 3.5%. In contrast, the pure asphalt that came from the asphalt emulsion was 0.0%, 1.5% and 3.0%, respectively. The scope of the tests included the determination of: mixture density, void content (Vm), water absorption (nw), intermediate tensile strength (ITS), water resistance (TSR),water and frost resistance according to AASHTO T283. The results of the research show that increasing the amount of RPP from 0.5% to the amount 2.0%, with the same amount of cement, increases the resistance to indirect tensile strength ITSdry from 645 kPa to 715 kPa. However, an increase in the amount of asphalt emulsion from 0.0% to 5.0% with constant amount of cement and polymer, i.e. 2.0% cement and 0.5% polymer, is a constant result at the level of 645 kPa. In the presence of a polymer of 2.0% and too much asphalt emulsion, a decrease in the intermediate tensile strength of ITSdry can be observed. The mixture containing 2.0% of polymer and 3.5% of cement is characterized by the most favorable (nw) absorption index, which is 1.3%. The highest rates of resistance to water and frost ITSR – over 80%, characterize recycled cold mixes, which consisted of 2.0% or 3.5% cement and 0.5% to 2.0% redispersible polymer powder, asphalt content is 0.0% or 1.5%. Proper selection of the mentioned binders makes it possible to reduce the amount of asphalt emulsion in the recycled BE-RCM mix. The obtained test results may help to optimize the composition of recycled cold mixes with asphalt emulsion, and provide an impulse for future analyzes of the impact of polymer powder on the parameters of the road foundation.

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ARCHITECTURAL PHSYCOLOGY

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ABSTRACT

Although the World Health Organization (WHO) and psychologists warned architects, some colleagues insist on designing apartment houses with the traditional space organization. Despite the evident environmental problems, natural air conditioning, in other words thermal comfort and human psychology, are not taken into consideration at all. It is far from sustainable architecture to produce more than necessary and low-cost flats on the land used. Such approaches cannot be called "Modern Architecture" or "Contemporary Architecture". One of the most important reasons for this is that if people do not feel a sense of belonging to the house they live in or even the workplace they work in, their psychology deteriorates and this fact has been accepted by the science of psychology. It is natural that people who have psychological problems are likely to have other health problems and also social and societal deterioration. WHO is also pointing out this issue. Social and societal life of people is deteriorating, this is the cause of alienation and increase in crime rates. During the Pandemic Process we live in today, people of all ages are not obeying the “stay at home, stay healthy” warnings and other prohibitions imposed by the medical community, this is due to the fact that people do not feel a sense of belonging to the house they live in. The duty of us, modern architects, as psychologists reveal, is to design our projects in order to create more livable environments, and without ignoring the fact that interpersonal relationships are shaped according to the environments they are in, Architects should refer to cognitive sciences, especially psychology to create projects. We should especially pay attention to apartment-type residences where more than one family live in. In this article, two examples, one positive and the other negative, are discussed as field work for a better understanding of Psychological Architecture. The first example is the Pruitt-Igoe site in the city of St. Louis in USA in 1955 without considering human psychology and was demolished only 16 years after its construction and whose destruction was evaluated as "the day the modern architecture died" by the post-modern architectural historian Charles Jencks. The second comparative example is the Samanbahce houses in Nicosia, the capital of Cyprus, made of adobe brick, a traditional building material for families with insufficient financial means. The gross area of these houses is 85 m², their net area is 64.90 m², but the closed area is only 42.90 m², while the open area is 22.00 m² courtyard. Considering natural air conditioning, thermal comfort and human psychology, Samanbahçe houses, whose first stage construction was completed in 1925 and are still in use, were taken as an example.

INDICATIVE ASSESSMENT OF CLASSROOM ACOUSTICS IN SCHOOLS BUILT IN REINFORCED CONCRETE TECHNOLOGY ON THE EXAMPLE OF A SCHOOL BUILDING IN ZABRZE

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ABSTRACT

In view of room acoustics in schools, not only noise level is extremely important, but also the reverberation conditions in a given room. Such conditions affect the intelligibility of speech, which determines the acquisition level of knowledge conveyed by the teacher. The article presents problems of school classroom acoustics for a building made in reinforced concrete technology on the example of a school building in Zabrze. For the research we selected one of schools established in 1970s as a commemoration of the Millennium Jubilee of the Republic of Poland. The obtained results of the reverberation time indicate poor acoustic conditions, which, unfortunately, is quite common in Polish schools. For low frequencies, the reverberation time of a classroom for teaching mathematics was over 2 seconds, and for medium frequencies it was almost 2 seconds. The article presents the acoustics of the studied school classrooms without proposals of acoustic adaptation.

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ASPHALT CONCRETE IN HALF WARM MIX ASPHALY TECHNOLOGY WITH FOAMED BITUMEN

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ABSTRACT

The "half-warm" technology for the production of asphalt mix (Half Warm Mix Asphalt – HWMA) is distinguished by the production temperature in the range from 100°C to 130°C, due to the use of foamed bitumen with water. The AC 8 S asphalt concrete with the 50/70 foamed bitumen, which had previously been modified by adding 0.6% by weight SAA surfactant in relation to the bitumen, was used in the tests. In order to ensure its standard resistance to permanent deformations and the influence of ambient factors (water, negative temperature), hydrated lime was used, added in the amount of 0, 15, 30 and 45% by weight, interchangeably for a part of the mineral filler. The influence of the amount of hydrated lime on the asphalt concrete parameters analysed according to the WT-2 2014 methodology and the stiffness modulus at 0oC and -10oC was studied. The possibility of practical use of asphalt concrete produced in the "half-warm" technology with the foamed bitumen in road construction practice was proven in the tests.

THE IMPORTANCE OF ART AND ARCHITECTURE REGARDING THE IDEA THAT WE HAVE ABOUT A CITY

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ABSTRACT

This article intends to make people reflect about the importance of artworks and architecture in the cities, as a way to turn them into memories and icons, regarding the idea we have about a city itself. The importance of new technologies and artificial intelligence have become a vehicle of dissemination of a certain image and attractiveness. The importance of communication in terms of a city image as a whole and of urban sites of specific cultural, artistic or historical interest. This is a contemporary subject, since tourism and the number of visitors to a city have practically disappeared or been suspended due to the current situation in the world. The crisis that has arisen with the emergence of the COVID-19 virus. A very important question arises now, when the pandemic ends, how to restore the attraction of people into certain historic and touristic places, which have meanwhile become deserted? During this period, art and traditional forms of artistic expression have been transformed. Digital and technological resources have been increasingly combined, thus giving rise to new forms of artistic expression combined with new technologies. We can see with great facility, in the most varied internet platforms, museum tours, virtual exhibitions, conferences and lectures. The city as it was known before the pandemic no longer exists. People now move around the city, silently or by car with their glasses tightly closed, they don't go to cultural places as they previously did, and they don't use restaurants in the same way. The city has become a place where people live inside and where they only travel outside for short, occasionally necessary journeys. Therefore, we are in a moment of convergence, a kind of turning of the page, where we will all learn again how to live and enjoy the city. In this article we relate the new paradigm of the increasingly digital city with the conventional city as we knew it. How can the most iconic places in cities help to make cities better known and more attractive? We did some research on some cities, and we tried to verify what were the main icons of these cities? In what way did those icons make them well-known?

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APPROXIMATION OF FUNCTIONS IN MULTI-CRITERIAL SYNTHESIS OF COMPOSITE MATERIALS

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ABSTRACT

A prerequisite for the synthesis of composite materials as complex systems is the principles of the control paradigm of Peace and the effectiveness of mathematics (for any reality and any given (not absolute) accuracy, there is a mathematical structure that describes this reality with this accuracy; the converse is also true (homomorphism, arbitrarily close to isomorphism between reality and mathematical structures)).The proposed methodology for managing the identification process (design of composites) includes the process of human choice: the probabilistic nature of the control; the main reason for the inadequacy of a purely analytical research procedure. Here, the optimization of the control of the properties of the composite is carried out experimentally on the model as a result of the approximation of the response function: not the generalized functional is approximated, but the particular criteria of which it consists. The development of composite materials is carried out on the basis of evaluating the parameters of the formation of operational properties. The parameters of each of the kinetic processes of the formation of the physical and mechanical characteristics of the material were taken as particular criteria. Kinetic processes are asymptotic for the composites under study and contain extremum and inflection points. A method is used to approximate multidimensional table-defined functions by generalized polynomials of a particular form. In the parametric identification of kinetic processes, their parameters are considered basic. Approximating models of the main properties are presented. Vector optimization of properties (selection of recipes, technologies and methods of material quality control) is carried out by overcoming ambiguities of goals using linear convolution, introducing benchmarks, building Pareto sets, etc. The expediency of using a systematic approach (the hierarchical structure of properties and the hierarchical structure of the composite proper) to the design of building materials as complex systems is shown. The research results are introduced as prototypes of new identification systems in the development of composite materials with adjustable structure and properties, in contrast to the replication of reference applied developments of identification theory in various industries.

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MATHEMATICAL APPARATUS FOR THE SYNTHESIS OF COMPOSITE MATERIALS WITH SPECIFIED PROPERTIES

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ABSTRACT

The meaning of the creation and functioning of the system is defined as the achievement of extreme values of goals that unite the individual elements of the system into a single whole. Based on this, the main system attributes of composite materials are indicated. It is assumed that the systemic effect is generated by the systemic properties of quality criteria. The implementation of the technical task is initially determined at the stage of cognitive modeling with the establishment of intensive and extensive properties with the allocation of control parameters. Based on the cognitive map, hierarchical structures of quality criteria are determined, and in accordance with the selected quality criteria, the corresponding structural schemes of the system (for each selected scale level). Further, the system's quality criteria are formalized, and mathematical models are developed in accordance with each of the criteria. The main purpose of using system analysis is to apply the general principles of decomposition of the system into individual elements and establish connections between them, in determining the research goal and stages to achieve this goal (based on solving single-criterion optimization problems using the found optimal values). The formalization of the multicriteria problem and its solution are made based on the required operational values, the type of kinetic processes of the formation of the physical and mechanical characteristics of the material (determine its structure and properties). The problem of materials synthesis is reduced to the choice of the order and type of the differential equation; parametric identification within the chosen model; comparison of experimental and model kinetic processes at a given accuracy; adjusting the model (if necessary). Therefore, it is important to interpolate the kinetic processes of the formation of the main physical and mechanical characteristics of composite materials. The technological process is considered as a complex system consisting of elements of various levels of detail: from atomic to a separate process. Decomposition of the technological process consists in dividing it into basic operations (elements): preparation of materials, mixing of components, molding of a semi-finished product, heat treatment and additional operations. The effectiveness of this approach was confirmed in the development of chemically resistant sulfur composites, epoxy composites for radiation protection, etc. The initial prerequisite was the required operational values of the material and the type of kinetic processes. The results of effective use of interpolation models (including splines) of compressive strength, heat release, and shrinkage of composite epoxy materials are presented.

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RESEARCH AND DEVELOPMENT OF INTELLIGENT COMPACT HEATING / COOLING UNITS USING RENEWABLE ENERGY SOURCES

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ABSTRACT

Many ingenious inventions were developed during modern history, but their spreading failed due to inconvenient timing or weak propagation. The goal of our research and development is an intelligent compact heating / cooling unit using RES. This paper describes the results of experimental measurements for different variants of heat pump connection in cooling mode with refrigerant tank and cooling system. The paper compares different situations where there are differences in the volume of the tank, the volume flow of the working substance and in the direction of filling the tank. The aim of the measurements was to optimize the number of start-up cycles of the heat pump by storing energy in water tanks. By reducing the number of pumps starts, the service life of the mechanical parts of the heat pump, the compressor, is extended.

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ANALYSIS, EVALUATION OF THE STATE AND PROPOSAL OF REMEDIATION INTERVENTIONS IN THE RECOVERY OF THE NATIONAL CULTURAL MONUMENT OF THE CASTLE IN MALACKY

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ABSTRACT

Sustainability is one of the leading topics not only in construction, but also in other sectors. It is necessary to focus on this trend not only in the construction of new buildings, but also in the restoration of various historical buildings, as many of them are exposed to gradual degradation of individual structural elements, which subsequently leads to complete destruction of the building. Of course, this phenomenon also affects the so-called "Earth's development". For this reason, the paper is focused on evaluating the current technical condition of the National Cultural Monument of the Pálffy's manor in Malacky in western Slovakia. The first part will provide general technical information about the examined object, such as the shape and dimensions of the object, the material used for construction and the like. In the next part, the article describes the rich history of this building, which significantly affected the current technical condition of the building. Subsequently, the article will take a closer look and describe in detail one of the biggest problems of the object - rising humidity and present the results of research focused on this problem, which were obtained in situ and also describe the current state of external and internal plasters, which significantly affected the time and also effect of humidity. Other, less serious defects will also be mentioned on the issue, but they also help the degradation of individual structural elements. As the building has undergone a partial reconstruction / renovation of some parts, these construction interventions will also be briefly described in order to create the overall picture. Finally, the authors focus on evaluating the condition of the building and propose remediation interventions that would help improve the condition of the building and prevent its destruction and negative impact on the environment caused by possible destruction.

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COMPARATION OF TWO DIFFERENT METHODS FOR FIGHTING MOISTURE IN HISTORIC MASONRY

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ABSTRACT

Nearby all historic building built in Central Europe before the half of the 20th century have to face problems with unwanted moistening of their constructions. A significant part of them stands under legal protection as architectural monuments. There are several technologies which can be used to deal with this problem. Some of them are more invasive into historical masonry, some of them are less invasive. Some of them are much more effective in insulating effort, some of them are less. According to the Venice charter from 1964 methods which are less invasive should be preferred. Some of them are the ventilation methods. But are they really effective? On the other side of the spectrum are undercutting methods, which are drastically invasive. So they are standing in a clear opposition the recommendations of the Venice charter. Why should they be used? Are they really so effective? And what should be done with their conflict with the Venice charter? The article tries to find answers on these questions on a base of introduced anti-moistening technologies from both sides of the mentioned spectrum. From a couple of renovation interventions undertaken in Slovakia, in the climate of Central Europe, two typical examples were taken out to support a – hopefully – right result. We used natural ventilation in a church in Western Slovakia and we achieved a success. Then we used the undercutting technology in some other church - again in Western Slovakia. We were also successful. So what is the matter? The matter is that one of this method was not successful in an adequate extend. The other one was.

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THE IMPACT OF CLIMATE CHANGE ON HISTORICAL BUILDINGS IN HALFETI

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ABSTRACT

Global warming and climate change are a common problem of all humanity. Increase in human population in connection with consumption causes high levels of carbon dioxide and methane gas emissions that lead to thinning of the ozone layer and climate change. While many living organisms are affected by climate change, historical buildings also suffer greatly. One of the biggest human impacts that are ignored today is dams and hydroelectric power plants. These structures which are still under construction in developing countries, change the climate of the region leaving permanent damage to existing buildings. Also increase in the release of methane gas and carbon dioxide in the dam areas has been proven in many studies. While the dam construction flooded many historical buildings, the survived structures were doomed to disappear under impact of the climate change. In this context, the climate data of the reservoir area built in 2000 in Halfeti district of Şanlıurfa province were analyzed and the change over the years was determined. By comparing the photographs of the historical masonry buildings in the region from the previous years, the damage to the buildings was determined. As a result of this study, it is assumed that the dams change the climate of the region where they are built and accelerate global warming. In this paper damages due the climate change in this region will be assessed.

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CONSIDERATIONS REGARDING THE CLIMATE CHANGE INDUCED HAZARDS ON AIRPORTS IN ROMANIA – A CASE STUDY OF TIMIŞOARA INTERNATIONAL AIRPORT

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ABSTRACT

Climate change is regarded as a global scale process in which an increase of magnitude and intensity of severe weather events is observed, thus affecting both air travel as well as airport infrastructure. Although the COVID-19 crisis has a significant negative impact on air travel and thus on the further development of airport infrastructure, the demand for air travel will continue to rise as this crisis nears the end. The aim of this paper is to analyse and highlight the climate change associated hazards for the airport infrastructure as well as for the safety of passengers and goods in the Western part of Romania, mainly Traian Vuia International Airport from Timişoara. Throughout this analysis, aviation related severe weather events, such as thunderstorms, hail events, fog, icing, squalls, low level wind shear, snow falls and heavy precipitation, which affect airport infrastructure and thus air travel, are highlighted. By analysing meteorological parameters from the time scale 1980-2010 together with climate change scenarios, and thus developing weather hazard maps, a better perspective of area-related hazards and therefore customized mitigation measures and adaptation strategies are to be developed. The implementation of modern forecasting equipment such as dual polarization Terminal Doppler Weather Radar (TDWR) is thus necessary in order to prevent loss of human lives, to reduce financial losses and to protect the airport infrastructure and the aeronautical navigation and communication facilities. Long term changes in meteorological parameters include an increase in air temperature, an increase in speed for both horizontal and vertical windshear during severe weather events, an increasing number of air mass thunderstorms and an increase of situations with limited visibility especially during the late autumn and early spring time.

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LOAD HEIGHT POSITION EFFECT ON THE STABILITY OF WEB-TAPERED THIN-WALLED OPEN SECTION BEAMS

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ABSTRACT

Structural efficiency, economy, and slenderness of tapered members are reasons that lead to their increasing use in the steel construction industry. However, the exhibited instability phenomenon when an unrestrained steel cross-section is bent about its major axis can cause the beam and structural failure. This instability is called Lateral Torsional Buckling, is in function of the classical stiffness terms, load height position, and tapering parameter. To analyze the effect of load height position on the elastic lateral-torsional buckling of doubly symmetric web-tapered thin-walled beams, a non-linear model is developed in a large torsion context. Ritz's method is deployed to derive algebraic equilibrium equations. The present analysis results are in good agreement when compared with those available in the literature; Linear, Ritz's method, and finite element simulations.

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HISTORICAL AND MODERN BRIDGES OVER THE ELBE-VLTAVA WATERWAY

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ABSTRACT

The Elbe-Vltava Waterway (EVW) consists of continuously navigable sections of the Vltava and Elbe rivers in the Czech Republic comprising a total length of over 300 km. Most of the length of this waterway was obtained by building a system of interconnected weir basins using the canalization method. Detailed plans for making this waterway navigable started in the early 19th century, and the construction of the structures was enabled by the Austro-Hungarian Water Act of 1869. So, most locks along this waterway constitute a part of industrial heritage. Among its main structures are weirs, hydroelectric power stations and locks designed by pre-eminent Czech architects of the 19th and early-20th centuries. Many of them are excellent examples of modernist industrial architecture. Since the beginning of construction of the weir system along the EVW, bridge construction also came into focus in order to provide transportation access to both banks of the Elbe and Vltava rivers in this historically heavily urbanised area of Bohemia. This article deals with the historical development of bridge constructions over the EVW, systematically categorising them as road, railway and pedestrian bridges. Focus is on the basic technical aspects of the bridge design and technical solution, but also on their historical value and the need for a sensitive approach to their modernisation. The goal of the research is to complete the current web application *www.lvvc.cz* devoted to the EVW structures with the architectonically and technically most interesting bridges, including their histories. The system has been designed as an expert system, making the archived historical documents, maps, plans and photographs available for use by government institutions as well as by the general public for education and for the protection of this technical cultural heritage. The research was conducted as part of project no. DG18P02OVV004 entitled “Documentation and presentation of technical cultural heritage along the Elbe-Vltava Waterway” within a support programme for applied research and experimental development of national and cultural identity, funded by the Ministry of Culture of the Czech Republic.

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HISTORICAL RIVER TRAINING WORKS ON THE LOWER ELBE

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ABSTRACT

The paper deals with river training works built on the reach of the Elbe River between the city of Ústí nad Labem (CZ) and the Czech/German border. Downstream of the Ústí nad Labem, the Elbe in the Czech Republic and in Germany has only been made navigable through river training measures without building weirs. The goal of river training for watercourse navigability is to attain the required waterway parameters through fairway adjustments. This is primarily achieved through channel dredging and the construction of training dams to concentrate the water flow into a narrower but deeper main channel. The paper describes the historical development of river training works during the period from the Middle Ages to the present day. Initially, such works were not meant as part of a unified conceptually designed system of measures. Instead, they were local initiatives aimed to remove natural obstacles from the river bed and to build facilities and structures to aid navigation. Systematic regulation works along the Czech and German sections of the Elbe only started in the early 19th century. The research was focused on studying the original project documents and documentation of the actual design of the training dams since 1894. This historical design documentation was digitised and projected into the maps in the Czech JTSK local coordinate system through the use of advanced geographic information system (GIS) methods. The final atlas of river training works on the Elbe-Vltava Waterway (EVW) along the lower Elbe in the Czech Republic is the first of its kind, utilising geographic information systems to document the locations of technical structures built since the early 19th century in the Elbe River bed in order to make the river navigable and maintain its navigability. The collection of maps also documents the development of the river training works in time based on map data obtained from digitised design documentation from the 19th and 20th centuries, historical aerial photographs dated 1930-1946 and 1950-1964, and present-day maps and orthophotomaps of the Elbe section in question. The atlas of the Elbe-Vltava Waterway river training works is publicly available via a web-based application. The maps are a result of original research and offer a synthesis of interactions between the existing technical structures, the sediment regime of the Elbe and sites that are subject to environmental protection. The research was conducted as part of project no. DG18P02OVV004 entitled “Documentation and presentation of technical cultural heritage along the Elbe-Vltava Waterway” within a support programme for applied research and experimental development of national and cultural identity, funded by the Ministry of Culture of the Czech Republic.

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TRADITION AND INNOVATION IN POLISH CONCRETE HOUSES

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ABSTRACT

The article discusses examples of concrete houses made in Poland after 2000. The aim of the article is to present the thesis on the increasing importance of concrete for the creation of architecture of single-family houses. Comparative research was carried out on the basis of the form of single-family houses constructed and through the technical analysis of architectural documentation and construction details. After decades of rejecting concrete as a material to live and live in, concrete has once again become an intermediary material in the search for new elementary residential structures in the Polish landscape. An important element in this mental transformation is the belief in the essence of the importance of forms and technologies of concrete architectural details. A detail is a tool that shows the originality of the idea and the meaning of concrete formations

ADDITIONAL ACTIONS UPON THE VEHICLE FOR DRIVING THROUGH THE CLOTHOID CURVE

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ABSTRACT

The first research purpose is the improvement of the road traffic conditions on clothoid curve. The second one is to find out more about driving dynamics. The paper discusses some actions upon the vehicle for its driving on the clothoid curve (with variable radius), caused by the special characteristics of this curve, used to the roads all around the world. The work finds more several actions unknown for the moment. Mainly, it is shown that although angular acceleration does not create force and therefore it has no dynamic effect, however, indirectly, an additional stress appears when entering the clothoid curve. The variable radius also produces force, as well as, indirectly, angular acceleration. All is explicitly and deeply detaild. Apart from the well-known centrifugal force caused by inertia for which special curvature road arrangements are made, there are also: a. The force due to the variation of the radius of curvature in the module - "the centrifugal force of contact with the clothoid curve"; b. The momentary force of additional rotation", due indirectly to angular acceleration.

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STRATEGIC PLANNING OF THE ACTIVITIES OF MOBILE UNITS

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ABSTRACT

Nowadays, the territory of the Far North, Siberia and the Far East is being actively developed, as a rule, by the forces of mobile construction companies and their units. They carry out a huge range of works, including the pioneering development of territories and the construction of various objects of concentrated and dispersed construction. At the same time, the activities of mobile units significantly differ from the activities of traditional construction organizations, first of all, in that they have to autonomously solve the entire aspect of life support tasks far from their places of permanent deployment. In this regard, the issues of their reliable provision with effective means of production are extremely relevant. It allows them to quickly transform materials, structures and equipment into finished construction products with minimal costs of living labor at the construction site. The paper pro-vides an approach to the choice of a strategy for the activities of mobile units using the example of pioneering territory development. The model of optimal planning is disclosed in detail, and methods for obtaining an integer solution are indicated.

ARTICULATION OF FACADE GRAPHICS IN ARCHITECTURE AND ITS DEVELOPMENT TECHNIQUES

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ABSTRACT

The article deals with issues at the boundary of architecture and technology, related to visual articulation. The facade graphics is a relatively new phenomenon that has arisen over the last two decades. Some of the image implementation techniques it uses have been known for a long time. Some of them are derived from stained glass (e.g., the technique of manual enamel application), some are related to the already known techniques of workshop graphics (screen printing). One of the latest technological achievements is the development of digital printing technology. Each of the aforementioned techniques has specific artistic possibilities and means of expression, which influences the articulation of the image in the external partition and has a significant impact on a number of compositional aspects. The image placed in the façade supports the building's form, underlining its shape, emphasizing important places in the building. The work examines the relationship between the applied techniques of implementation and the properties of the image on glass. An important part is to determine to what extent the construction of the image and the applied plastic measures affect the visual range of the glass partition and the functional properties. Particularly interesting projects are those made with several techniques, and those in which a new technique was discovered, which is later copied in other projects. The research can make a strong case for using artistic glass in the facade of a building and provide guidance for designers and investors. The publication will present examples of implementations placed in the facade of the building. The phenomenon will be investigated on the basis of buildings constructed over the last two decades. Due to the global nature of plastic phenomena, there is no limited research territory.

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LETTER GRAPHICS IN THE FACADE OF THE BUILDING - COMPOSITION AND MESSAGE

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ABSTRACT

The publication raises issues related to the integration of architecture and art. Art that exists in architecture in the form of large-format murals on glass, as well as graphic textures that change the reception of the building. Apart from the compositional and aesthetic value, artistic glass contains visual elements that are part of the message. One of the forms of this message is a record created directly in the form of lettering graphics or codes. The article discusses preliminary research on the message contained in facade graphics as well as the form and purpose of their coding. Objects in which the designer has saved some content will be analyzed on a few examples. The author analyzes to what extent the form of the code is related to the letters in the facade, to what extent the code is legible, for whom it is intended and which functions it plays. The publication will present examples of implementations placed in the facade and inside the building. Mainly graphic techniques were used in the projects: digital printing and screen printing. The phenomenon will be investigated on the basis of buildings constructed over the last two decades. Due to the global nature of plastic phenomena, there is no limited research territory.

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STRAIN MONITORING OF AN ALUMINIUM JOINT WITH AN OPTICAL SYSTEM

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ABSTRACT

The stresses distribution can be easily determined in the cross-section of the elements but in a joint, the distribution of stresses is more complicated. Its complexity is also increased if stiffeners are added to the joint and if the connecting bolts are not positioned in a regular configuration. An aluminium cantilever with a two bolts connection is experimentally tested to determine the real bending capacity. Stiffeners reduce the stress intensity in the connection, but they are prone to instability problems if they are subjected to compression. In order to determine the real stress development in the stiffeners, the Digital Image Correlation (DIC) technique was used. This technique determines the strains in the loaded parts which then can be equivalated to the stress distribution. The paper presents the stress development in the compressed stiffeners of the joint considering also improvement solution for increasing the bending capacity by reducing the instability parameters.

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 this kind 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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STRATEGIES TO IMPROVE URBAN ENERGY EFFICIENCY FOR URBAN RESILIENCE

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ABSTRACT

Urban resilience in simpler terms refers to the ability of an urban system and all of its socio-ecological and socio-technical network components to function or adapt to change and transform systems rapidly in the face of risk at temporal and spatial scales. Starting from the 1990's, subject of increasing the urban resilience against environmental, socio-economic and political uncertainty and risk has been on the agenda of disciplines, sectors and decision makers. In this process, the concept of resilience has become gradually more important in confronting climate uncertainty and its environmental impacts. Particularly, as the challenges of climate change have become more apparent and active in recent years, the questioning of the resilience of cities in the face of climate change by researchers, governments and international organizations has made energy efficiency a driving force of urban policies. Thus, achieving resilience has become a crucial objective for cities, especially in the face of climate change. Considering that urban areas contain the majority of the world's populations and that the rate of urbanization is rapidly increasing, we can point out that cities are the main focus of resource consumption and also the areas of innovative approach in dealing with climate change. However, with the subject of urban resilience having various social, economic, cultural, environmental and spatial dimensions, efficiency in resource consumption, which is a vital necessity in cities, should be addressed with policies and strategies developed with interdisciplinary cooperation. Within the academic literature it is frequently emphasized that the main policies should be resilience through preparedness and flexibility of performance. Preparedness ensures that the city is ready and / or resilient in terms of risk management by closely monitoring the current conditions and searching for possible solutions for present and future risks. The performance phase on the other hand focuses on maintaining and protecting the core functions of the city, managing key resources and proposing improvement strategies, response and recovery. In our day, numerous contexts or application tools such as ensuring energy efficiency, reducing energy consumption, the use of renewable energy resources effectively and widely and the processes from energy generation and flow to consumption stage and recovery are on the world's agenda. However, cities are not within comparable range in terms of layout, development stage or economic foundations. Therefore, it may prove to be useful to envision feasible or guiding strategies that identify current levels and trends in urban resource use and calculate future mitigation options. At this point, spatial planning gains importance as it contributes to both the resistance towards negative effects of climate change and the reduction of emissions. Utilising materials or practices that reduce energy consumption, from a macro-urban scope to a micro-scale energy-efficient building designs, and even in the use of various tools and equipment can provide resilience against this global risk. The aim of this study is to cover the subject of urban resilience against climate change through close examination of the relevant academic literature on energy efficient cities while highlighting applicable solutions through Turkey.

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INNOVATIVE PROGRAMMING PRODUCT FOR WORK ARCHITECT-URBANIST WITH BIG DATA OF CITY

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ABSTRACT

It is an undeniable fact that the basic needs of city dwellers for water, air, food, and shelter are met by resources that are currently limited. The pollution produced by the environment is piling up, and nature is unable to recycle even half of what it receives. Modern cities have practically no other options but to develop the principles of intensive environmental management. This means that the functioning of each city must rely on the renewable resources of the surrounding area. Such radical changes are always associated with an aggravation of social, technogenic, and ecological crises. The cost of a mistake here may be a critical loss of resources and possible depopulation of large cities in the country. The purpose of the research outlined in this article was an attempt to create a universal tool responsible for information support of strategic decision-making processes for the management and adjustment of the functioning principles of cities as complex dynamic systems. "The program complex for modeling the city as a dynamic system" was developed as a complexly compiled product with multilevel nonlinear logic and a simple interface. The materials outlined in the article are the theoretical basis of the technical task for the program product currently being designed. The purpose of the program package is to analyze the processes of the city functioning as a complex dynamic system. In this case, it is possible to diagnose the current state of the city as a system in real time, the state of its subsystems and elements, as well as to predict changes in the dynamic processes of their functioning. The specified program package is based on a combination of two trends in modern science: optimization of processes of city functioning and management of large arrays of city data (Big Data). The program simulates positive and negative dynamics of the transition of the city, its subsystems and individual elements from a state of stability to crisis and a possible pre-catastrophic state. The methodological basis for the development of the program complex is the methods of system dynamics. According to these methods, the totality and mutual influence of all dynamic processes in the city system determine the parameters of its functioning. The strength of these changes, their speed and acceleration form certain requirements for the organization of the city as a system. A dual approach to the formation of the methodological component of the program package has been developed, based on the connection of deductive and inductive methods of research. The program complex consists of two hierarchically connected but autonomously organized modules: 1) Cognitive-research matrix of identification and analysis of problems of the city as a dynamic system (Matrix). 2) Information-accumulative interactive model (Model).

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THE CONTRIBUTION OF JEWISH ARCHITECTS TO THE CONSTRUCTION OF THEATERS IN LVIV

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ABSTRACT

Since Ukraine has gained its independence, the number of publications about Lviv and its architecture increased. However, most of them provided only some fragmentary data due to the fact that this information was interpreted into Ukrainian from Austrian and Polish old newspapers. Insufficient understanding of the general phenomenon and the context in which the historical event took place sometimes resulted in writers drawing erroneous conclusions. Furthermore, the publications on architectural objects written by researchers who were not experts in this area lack in objectivity. Therefore, there are "new" publications replete with unfounded interpretations of the architecture of our city which are devoid of both analysis and comparison to architectural phenomena in Europe and around the world. It should be highlighted that the architecture of Lviv, as well as its theater buildings, has many interesting and unique features, both in terms of the historical events facts and the genesis of the concept of "Lviv architectural tradition". It is worth noting that the city environment was built by representatives of different nationalities - Ukrainians, Poles, Austrians, Jews, Italians, Germans, Czechs, Hungarians, Russians, Armenians, who presented both Lviv and their national architectural schools. A constellation of Jewish architects - A. Stahl, S. Riemer, A. Schleyen and many others also worked in the theatrical field. There were many spectacular buildings: theaters, halls in social spaces, clubs, educational institutions. Undoubtedly, the contribution of Jewish architects to the overall development of the city was extremely significant not only in historical times, but also in modern times –the 20th century and should be included in the topical issues which need further scientific investigation.

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THE ARCHITECTURAL PHENOMENON OF CHERNIVTSI OF THE BEGINNING AND THE MID-20TH-CENTURY: F. FELLNER, G. HELMER, F. KIESLER, H. CREANGĂ AND OTHERS

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ABSTRACT

Over the last 30 years, there has been considerable debate on the styles of modern architecture around the world and, particularly, in Ukraine. Interestingly, proponents of traditionalism seek answers in the reproduction of ornaments and facades of buildings or the imitation and interpretation of folk forms and materials engendered in past eras. Connoisseurs of the latest technologies and trends see the essence of modern architecture in open space planning, the universality of space and share common views on the overall versatility of objects, irrespective of the territory on which they are located. However, it is of the utmost importance that they also study extensively the outstanding personalities and their creative heritage which will enable them to predict the potential ways of architectural development down the line. For many years the Department of Architectural Environment Design of Lviv Polytechnic National University has been investigating architecture through the prism of continental and world systems of culture with numerous cross-cultural similarities and differences, authenticity and borrowings and synthetic phenomena. In other words, the Department hones in on the development of conceptual ideas throughout European history and the World cultures. It should be noted that within the territorial boundaries of modern western Ukraine there are cities which used to be the administrative centers of other countries. They developed in accordance with the dominant tendencies of the former capitals, which shifted their culture potential from the center to the periphery, mainly due to architecture. One of the brightest cities of the early 20th century was Chernivtsi. It was the administrative center of Bukovina which belonged to the Austro-Hungarian monarchy, and later to the Kingdom of Romania. Hence, the experience of architects who worked in the city and erected many multifunctional buildings constitutes important evidence in our investigation. However, these are not the quantitative indicators of the completed building projects but rather the architects` progressive ideas highlighting a phenomenal universal feature that should be taken into consideration, which is sometimes of greater importance than merely practical optimization of complex architectural forms. The paper seeks to address three architectural phenomena associated with Chernivtsi, namely, the Viennese bureau of F. Fellner and G. Helmer, the futurist designer F. Kiesler, and the Romanian modernist H.Creangă.The criteria for selecting these personalities were their common features: the certain period of time spent in Chernivtsi, enthusiasm and desire to constantly improve architecture, the willingness to seek understanding of the spatial, formal, historical and urban contexts of architecture. The design concepts of these architects are systematically collected and analyzed at the Institute of Architecture and Design in Lviv Polytechnic National University. They are developed and implemented in student research projects, as well as bachelor's and master's theses and can lay the foundation for the innovative architectural solutions in Ukraine.

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THE IMPACT OF THE OUTSTANDING STAGE ARTIST Y. LYSYK`S ARCHITECTURAL AND SCENOGRAPHIC IDEAS ON ARCHITECTURAL SCIENCE, EDUCATION, AND DESIGN-BASED RESEARCH STUDY IN UKRAINE

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ABSTRACT

In 2020, the admirers of the outstanding stage artist Y. Lysyk celebrated the 90th anniversary of his birth. Undobtedly, in the history of Ukrainian theater he left a mark no less important than such geniuses of national and World theaters as G. Parigi, G. Burnacini, G. Torelli, F. Bibiena, and later P. Gonzago (Gonzaga), K. Schinkel, A. Antoine, O. Brahm, P. Grain, who gained their international recognition over timescales of multiple decades, and outstanding masters of the 20th century: K. Mackiewicz, A. Pronaszko (Poland), A. Vesnin, A. Exter, V. Dimitriev, J. Svoboda (Czech Republic), J. Barry (Great Britain). Although today, modern Ukrainian scenographers such as D. Lider, F. Nirod, N. Gomon (Kyiv), M. Levitska (Donetsk), O.Lysyk-Zinchenko, T. and M. Ryndzak, M. Kypriian (Lviv), and others are known all over the world, Y. Lysyk`s heritage still remains a unique phenomenon. Interestingly enough, many art critics have tried to analyze and describe his work, which consists of 82 opera and ballet as well as dramatic performances: sketches and models of their subject-spatial environment, thousands of square meters of panels, curtains, stages, backdrops. Ballet and stage design of the performances "Spartacus", "Three Musketeers", "Romeo and Juliet", "Swan Lake", "Creation of the World", operas "The Queen of Spades", "Boris Godunov" and others continue to dazzle the world with their innovation and creativity.
In particular, the article explores those performances of Y.Lysyk, which display noteworthy architectural features in their various manifestations: metaphors on the theatre curtains, backstage, backdrops; the use of coordination methods and syncretization of the performance space and stage; exploitation of architectural styles and their development.These studies are systematically conducted by scientists of the architectural school of "Lviv Polytechnic" and are widely used in course, diploma design and international exhibition activities of the Department of Architectural Environment Design. It should be noted that representatives of the architectural school of "Lviv Polytechnic" and its graduates, as well as other architects from Kyiv, Dnipro, Chernivtsi, Lviv, Lutsk, Odessa, Chervonohrad, such as Y. Bilas, V. Proskuryakov, O. Proskuryakov, T. Tovstyk, O. Kordunyan, I. Tarasyuk, V. Meshcheryakov, Y. Filipchuk use creative interpretation of Y. Lysyk's ideas in their projects and structures of landscape, chamber, TV show theaters; stages; museums; multifunctional houses; sacred buildings; TV studios, etc.

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DEVELOPMENT OF INDUSTRIAL ZONE AS AREA FOR CONSTRUCTION OF WAREHOUSE AND PRODUCTION HALLS

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ABSTRACT

The article focuses on the analysis of the development and use of industrial zones, which represent the area for the concentrated location of the manufacturing sites specialised in specific industry, strategic services, or technology centres. Both services and industry impact the top drivers of the Gross Domestic Product and the labour force occupation in the Czech Republic and European Union. The important parameters of each industrial zone are its area and the predominant category of economic activities. In terms of the impact on the territory, they place demands on employees, transport, technical equipment, landscape and settlement. The main goal of the research is the analysis of the industrial zone, the territory on which warehouse and production hall projects are built. The analysis of warehouse and production hall construction investment in Žďár nad Sázavou is performed and the study of this project shows the impact of the project in its industrial area and the deviation between the project plan against the audited reality. The research sample consists of 12 selected warehouse and production hall projects, which are in Central and East Europe. They are in various phases of their life cycle, in the planning, implementation or operational phase. One of the partial outputs of the article is a SWOT analysis, which deals with variables that affect the effectiveness of these projects both from the perspective of the investor and from the perspective of the public in the area where they are located. The implementation and operation of these projects affect public life significantly, so their potential socio-economic impacts on the creation of economic cash flows are examined.

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STRUCTURAL BRACING OF WOODEN ROOFS UNDER THE EXTREME WINDS

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ABSTRACT

An essential element of every building is a roof that protects it against the influence of weather conditions - rainfall, wind, and temperature changes. The shape of the roof, the type of roof covering, and the slope of the roof have the greatest impact on the type and material solutions. The roof structures are made of wooden, steel, or reinforced concrete. Especially in single-family residential buildings, wooden roof structures are most often used. Wood is perceived by many as the oldest and best building material, valued for its low weight, good strength, elasticity, and high thermal and insulation values. Traditional roof has been used over the centuries. Wood framing is the most popular structural framing for residential, commercial building in north America and part of Europe. The more common roof in wood framing roof is gable and hip roof which is consist of rafter, ridge, hip, collar tie and joist. The common slop for hip roof is 3/12 to 12/12. By increasing the slop, the length of the hip element in roof increases and needs to brace closely. Due to technical design codes, hip shall be braced at the ridge point. The light wood framed houses are highly vulnerable to damage under the wind load. Long unsupported structural member lengths are the reason of the damage among stick frame roofs based on prescriptive design requirements and visual inspection of the damage photos. Therefore, the aim of the study is to analyse the location of roof braces for hip element in the roof, due to the ultimate and serviceability limit states. Elements with the following different spans and cross-sections are analysed for different slope of the roof. Later in the paper, the effect of wind on the roof structure is analysed.

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VIBRATIONS OF SLENDER STRUCTURES CAUSED BY VORTICES

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ABSTRACT

Slender cylindrical structures such as overhead transmission lines, skyscrapers, chimneys, risers, and pipelines can experience flow induced vibration (FIV). The vortex vibrations are a type of FIV. They arise because of oscillating forces caused by flow separation and the detachment of vortices. The characteristics of the flows around non-tidal bodies are mainly related to the Reynolds number. When the Reynolds number exceeds a certain critical value, the flows of non-tidal bodies are characterized by a certain preferred frequency, the so-called Strouhal frequency. At this frequency, vortices are alternately broken off from both sides of the body and dropped into the track. During this process called vortex detachment, the body experiences a large pressure drop at the back of its surface and a significant fluctuating lateral force due to the asymmetric vortex detachment. This process causes the body to vibrate with considerable amplitudes, which can lead to fatigue failure. The fatigue failure of a vibrating structure and average drag force caused by vortex induced vibrations are major problems in structural engineering where flaccid structures, such as bridge cables, chimneys, tall buildings, power lines, etc., are exposed to wind. The paper presents a brief overview of experimental research on vortex induced vibration - VIV of short, rigid cylinders elastically supported, with a small aspect ratio. This overview summarizes the basic results of the vortex vibration which have been performed in the last five decades. These studies were mainly related to determining the influence of selected parameters - mass, damping and Reynolds number on the cylinder response, either in one direction only or simultaneously in the flow direction and transverse to the flow direction, and with the search for a map of vortex images in the trace, that is named as vortex wake pattern map.

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CHARACTERIZATION OF THE DRY STONE HERITAGE OF THE BARROCAL REGION (ALGARVE, PORTUGAL)

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ABSTRACT

The paper aims to value the diverse and important dry stone heritage located in the Barrocal area (Algarve, Portugal). The dry-stone construction technique and the set of constructions that derive from its application are present in all parts of the world where stone is present. Throughout the Iberian Peninsula and specifically in the territory of Portugal there are different dry-stone constructions that make up the rural landscape. They are an example of the work of the field and the use of local natural resources during different generations. The recognition by UNESCO as Intangible Cultural Heritage of Humanity highlights the importance of maintaining a construction technique that, transmitted orally, is materialized in different constructions according to the constructive heritage and the stone typology of the nearby environment. The study opts to focus on a specific area of the Barrocal where different types of construction of dry-stone elements exist and which is partially cultivated. Starting from the contextualization of the studies carried out throughout Portugal, the predominant dry-stone constructions of the Barrocal, the area with the greatest presence of a variety of types of the Algarve, are being identified, recorded and analysed. The document provides a classification of the present constructions in the area linked to their use and provides data on the construction characteristics and the typology of the stone. The knowledge of these constructions makes it possible to explain the economic and social context of a certain period and to plan reactivation measures for other economic sectors not linked to tourism. The Algarve, one of the most touristic areas of Portugal, has focused most of its economy on beach tourism, leaving the cultural and architectural heritage of dry stone almost unnoticed. The constructions and the dry-stone construction technique are a way of preserving the rural landscape and a cultural memory so that the benefits related to ecology and biodiversity are observed through this document.

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REAL-TIME DEFORMATION MEASUREMENTS USING SINGLE IMAGE PHOTOGRAMMETRY

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ABSTRACT

Most photogrammetric measurements are currently based on image acquisition in the field and subsequent processing in office environment with certain temporal delay. However, in some cases it is necessary to process the data real-time, or at least in-situ. Bridge load testing is an example of measurement processing directly at the place of imaging, where almost immediate information about the current state or change of the object is required. An algorithm is developed for these purposes, including a camera controlling software and a MATLAB code that identifies and quantifies the shifts of the observed points in the image plane. The observed points are in the shape of black disks on a white background. Using a horizontal camera position individual epoch are captured. Each image is immediately transferred to a computer via Wi-Fi. The MATLAB code then loads the image and binarizes it. Binarization of the image is performed by the Canny edge detector. Using normalized 2-D cross-correlation, the algorithm determines the approximate coordinates based on a target template. A function performs least squares ellipse fitting and determines the center of the target in sub-pixel accuracy, the semi-major axis, the semi-minor axis and the rotation angle of the ellipse. The target detection is executed in a while cycle loop, which compares the point coordinates from each epoch to the initial state, thus quantifying the deformations in pixels. If the next image is not yet available, the loop restarts. The deformations are calculated based on the known scale of each target. This paper presents a detailed description of the development of the algorithm, the results achieved and the proposed improvements going forward.

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POCKET PARKS IN CITIES: CURRENT TRENDS AND NEEDS, GENESIS AND CHALLENGES IN TIME OF PANDEMIA

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ABSTRACT

The article presents the issue of creating pocket parks in cities. In the face of the coming climate change, any area of green spaces in cities seems to be very important. Some of them have recently been built in city centers and have become important points on city plans in spatial and social aspects. Many of today's pocket parks have been created thanks to social, municipal initiatives, in areas that were previously inaccessible or neglected. The article presents a few selected examples of pocket parks, their role in cities and the history of their creation. An example of an urban competition for a new pocket park in the city center of Gliwice, Poland is also presented. The authors were co-organizers of the urban competition for a pocket park together with a municipal company that plans to develop the park and make it available to residents. The described case study shows the role of pocket parks in cities, which is particularly important during the covid-19 pandemic, when access to recreational and leisure areas was limited. Conclusions from the research and the experiment carried out by the authors may be useful for creating urban policies, planning green areas in cities and creating utility and functional programs for new green areas.

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ECOLOGICAL ASPECTS IN THE DETACHED HOUSE CONSTRUCTION

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ABSTRACT

The article deals with the ecological impacts during a detached house construction and looks for the optimal way of its financing. The aim of the article is to evaluate how much the house construction costs would increase in the case of the use of materials, which production generates smaller volume of negative emissions. The issue of the environment in relation to ecological construction has been widely discussed in recent years. The construction industry burdens the environment already by the production of building materials, extraction of raw materials, energy consumption, through designing activities and construction itself, to the phase of the building use and its eventual liquidation. There are six basic requirements for building materials used in construction, which are required for the quality environmentally friendly construction: the statics and stability of buildings must be provided, noise protection, fire safety, hygienic safety and reduced environmental impact must be met, buildings must provide safe use and well-being, and last but not least energy efficiency. Already in the structure construction phase, it is necessary to consider the appropriate selection of building materials, for which it is necessary to take into account ecological criteria. Appropriate selection of building materials results in a positive effect on the environment. When optimizing the total cost of building a detached house from an ecological point of view, the procedure consists in replacing the most cost-effective items in the construction budget by alternative materials with regard to ecology. When choosing alternative materials, maintaining the standard of the brick building and the aesthetic character of the house are taken into account. When comparing the budgets of both variants, it was found out that a detached house built using alternative, more environmentally friendly materials, resulted more expensive. However, the price difference is slight. Own housing can be financed in several ways. One option is to use your resources. However, this method is currently unrealistic for most people, and therefore they often choose the option of combining their resources with external sources. The most commonly used products for housing financing are building savings loans and mortgage loans. Another possibility is to use subsidy programmes for housing to finance the house, which are often focused on supporting ecological construction and housing.

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COMPARISON OF THE PERFORMANCE DEVELOPMENT OF CONSTRUCTION COMPANIES IN THE SOUTH MORAVIAN REGION OF THE CZECH REPUBLIC: A CASE STUDY

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ABSTRACT

Historically, construction has always been one of the key sectors for state economic production. It has undergone developments over the years closely related to the world economic situation. The Czech Statistical Office, which processes annual analyses of construction production and describes market development resulting from the analysis of the construction industry deals with the development of economic sectors in the Czech Republic. A set of financial indicators which provide information on the overall market situation is annually published as a part of the research of the Ministry of Industry and Trade of the Czech Republic in the form of a corporate sector financial analysis. The performance of construction companies can be measured by various indicators. The most important performance indicator is the return on sales. This financial analysis ratio is quarterly published as a statistic within the construction sector in the national statistics published by the Ministry of Industry and Trade. The aim of the research described in the article is to compare the performance development of construction companies operating in the South Moravian Region of the Czech Republic. 12 samples of construction companies (4 samples representing the category of small, medium-sized, and large companies) were chosen for comparison. Their return on sales was calculated on the basis of financial statements in the 2013 – 2019 period. This value was plotted in the development trend, which was subsequently compared with the national statistics. The overall comparison of the performance development of construction companies, which was quantified using macroeconomic indicators, was carried out in the South Moravian Region. The macroeconomic indicators of the South Moravian Region were also compared with the national indicators provided by the Czech Statistical Office.

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MODERN ARCHITECTURE OF SCHOOL BUILDINGS IN POLAND: SELECTED DESIGN ISSUES ON THE EXAMPLE OF TWO SCHOOL BUILDINGS BUILT IN THE 21ST CENTURY

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ABSTRACT

This article concerns the design and architecture of educational facilities in Poland. It presents selected architectural and spatial solutions for modern primary school buildings. The article is based on a juxtaposition of two school buildings built in the second decade of the 21st century, located in the central and southern part of the country. Contemporary buildings were selected to draw attention to the changing approach to design and the development of architecture dedicated to the youngest recipients, emphasizing important aspects of the school space in the era of growing demands and social awareness. The analysis of the buildings indicated in the article was carried out on the basis of the available literature on the subject, comparison with typical buildings in Poland, and in situ research in school buildings, with an emphasis on the key aspects of the functional and spatial arrangement in the presented facilities, determining the target educational space for students. A school building in Poland, in the minds of many architecture recipients, is associated with a typical building, such as 'millennial schools', created as part of the campaign to build a thousand schools - monuments related to the celebration of the Millennium of the Polish State. The typification period, abounding in many buildings that still function to this day, lasted almost twenty years until 1981, when the standard for typical schools was repealed. At that time, the search for the perfect form of the building as well as flexible and functional school spaces, tailored to the scale of the youngest recipients, began. The classroom, which used to be the only condition for the functioning of the school, turned out to be insufficient. Modern projects have started to be implemented, which systematically contribute to the creation of a new image of the school as a friendly and modern institution, maintained in an optimal and holistic development-oriented educational environment.

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TOWARDS AN EMPATHIC ARCHITECTURE

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ABSTRACT

Increasingly in recent years, different disciplinary knowledge has sought to overcome the traditional dichotomy between the natural sciences and the humanities, i.e., between a method based on "explaining" (*Erklären*), that seek random connections and universal and necessary laws in accordance with a nomothetic arrangement, and a method based on "understanding" (*Verstehen*) and in particular on empathic understanding – *Einfühlung* – in its various articulations, developed within the hermeneutical philosophical tradition and upon the idiographic nature of observation. In the last years, architecture has also opened up new perspectives in order to provide the designer with a better understanding of "who we are and how we actually engage the world", as Harry Francis Mallgrave writes in his recent book *From object to experience: The new culture of architectural design* (2018). Long before the Sars-Cov-2 pandemic crisis forced us to stop, leading us to think more about the spaces of our daily lives and their direct influence on the well-being (or malaise) of our bodies, some factors have contributed to what has been defined as an *emotional turn* or an *affective turn*: they include the progress made by the neurosciences (particularly, the discovery of Mirror Neurons System), the resumption of phenomenological themes with the development of the "new phenomenology" and of atmospherological aesthetics, and, closely related to these, the rediscovery of empathy as a fundamental fact of human nature and perhaps the chief way in which understanding is organized in the consciousness of human action. Starting from the salient developments of embodied cognition since the 1980's, this essay will underline an idea of architecture as a "shared continuum" between the human and the natural, that is between nature and culture, body and mind, self and world, to regain in architectural design a dimension linked - in the phenomenological tradition - to the *living body*, in which the rediscovery of empathy becomes the possibility to articulate an understanding of space that hinges upon feeling and human action.

VERIFYING THE SHEAR LOAD CAPACITY OF MASONRY WALLS BY THE V_{Rd}–N_{Ed} INTERACTION DIAGRAM

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ABSTRACT

The need to verify the shear resistance is required for all shear walls to absorb horizontal wind loads, subsoil loads or other non-mechanical (rheological or thermal) loads. Apart from shear forces, the stiffening walls are also influenced by vertical loads caused by dead loads or/and service loads, as the stiffening walls usually also play the role of load bearing walls. This type of load combination is quite important as the shear resistance V_{Rd} depends on the mean design stresses σ_d, which in turn depend on the design forces N_{Ed}. As a consequence of the combination of actions in the shear wall, the shear resistance V_{Rd} interacts with the vertical load N_{Ed}. In addition, the vertical load N_{Ed} acts on the wall at some eccentricity e_{Ed} which may change the length of the compressed part of the cross section l_c. The paper presents the procedure for checking the cross-section of shear resistance of masonry walls using the interaction diagram, built according to the Eurocode 6 (prEN 1996-1-1: 2017) code. The necessary equations defining the cross-section capacity as a function of the vertical load N_{Ed} were formulated. The influence of the wall shape and the vertical load eccentricity on the shape of the interaction plot was analyzed.

PROPOSED METHOD OF DISTRIBUTION OF HORIZONTAL LOADS ON STIFFENING MASONRY WALLS

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ABSTRACT

Currently, numerical methods are readily used to determine internal forces in stiffening walls. As a result of the FEM model solution, extreme computational values of internal forces necessary for design are obtained. It is not always necessary to build a FEM model. This mainly applies to single or multi-family buildings with a simple wall layout. Then you can use the analytical model that allows you to easily calculate the values of internal forces in the walls. Eurocode 6 (prEN 1996-1-1: 2017) does not provide specific guidelines for the calculation of internal forces in walls, allowing the use of numerical methods and other proven methods. The paper presents the procedure of determining internal forces in a building with a simple wall system. A method of proceeding was proposed, consisting in dividing the wall with openings into components. The results were compared with the values of internal forces determined with the use of the linear-elastic, shell FEM model. It has been shown that an important factor influencing the distribution of loads are, apart from the bent and form stiffness, also the location of the rotation center (RC) of the walls cross section.

COMPARISON OF MASONRY HOMOGENIZATION METHODS - MACROMODELLING AND MICROMODELING OF WALLS BEHAVIOUR MADE OF AUTOCLAVED AERATED CONCRETE MASONRY UNITS

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ABSTRACT

The adopted method of empirical homogenization strictly determines the degree of faithful reproduction of the masonry structure's work in terms of the analysis of cracking forces, destructive forces, and the mechanism of structure destruction. The high level of detail of the numerical model may make it impossible to perform calculations and predict internal forces for larger structures or entire buildings. The study aims to compare two different masonry homogenization techniques and determine the advantages and disadvantages of the adopted methods. The concept of a micromodel, in which the contact of two materials - a masonry unit and a mortar, was simulated using contact elements in the interface planes and a macromodel in which the wall was modelled as a homogeneous, isotropic material, omitting contact surfaces. The analysis subjects were standard wall models made of autoclaved aerated concrete (AAC) masonry units in axial and diagonal compression tests. In the numerical calculations, the elasto-plastic model with degradation implemented. The Menetrey William boundary surface describes the compression phase, and the Rankine criterion determines the tensile phase. In the axially compressed walls, the relations of forces and vertical and horizontal deformations compared, and in the shear walls, the forces and values of strain angles analyzed. In both models, the mechanisms of wall destruction and scratching were considered. The initial parameters of the elasto-plastic model derived from the results of wall tests using various model validation techniques. The calibration coefficient was used in the micromodel, determined as the quotient of the wall's compressive strength and masonry unit's compressive strength. The fracture energy value was also corrected. In the macromodel, the masonry's modulus of elasticity and the tensile strength value calibrated. Calculations based on the micromodel were consistent with the test results at the relative error level of 2%. The observed damage and scratches to the walls after the tests were consistent with the numerical projection. The macromodel calculations showed the convergence of the results in scratch morphology, scratching and destructive forces. The most significant differences occurred in shear deformations. The macromodelling approach allowed for capturing the wall's global tendency to deteriorate without opening the contact surfaces locally (cohesive cracks), as is the case during the tests.

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TRANSFORMATIONS OF DANUBE RECREATIONAL SITES

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ABSTRACT

The purpose of the research was to verify models of sustainable urbanization of the Danube riverside landscape in the suburban surroundings of Bratislava. The research focused on landscape-ecological forms of suburban urbanization in the contact of the river Danube, in the context of meanders of the Danube branches with the formation of recreational localities. The implementation of ecological principles was based on the concept of regional structures with a vision of the renewal of the ancient branches of the Danube for the creation of the climatic envelope of Bratislava from the southwestern side. The completion of the Petržalka, Slnečnice, Južné Mesto, and rural structures near Jarovce, Rusovce, and Čuňovo, conditioned by ecological urbanization, will acquire more landscape elements and a system of blue and green infrastructure. The hierarchical transition of the city to the suburban localities is solved by creating zones of recreation and sports on the Danube. Variant case studies of the "Danubia Park" near the village of Čuňovo are located on the southwestern bank of the Hrušov Reservoir of the Danube, with access to the Wild Water sports zone and the Danubiana Gallery complex. The research followed up on the verification of the recreational function in the landscape and focused on the level of low occupancy, the integration of sports and recreational functions, accessibility by all modes of transport, the penetration of recreation into the open landscape. For the identity of the original landscape, freely modeled connections to the riparian zone, work with water flow in the area, port, pedestrian and cycling connections to the EuroVelo route, outdoor museums of the Danube meadows, lakes and wetland communities, workouts, and multifunctional playgrounds, forms of wellness, sauna world and natural swimming. Ecological recreation concepts in the landscape of the Danube floodplains on the banks of the Danube used the modeling of banks, watercourse lines, meandering of recreational areas, green axes, play areas, elements, and zones. They used lighthouses and lookout towers for accent and orientation. The hierarchy of the release of small urban structures and loose forms of sensitive urbanization with functional flexibility and attractiveness proved the justification and location in the landscape of the Danube meadows, in the contact zones of the protected landscape and the watercourse. In this way, the importance of the suburban landscape structure is beneficial for the city not only in terms of functional attractiveness but also in terms of landscape protection and the climatic influence of the city's hinterland on its compact structures.

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COMPARISION OF CONVENTIONAL AND PASSIVE PUBLIC UTILITY BUILDINGS IN POLAND

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ABSTRACT

Poland sees the increasing popularisation of sustainable housing and the growing awareness of the importance of sport development. A good physical condition of residents translates into effective work, whereas caring for the environment improves living standards. Introducing healthy lifestyle from an early age has the best results. Due to this fact in Poland every school has its own sports hall. The pilot programme to build swimming pools near every primary school was introduced in Lower-Silesian district and it is called 'Dolnośląski Delfinek' (Lower Silesian Little Dolphin). Swimming pool buildings are characterised by high demand for heat. Their operation burdens district budgets and indirectly every taxpayer. Those facilities are occasionally rented commercially to earn some money for maintenance expenses. The costs usually exceed the income of those buildings. The article discusses results of thermo-vision (infrared) tests and presents the analysis of the technical documentation of twenty-eight public utility buildings located in Poland. The investigations encompass conventional, energy-saving and passive buildings. The conventional buildings described in the work are school swimming pools from the programme 'Dolnośląski Delfinek' (Lower-Silesian Little Dolphin), whereas energy-saving and passive buildings include office, industrial, hotel, educational and sports buildings (including an indoor swimming pool). This article aims to find the most effective design manner and energy-saving sports buildings construction such as swimming pools. The results obtained in the tests indicate the necessity of compliance with the energy-saving technology in the design and construction of public utility buildings. A conclusion arises that swimming pool buildings are the most suitable candidates for passive buildings.

THERMAL CRACKS DEVELOPMENT STUDY IN NEWLY BUILT REINFORCED CONCRETE RESIDENCES

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ABSTRACT

Concrete blocks and concrete assemblies are affected by natural physical conditions, which impacts on the durability and service life of the structures. In this paper, site data was gathered, which was used to perform a numerical and a finite element modelling to investigate the impacts of several conditions on thermal cracking in the structure. The field recorded data was used for the numerical modelling, using MATLAB software, and the finite element modelling, using ANSYS Mechanical software. It was observed that among the conditions considered, the wall ratio in the structure and formation of microcracks have significant impacts, while the age of the structure, the compressive strength of the concrete have minimal impacts, as the shifting in the curve is small. Finally, a probabilistic crack development model was made to study the potential crack development in the finite element model, which was seen to tally with observed site data, demonstrating the potential of predicting cracks development.

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A COMPARATIVE ANALYSIS ON THE METHODS OF STRENGTHENING ISOLATED REINFORCED CONCRETE COLUMNS

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ABSTRACT

In the construction industry, there are several methods which have been used to improve the capacity and effectiveness of structural concrete structures. Engineers can extend the life of the structures by implementing strengthening techniques. One of the techniques to strengthen columns and beams is the use of jacketing. The strength of the structural members is enhanced through the surface structural bonding of materials such as Carbon-Fibre Reinforced Polymer (CFRP), Glass-Fibre Reinforced Polymer (GFRP), ferrocement, steel angles, steel plates, wire mesh and so on. In this study, 18 reinforced concrete short columns of cross-sectional size 60 mm × 60 mm and 500 mm height were cast using concrete grade 30 MPa. The columns were subjected to compressive axial loads till failure. Moreover, the damaged columns were strengthened using three structural strengthening techniques namely; Reinforced Concrete Jacketing (RCJ), Reinforced Concrete Wire Mesh Jacketing (RCWJ) and, Steel Jacketing (SJ). The columns strengthened using RCJ and RCWJ had a cross section of 120 mm × 120 mm while SJ had a cross section of 66 mm × 66 mm. Six different configurations were used for each technique. The experimental investigations showed a minimum increase of 48.0%, 48.7% and 35.2% in the axial compressive strength when strengthened using RCJ, RCWJ and SJ respectively. Among the three strengthening techniques, SJ was determined to be the effective technique on considering structural design, time production and costs.

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A FURTHER MILESTONE TO THE USE OF NATURAL FIBRES IN CONCRETE – PAST FINDINGS, BARRIERS AND NOVEL RESEARCH AVENUES

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ABSTRACT

Concrete as a building material is much appraised for its good compressive strength; however, its low tensile strength makes it a quasi-brittle material. Experiments have proven that fibres such as steel and some polymeric fibres can reinforce and enhance the mechanical strength of concrete. The relatively high production cost of these fibres coupled with environmental issues for their end-of-life disposal and decline in mechanical strength beyond a certain fibre fraction have encouraged the use of natural fibres; particularly due to their renewability, low cost and good tensile strength. This paper reviews published literature in the field of natural fibres, their extraction methods as well as their effect on the mechanical properties of concrete. Alkaline fibre treatment to improve strength, wettability and subsequently, fibre-concrete matrix interfacial adhesion has also been discussed. As part of the research, the current authors have found that by just using untreated (raw) fibres as reinforcement in fact leads to a decline between 75 % and 90% in compressive strength tested at 8 days for 2 different fibre lengths and volume fractions, respectively. This decline in strength could be co-related with the phenomenon of fibre agglomeration as seen from microscopic analysis. As such, fibre treatment, to remove different impurities from its surface, constitutes an important step towards the manufacture of natural fibre-reinforced concrete. Furthermore, water adjustment in relation to the total water requirement of the cement, aggregates and water needed to saturate the plant fibres is an important property that requires proper control since water content has a direct impact on the workability of the concrete and can turn into a major constraint. The main challenge of the use of natural fibres in concrete is its degradation with time within the highly alkaline concrete environment. Accelerated ageing experiments for natural fibres in concrete as described in literature have confirmed this deleterious occurrence. Thus, as per findings from the current experimental works and literature, the following recommendations are proposed: natural fibre pre-processing to inhibit agglomeration, adequate water addition to cater for all the constituents of the reinforced concrete and the potential implementation of biomimicry to solve the fibre degradation problem.

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INVERTED UMBRELLA-TYPE HYPERBOLIC PARABOLOID REINFORCED CONCRETE SHELL STRUCTURES

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ABSTRACT

The paper overviews and investigates inverted umbrella-type hyperbolic paraboloid reinforced concrete shell structures. During the designing, constructing, describing and admiring these structures, many authors name them under several phrases. Usually they omit some words and call them inverted hyperbolic paraboloid shell structure, inverted hyperbolic paraboloid shell, hyperbolic paraboloid shell umbrella, hypar, HP, or just umbrella. But one should be careful because hyperbolic paraboloid shells could be supported by one, two or more supports. In this article, only single column inverted umbrella-type hyperbolic paraboloid shell structures made of reinforced concrete are considered. In this article they are called umbrella HP structures. The paper provides a historical overview of architecturally most attractive umbrella HP structures. It starts with the world's oldest HP structures, designed in reinforced concrete by pioneers such as F. Aimond, A. Williams, K. Hruban in the second quarter of the 20th century. By joining four straight-edged hypar shell reinforced concrete surfaces in concave shape supported by one vertical beam, the form of the inverted umbrella-type hyperbolic paraboloid reinforced concrete shell was introduced. During the 1950s the form of umbrella HP structures became widely used. F. Candela became the pioneer in calculating and designing them and constructed numbers in Mexico between 1953-68. Some of architecturally or structurally unique umbrella HP structures, devised by architects or engineers after 1960 throughout the Western world are mentioned. Inverted umbrella-type hyperbolic paraboloid reinforced concrete shell structures became a predominant type of single column structure during the 1950s and 1960s. All structures consist of three main elements: the highest element is a cantilever thin shell roof; in its centre is supported by the second element, a column, called also pillar or vertical beam; the third element is a foundation, not visible as it is hidden in the ground. After 1975, the disappearance of umbrella HP structures began. They were not used only for canopies, filling stations, hangars, factories, warehouses or markets, but also for public buildings: churches, hotels, restaurants, casinos, banks, libraries, markets, museums, pavilions, and even as low-cost housings. The results of the paper are presented in several tables where the single column roof structures are analysed according to several criteria (author, time, location, roof type, roof parameters, column type, column parameters, number of elements). The similarities and differences between roofs and columns of the analysed objects are compared. In conclusion, the advancements and disadvantages are briefly exposed. One of their benefits is that open space under the roof is without supporting walls. Nevertheless, reinforced concrete thin roof structures, that stand in one column only, do not meet all these safety standards. Building codes become stricter, as some of the single column roof structures become fragile and unstable. Wind vibrations and unexpected live loads may cause the structures to buckle and fail easily. Furthermore, earthquakes triggered the introduction of higher safety standards for earthquake-resistant design. Additionally, heat insulation and sustainability become important building requirements in building physics. The designing of inverted umbrella-type hyperbolic paraboloid reinforced concrete shell structures is today generally prohibited.

ON DIFFERENCE OF COGNITIVE STRUCTURE BETWEEN CHILDREN AND ADULTS BY THE PATH SELECTION ANALYSIS AND THE BASIC DRAWING METHOD

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ABSTRACT

Now, the number of children playing outside is decreasing from 1980 in Japan. And our lives have changed significantly with the development of transportation. However, by depriving children of playground space, may have negative mental and physical effects. In order to solve such problems of public spaces, we propose urban space that will be attractive to both adults and children by clarifying what adults and children find attractive. Creating a playground that is attractive to children and a city that is easy to live in and that you want to live in for a long time is an issue for future urban development, and in order to create them, children should be attractive. You need to understand the image of the city you feel. In order to understand the playgrounds and towns that children find attractive, it is important to know how they perceive the space in which they usually live. To create a livable city or town, it is important to conserve attractive places for children to play. One of the tasks of urban planning is to create a town where children want to continue living even when they grow up. For this, we need to understand in what ways children find it attractive. Regarding the parks, streets, rivers, etc., it is necessary to know how children perceive the space. The purpose of this study is to identify the parts of the city that appeal to children, analyzing the cognitive maps drawn by them. Ultimately, the goal is to propose an urban space that will be enjoyable, fun, comfortable and safe for children and adults as well. There are two research methods for this study. One is a route selection experiment based on the Paired Comparison Method using photographs. By grasping the components of each photograph, the “taste” of the road is analyzed. The other is to conduct a survey using the Basic Drawing Method, where we extract elements that are recognized. The results of the first route selection experiment showed that children prefer roads with good visibility, while adults tend to prefer well-maintained roads. From the results of the Basic Drawing Method, it was found that children perceived what they usually see more honestly than adults.

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ENHANCE THE PUBLIC SPACE: AN ECO-MUSEUM FOR MONTEROSSO ALMO (RG) IN SICILY

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ABSTRACT

The city has become the place of sustainability and public space is one of the main elements of this concept: it does not consume land, it recovers the existing building assets, it works with requalification, re-design, accessibility and availability. In this sense, public space takes on an ecological and environmental connotation, supported by a growing respect for nature. Nowadays, in historical small towns, all works addressing the public space acknowledge an overlapping of traces and testimonies that identify those space as assets to be protected, but also made available to the public. In this regard, it is also necessary to protect the buildings that define this space. A tool is valorization. Enhancement means taking actions aimed at giving value. Its objectives focus by integrating the architectural heritage into contemporary life, by strengthening social development, as well as the economy, and defining its roots and identity. Today, valorization connects the past with the future and provides an occasion to highlight the tangible and intangible resources safeguarded by such heritage. For ordinary heritage the only possible strategy is represented by eco-museums, through a systemic approach towards all tangible and intangible elements. The case study is a very small town in the country of Ragusa, Sicily, Italy, is considered a “cultural, natural and architectonical landscape” and reflects the combined works of nature and humankind, where cultural heritage is located both in rural areas, both in center of town. The city has an interesting old town consisting in two important historical area: Matrice district and San Giovanni district. In them there are small palaces built almost all after the earthquake of 1693, beautiful churches even older, beautiful woods and views that design public space. This research is aimed at retrieving the present architecture and landscape by using the existing structures to leave an indelible mark on renovation projects. The enhancement project guides the birth of the eco-museum; it identifies, selects and recovers the existing building assets, proposing attractive and economically interesting functions for public space. An action based on eco-museums helps breathing new life into a community and its heritage, promoting life, economy and tourism.

SEISMIC PERFORMANCE OF A NEW TYPE STEEL-CONCRETE COMPOSITE SHEAR WALL

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ABSTRACT

Using steel-concrete composite section is an efficient method for improving the behavior of shear wall under seismic action. In consideration of the complex configuration of traditional composite shear wall and the time-consuming constructing process, based on the existing research, partially encased composite section was introduced into shear wall system. The partially encased composite shear wall (PECSW) is composed of a steel bone, some horizontal links and a group of concrete columns. The steel bone is a steel web, welded with vertical ribs and flanges in both side at certain interval. The horizontal links connect the flanges (or vertical ribs) and vertical ribs. Concrete is poured on both sides of steel web, between flanges (or vertical ribs) and vertical ribs, formulating several independent long concrete columns. The PECSW can be bulk prefabricated in the factory and transported to the site to install. Because of no vertical rebar in PECSWs, the PECSW structure, which consists of PECSWs and other precast concrete structural elements, can be assembled quickly. This paper reports an experimental study on the seismic behavior of the PECSW under cyclic lateral loading. Two full-scale single-bay, single-story specimens were constructed. The bearing capacity, energy consumption, ductility and other performance data had been discussed based on the results of experiment. To explore the possibility of simplifying configuration of PECSW, the web of one specimen was welded with stud shear connectors on both side while the web of another specimen wasn't. The test results show that the PEC shear wall has a good seismic behavior. Both specimens followed bending failure mode. The concrete columns offered the vertical bearing capacity as well as the flexural bearing capacity. The concrete and the horizontal links between flanges and ribs provided effective support against local buckling of the flanges, once broken occurred between the links and the flanges, the flanges buckled severely, and the bearing capacity of PECSW fell accordingly. The initial stiffness, yield drift angle, peak point bearing capacity, accumulated energy dissipation of the PEC shear wall specimens with and without stud shear connectors was basically identical. Then, parametric studies were conducted through numerical simulation so that the contribution of links and concrete can be evaluated. According to the research above, the concrete part in the PEC shear wall can improve initial stiffness, postpone local buckling of steel sheet. The horizontal links in the PEC shear wall support interaction between steel and concrete, provide concrete anchorage to steel bone. In general, the PEC shear wall has commendable seismic behaviors and deserve further study.

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STONE WORKS VALUATION WITHIN IMMOVABLE CULTURAL HERITAGE MONUMENTS RESTORATION

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ABSTRACT

Historic buildings and their stone parts represent both specific functional architectural features of constructions and important aspects of the cultural heritage. They provide important and valuable proof of development, style, and architecture, level of decorative art, and material processing techniques. However, these historic buildings need restoration so that their legacy can be preserved for future generations. The quality of restoration work tends to be closely related to work price. At present, however, prices for the restoration of stone parts of historic buildings are determined intuitively, based on their complexity, uniqueness, and specificity of restoration work. The valuation of restoration work is therefore carried out mainly by the private sector, based on the experience of individual budgeters and restorers. Due to the fact that the limits of the maximum and minimum scope of individual actions are not set, incorrect valuation can occur, which, in the case of subsequent implementation, may damage, or even in fact damages, the restoration activity as such. Based on this, the article deals with valuation of stone works restoration in real historic structures. It introduces and describes the proposal for systematic classification of these types of work, the procedure for setting standards for time units and consequently the proposal of formula structure for calculating costs and prices. The aim of the article is to introduce the use of standardised procedures for pricing of stone works restoration and thereby create a comparative and cost bases in order to make a qualified choice of restoration specialists.

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FISH LADDERS HYDRAULIC CALCULATION, STUDY CASESEBESEL 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. The objectives of the studies were: description of the qualitative and quantitative structure of the communities of benthic macrononevertebrates and fish; assessment of the ecological status of the rivers in the areas of hydropower development; highlighting the presence of fish species of conservative interest (if present) and assessing the status of their populations

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UNMANNED AERIAL VEHICLES- AN EFFECTIVE TOOL IN IDENTIFYING MINING DAMAGE IN AGRICULTURAL AREAS

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ABSTRACT

The areas subject to mining impacts are subject to continuous inventories, inter alia, in order to assess the degree of terrain deformation or to control particularly protected objects. Modern measurement techniques, including unmanned aerial vehicles (drones), can serve this purpose. The equipment allows you to take a series of photos and then create an orthophotomap from them, which is the basis for determining the current relief. The generated digital terrain model contains a huge amount of data in the form of coordinates of terrain points (point cloud). Data processing also allows you to create profiles, cross-sections, and determine the volume. Great opportunities at the post-processing stage mean that unmanned aerial vehicles can be successfully used in the identification of mining damage, including in agricultural areas. In addition, the speed, flexibility and efficiency of measurement speak for their use. The article describes the wide use of unmanned aerial vehicles in engineering works. Reference was also made to the issue of repairing mining damage, based on the applicable legal regulations. On the basis of the examples from the raids, the use of unmanned aerial vehicles in the damage inspection was shown, which is so important in the process of dealing with mining damage.

ADVANCE SEDIMENT TRANSPORT MODELLING, STUDY CASE BARZAVA RIVER, ROMANIA

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ABSTRACT

Study case is situated in Caras Severin county. To solve theoretical problems of movement of water in the river Barzava, it requires modelling of water flow in this case. Numerical modelling was performed using the program MIKE11. Advanced computational modules are included for description of flow over hydraulic structures, including possibilities to describe structure operation. 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. After simulation with MIKE 11 result the water level in each cross section. The Barzava River is 85 kilometers long. It springs from the Semenic Mountains (at a distance of 5 kilometers upstream from Resita Municipality), passes through the localities: Mun. Resita, Bocsa, Berzovia, crosses the national road Belgrade-Timisoara, about 4 kilometers from Deta crosses the border with Serbia and flows into the river Timis (Serbia) about 30 kilometers from the border. In the area studied or performed hydrological and topographic measurements on the watercourse and the nature of the land, these measurements were the basis for the numerical modelling of the watercourse by the method of finite differences. The main objectives of the paper are the modelling of the water course with the forecast of the evolution of water levels over time as well as the possibility of making flood risk maps.

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MODERNIZATION AND EXTENSION OF THE IRRIGATION SYSTEM - SPP1 - 1700 HA, SAHATENI, ROMANIA

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ABSTRACT

Through its rural development policy, the EU aims to help rural areas meet the many economic, social and environmental challenges of the 21st century. This policy forms the second pillar of the common agricultural policy (CAP). EU rural development policy is funded by the European Agricultural Fund for Rural Development (EAFRD), which has a budget of EUR 100 billion for the period 2014-2020. Infrastructure owned and managed by the O.U.A.I. Sahateni, is part of the arrangement of AHC CAMPIA BUZAULUI and serves the land area related to plot SPP1 on the Cvest 2 canal, Buzau county. The SPP 1 pressurization station supplies water for irrigation with a net surface of 1716 ha. Modernization and refurbishment of the irrigation system infrastructure are necessary to: ensure a much lower specific water consumption than today in the system, reduce electricity costs by reducing energy consumed per thousand cubic meters of pumped water, reduce operating costs. Reducing the risk and uncertainty in agriculture by reducing the incidence of natural phenomena (drought, soil erosion, etc.): due to unpredictable weather conditions from one year to another, a well-developed irrigation system will reduce the risk of obtaining a lower production per hectare in case of drought. Increasing the efficiency of agricultural activity by improving the supply of inputs and better use of the resulting products: eliminating water losses and water use where needed, which will lead to an increase in production per hectare and help increase the profitability of this activity.

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RIVER RE-NATURALIZATION - A NATURE-BASED SOLUTION FOR CLIMATE CHANGE IN URBAN AREAS

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ABSTRACT

The subject of the article is river management and their reconstruction in connection with the need to adapt urban areas to climate change. The article presents a fragment of a wider research. The aim of the study is to identify and indicate the main directions of activities undertaken in the field of river reconstruction, based on the analysis of documents and literature on the subject. The case study of the Wandle River - one of the tributaries of the Thames, running through heavily urbanized areas in London, is an example of the restoration of the river. In this case, the use of natural solutions improved: flood and drought risk management, stormwater retention, inhabitants' access to the river and biodiversity of natural habitats associated with the river.

HEAT RECOVERY VENTILATION SYSTEMS AND THEIR PHYSICAL QUANTIFICATION

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ABSTRACT

The essence of ventilation is the exchange of air in the room for fresh outside air. At the same time ventilation is a factor that can significantly affect the energy efficiency of a building. Hygienic requirements for ventilation of interiors of buildings in the context of increasing the energy efficiency of buildings lead to the transformation of unregulated ventilation by infiltration to regulated ventilation systems with heat recovery. The regulated ventilation system makes it possible to optimize the ventilation intensity on the basis of a stimulus from the room user or automatically on the basis of sensors monitoring the quality of the indoor climate (temperature and relative humidity, CO2 concentration in the air, etc.). In addition, if we use a ventilation system with heat recovery from the exhaust air to preheat the fresh supply air to the room, we can achieve high energy efficiency of the building by meeting the hygienic criteria of the indoor climate. The article describes heat recovery ventilation systems and their basic conceptual solutions applied in the modern architecture. The heat exchange between the hot exhaust air and the cold supply air in the winter takes place in heat recovery ventilation units in the heat exchanger. The efficiency of heat recovery defines how much heat we can transfer from the exhaust air to the fresh air in the heat recovery exchanger. The article analyses individual factors influencing the efficiency of heat recovery. Due to the fact that the manufacturers of heat recovery ventilation units declare in their brochures or websites the values of the maximum efficiencies of their products, we were interested in their real efficiencies under normal operating conditions. Therefore, we subjected to experimental research in a large climate chamber a product from the German manufacturer Lunos, namely a specific type of decentralized heat recovery unit Lunos Nexxt K. The article describes the methodology of laboratory experiment, used experimental basis, brings and analyses measurement results and calculates real efficiency of the subject heat recovery in accordance with STN EN 13 141. In the end it compares measured values with the values from the manufacturer.

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TEMPERATURE RISE IN THE DOUBLE SKIN FAÇADE CAVITY DURING THE WINTER SEASON

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ABSTRACT

Energy efficiency of buildings is becoming more and more demanding to reach. One way of lowering an energy demand of buildings is using the alternative source of solar radiation. Double skin façade is a building structure that uses the alternative source of the solar radiation. In the cavity of the double skin façade, the air is heated by transformed shortwave solar radiation to longwave thermal radiation. Heating the air causes that air is going up in the cavity of the double skin façade. Idea is that heat recovery unit in winter period would not take the fresh cold air from exterior, but would take the fresh, pre-heated air from the cavity of the double skin façade. Purpose of this research is to determine the temperature rise in the cavity (between inlet temperature to the cavity and the outlet temperature) for the use of the heat recovery unit. We made computational fluid dynamics (CFD) simulation of double skin façade with narrow cavity in the Ansys fluent simulation software. With simulation the values of temperature rise are determined. After, we compared the simulation results with the results of similar simulations with similar double skin transparent facades from other articles to verify results. Principal result is that the air in the cavity of the double skin façade is pre-heated during the winter season. In major conclusion, the temperature at the cavity contributed to the thermal comfort of the interior environment, reduces the heat demand for heating, due to use of the pre-heated air from the cavity.

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INHABITING THE PRESENT: THE HOUSE, THE COLLECTIVE DWELLING AND THE CITY

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ABSTRACT

Residential architecture is the first and most difficult way of making architecture. Apart from being one of the most urgent needs in people's lives, it also represents one of the most legitimate aspirations of human beings, whatever their social condition. Housing is the greatest exponent of architecture; it means working with human beings and their needs. The nature of our dwelling, regardless of the type of culture and time period, conveys an undistorted vision of the human condition. In that sense, housing has always shaped the quality of human life. A good dwelling is one in which we can live well. Its essential quality is that of being livable. Since domestic dwelling cohabits mainly with private life, the value of housing lies primarily in its capacity to convey the feeling of shelter / protection and of a discrete relationship between the 'interior' spaces themselves; its architectural value lies in the capacity that the spaces themselves have to express, through their form, this relationship. The house problematic is wide and complex, it requires technical, artistic and functional knowledge, and a clear vision of the new values and social needs of our time – new means to improve people's lives. The present document aims to clarify the following concepts and the gradual relationship between them – the house, the collective dwelling and the city. To this end, a first approach will be made to the relationship between the concept of house, home and the inhabitant, and subsequently, a progressive passage to collective living and its interaction with the city.

DETERMINING THE EFFECTS OF ECONOMIC FACTORS ON FLOOR DESIGNS IN THE ANCIENT PORT CITY OF TOMIS

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ABSTRACT

This article focuses on the effects that economic factors had on the floor designs of the ancient port cities of the Black Sea (present day Dobrogea, Romania). It will similarly focus on how economic activity and trade facilitated the proliferation of mosaic floors. In 132 A.D., a Greek man by the name of Arrian was appointed by the Roman emperor Hadrian to become governor of Cappadocia. A number of Arrian's important texts have been preserved such as *Periplus Ponti Euxini* that describes sea routes and ports. Arrian emphasized the existence of important natural resources such as timber and flax in Moesia and Thrace. These resources were considered instrumental in securing the maritime connections of the Roman Empire. One of the most famous port cities described by Arrian was Tomis. Tomis was the capital of all the port cities found on the Black Sea coast demonstrating thus, its greater commercial activity in comparison to other ports in the region. The development of trade within the port cities of the Black Sea lead to the construction of richly decorated, luxurious edifices with a polychromatic finish. The mosaic floors unearthed following archaeological excavations in public areas prove the existence of a prosperous economy, as its societies had been able to invest in mosaic floors spanning vast areas (of thousands of square meters). The article aims to undertake an economic evaluation of the materials used in the construction of the mosaic floors discovered in the ancient city of Tomis. The floors that were unearthed following archeological excavations were preserved and span an area of approximately 49.80 by 16.60 meters. The richly colored, lithic material used to create them, illustrates and points to the high technical knowledge required to generate such flooring. The Marmara Sea area and the Cyclades islands were the known sources of this material.

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THE ECC METHODOLOGY FOR ARCHITECTURE DESIGN PRACTICES RESEARCH

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ABSTRACT

This study proposes the ECC methodology to improve design practices systematically. The article describes the research strategy called the evaluation-creation cycle (ECC) the foundation of the ECC methodology. Recent studies showed that a failure of synthetic creation of desired outcomes often results from a failure of analyzing existing practices and understanding the principles they are based on. This suggests that improving design practices requires the evaluation of existing practices and the development of knowledge with which to improve design. There is no theory at present exists that explains the processes of knowledge creation within the design process. The study draws insight from the Renaissance theory in order to widen the kind of understandings that the contemporary analytic-synthetic theory can provide. This has led to understanding the development of design knowledge, consisting of knowledge of design and knowledge for design, through the analytic and the synthetic practices. These are the basis of the ECC methodology with which to improve design. In this article the evaluation-creation cycle (ECC) strategy is described and the ECC methodology based on it introduced, and the way in which the wider analytic-synthetic theory provides understanding that can be used as basis for improvement measures is discussed.

CONSERVATION THROUGH KNOWLEDGE: THE CASE STUDY OF PARMA BOTANIC GARDEN

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ABSTRACT

In the restoration field it is well known that the preservation of cultural heritage stands on a deep comprehension of the architectural object, material expression of a complex system made of cultural, technological, historical, social and economic issues. The knowledge of such meaningful structures requires the identification of both typological features and peculiar characteristics, within an interactive dialogue between contributions from different disciplines. Thus, the study of existing buildings is a complex process that needs to be planned: that means conceived, organized and realized with a critical method. The paper aims to show an example of this approach by presenting the knowledge path followed for the analysis of the Botanic Garden in Parma, Italy. This green area is located in the south of the city and hosts several buildings including the school of botany and the elegant greenhouse, built at the end of the 18th century. Recently, the restoration of the architectural complex has been proposed, aiming at its valorisation. The design process was supported by the studies and the analysis of the existing buildings carried out by the research group in Restoration of the University of Parma. In the specific, the constructive phases have been investigated through historical archive researches whereas the current structural systems have been studied through the geometric survey. Moreover, in-situ inspections allowed to define materials, deepening the knowledge of structural elements and their state of conservation. Finally, the survey of the crack pattern and decay allows to highlight vulnerabilities and mechanisms of collapse. In this way, it has been possible to understand the architectural structure thanks to the comparison between all data collected. On the other hand, in order to respect the historical construction, these analyses are required to reach a satisfying level of detail with the minimum action on the material construction, preferring non-destructive investigations. This approach entails assumptions and uncertainties that could be managed thanks to a critical interpretation of the results. Thus, the case study of Parma Botanic Garden shows the importance of planning the knowledge path with awareness in order to progressively deepen the comprehension with an interactive dialogue between the architectural object and the restoration issue.

LINEAR EQUATION SYSTEMS FOR STRUCTURAL ANALYSIS: IMAGINING RESOLUTIONS

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ABSTRACT

This paper is based on a study into new ways of resolving the equilibrium equation systems for manual analyses of certain structures commonly found in building. It suggests finding solutions based on images that reproduce the operations of current methods, which may inspire the design of others that qualitatively reflect those of other more effective procedures. To date three methods (Gauss, Cholesky & Crout) have been imagined: (i) by "visualising" their operations through the mechanical behaviour of models during the balancing phase. These visualisations may help suggest other physical responses that can balance models more quickly and identify with new, more direct numerical methods; (ii) by "geometrising" operations by means of lines sketched freehand. This geometrisation may reveal hidden links between the parts of the calculation of current methods that enable more direct but equally precise new methods to be created. The paper shows four images to reinforce these viewpoints. Two visualise the methods of Gauss-Jordan and Cramer, confirming that the abstract procedures that resolve the systems may be linked to specific mechanical behaviours. The other two geometrise the resolutions by Gauss and Gauss-Jordan when the stiffness matrices are asymmetric. Their systems could emerge from the analysis of cracked models or from obtaining the equivalent actions in the P-Δ method, in line with a procedure drawn up previously. The paper ends by geometrising the resolution of a system at different scales and comparing the outcomes with those of numerical methods. The results (i) confirm that geometrising scalar and vectorial magnitudes for numerical analysis procedures reduces application times if they are calculated freehand; and (ii) point to possible lines of research for developing further graphic methods that can analyse other types of structure directly and accurately.

CLIMATE-FRIENDLY CITIES – BLUE-GREEN INFRASTRUCTURE ACTIVITIES

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ABSTRACT

Increasing climate change affects many aspects of cities and their inhabitants. Extreme weather phenomena destroy urban areas, infrastructure and green spaces. Activities taken to improve the resilience of cities and their adaptation to climate change aim to reduce or avoid negative consequences, or to increase the benefits of risks. They are different in character and take different forms, depending on the level of economic and social development, financial, institutional, human, and knowledge resources. The planning and urban development tools and instruments used are also important. An integral part of adaptation activities is the development of modern systems of blue-green urban infrastructure. The experience of the last few years has shown the diversity of applied projects based on natural solutions. They are reflected both in the provisions of climate strategies and in the realizations visible in the urban landscape. The paper focuses on planning and implementation activities that strengthen resilience to climate change, highlight the importance of ecosystem services and shape urban space. The research focuses on polish cities that have undertaken the development of Urban Adaptation Plans (MPA). The aim of this paper is to present the blue-green infrastructure activities included in the MPA, the possibilities for their implementation and to show their role in improving the quality of life in cities, increasing the attractiveness of urban spaces and raising the awareness and involvement of local communities.

GRIPPING OF ANCHOR FIBER OF UKRAINIAN PRODUCTION WITH FINE-GRAIN CONCRETE

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ABSTRACT

The results of tests for drawing anchor fibers with a length of 50 mm and a diameter of 1 mm, laid at the end of concrete prisms 50x50x100 mm made of fine-grained concrete of classes C 20/25, C25/30 and C 30/35 are presented. From the tests of 50 fibers, the average value of tensile strength was determined, which is equal to 1242 MPa with a coefficient of variation of 2.1%. Prisms were made of fine-grained concrete, which included cement with an activity of 41.2 MPa for concrete class C 20/25 and an activity of 50.8 MPa for concrete classes C 25/30 and C 30/35. Sand with a modulus of size 2.1 was used as a filler. The concrete mixture was prepared in a forced concrete mixer, and the concrete was compacted on a vibrating platform. Simultaneously with these prisms, cubes with dimensions of 150x150x150 mm and prisms with dimensions of 100x100x400 mm were made to determine the bottom and prism strength of concrete. The length of laying fibers into concrete was 10,15 and 25 mm. It is shown that the forces perceived by the end anchors and the smooth part of the fibers rise with increasing strength of concrete. The results of tests for drawing fibers from concrete prisms are given in tables 1 - 3. For the length of laying fiber 10 mm into prisms with strength $f_{cm,cube} = 29.31MPa$ and $f_{cm,prism} = 23.15MPa$ the maximum stresses during drawing were 515.30 - 549.04 MPa (average value - 532.10 MPa). At the same length of laying fiber into concrete prisms with strength $f_{cm,cube} = 34.76MPa$ and $f_{cm,prism} = 27.11MPa$, these stresses were equal to 554.47 - 588.54 MPa (average value - 569.70 MPa). For the length of laying the fiber 10 mm into prisms with strength $f_{cm,cube} = 38.96MPa$ and $f_{cm,prism} = 31.14MPa$, the maximum tensile stresses were 590.51 - 621.72 MPa (average value - 606.81MPa). At the specified strengths of the prism concrete, the maximum values of the average stresses for fiber drawing were on average 13.37 MPa for concrete of class C20/25, 14.34 MPa for concrete of class C25/30 and 15.27 MPa for concrete of class C30/35. With a fiber laying length of 15 mm into prisms with concrete strength corresponding to class C20/25, the maximum tensile stresses were 575.80 - 607.64 MPa (average value - 587.10 MPa). With such a length of laying fiber into prisms made of concrete class C25/30, these stresses were equal to 614.44 - 680.25 MPa (average value - 638.95 MPa). At the length of laying the fiber 15 mm into the prisms of concrete class C30/35, the maximum stresses during drawing were 681.14 - 692.99 MPa (average value - 685.44 MPa). The maximum values of average stresses for fiber drawing were on average 9.87 MPa for concrete of class C20/25, 10.70 MPa for concrete of class C25/30 and 11.52 MPa for concrete of class C30/35. At a fiber laying length of 25 mm into prisms with concrete strength corresponding to class C20/25, the maximum tensile stresses were 645.44 - 735.03 MPa (average value - 692.76 MPa). With such a length of laying fiber into prisms made of concrete class C25/30, these stresses were equal to 736.58 - 773.25 MPa (average value - 752.37 MPa). With the length of laying fiber 25 mm into prisms made of concrete class C30/35, maximum stresses during drawing were equal to 780.27 - 839.49 MPa (average value - 809.12 MPa). The maximum values of the average stresses during fiber drawing were on average 6.97 MPa for concrete of class C20/25, 7.57 MPa for concrete of class C25/30 and 8.12 MPa for concrete of class C30/35. The coefficient of anchoring capacity η, which under Ukrainian standards of fibroconcrete structures designing is equal to 0.9, as shown by the data of our experiments, is not constant, so it is necessary to take this into account in the formula for determining the tensile strength of fibroconcrete.

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METHODS OF CALCULATION THE INCREASED REINFORCED CONCRETE ELEMENTS BY CARRYING CAPACITY OF SLOPE SECTIONS

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ABSTRACT

Reinforcement bending reinforced concrete structures by increasing the cross section and assessing the load-bearing capacity of the inclined section such elements is an urgent problem, as not yet accumulated adequate research data on the stress-strain state such structures in the span, which works on shear and shear bending moment and transverse force. Analysing the development theories calculation reinforced concrete elements inclined to the longitudinal axis, we can identify many areas, the main approach of which was based on the calculation using the bases of material resistance, and the use of empirical dependencies. Theoretical approaches calculation the European construction magazine RILEM TC, SNiP 2.03.01-84* are considered; DBN B.2.6-98 2009 (Eurocode 2); US ACI 318-19. Experimental studies reinforced concrete elements to determine the load-bearing capacity inclined sections were performed on the basis of 5 samples reinforced concrete beams, 14 reinforced samples of reinforced concrete and shotcrete a total of 19 pieces in four series. Beams were made of concrete in each series f_{ck} = 19.08 MPa; f_{ck} = 27.74 MPa; f_{ck} = 20.48 MPa; f_{ck} = 20.48 MPa, respectively, reinforced samples with concrete f_{ck} = 17.95 MPa; f_{ck} = 19.5 MPa (shotcrete f_{ck} = 31.00 MPa); shotcrete f_{ck}=19.9 MPa; f_{ck} =19.9 MPa. Also, for the manufacture and reinforcement beams used flat and U-shaped frames with working longitudinal reinforcement Ø22, Ø16, Ø12, Ø10, Ø6 A400C, and transverse reinforcement Ø6 A240C (step 120 mm). Reinforcement inclined sections of the experimental beams was performed on one, two or three sides, depending on the variant of the sample and the type of frame flat or U-shaped. Investigations of beams were performed according to the static scheme - a beam on two supports, span L = 2100 mm. Deformations of concrete and reinforcement in the samples when determining the bearing capacity of inclined sections were measured using microindicators of the clock type, strain gauges. According to the results theoretical and experimental studies the bearing capacity inclined sections to the longitudinal axis, we can see a significant reassessment between the theoretical values of inclined sections according to the new DBN B.2.6.-98: 2009 (Eurocode 2) over the actual results obtained during testing samples 53-67 % for conventional beams, and 27-50% for reinforced beams. The results US regulations ACI 318-19 showed convergence of results in the range of 2-9% for samples without reinforcement and 1-7% for samples with reinforcement, but the values show the excess of experimental data over theoretical, indicating the impossibility of accurately determining the actual final bearing capacity. The results the calculation obtained by the method of SNiP 2.03.01-84*, both unreinforced and reinforced beams have a satisfactory agreement with the experimental values in the range of 6-10%. The results according to the method of construction log RILEM TC 162 show a discrepancy in the results between the theoretical and experimental values of 1-11%.

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COMPARISON OF INFLUENCE OF SUPERFICIAL STRENGTHENING WITH FRCM SYSTEM AND KIND OF MORTAR ON SHEAR STRENGTH OF AUTOCLAVED AERATED CONCRETE MASONRY

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ABSTRACT

This paper describes a comparison of results from testing shear strength of autoclaved aerated concrete (AAC) walls strengthened with superficial strengthening with the results of tests of walls made of various types of joints and mortar. The initial and characteristic shear strength and the angle of internal friction were compared. The test elements were made using two types of mortars, three types of joints, and two methods of reinforcement. The models were made using masonry units in the SOLBET OPTIMAL system. SOLBET 0.1 mortar, intended for thin joints, as well as SOLBET SMART polyurethane adhesive were used. Typical joints with a width equal to the thickness of the wall, strip joints and joints without mortar were made. Models with typical joints were also tested as reinforced on one and two sides with the FRCM system, using the mineral cement matrix PBO-MX GOLD MASONRY and the PBO-MESH GOLD 22/22 mesh. A total of 56 models were tested in accordance with the requirements of PN-EN 1052-3: 2004. A significant influence of with superficial strengthening as well as the type of mortar and the construction of joints on the individual parameters of shear strength was demonstrated.

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RESEARCH OF INFLUENCE OF HORIZONTAL REINFORCEMENT ON COMPRESSION AND SHEAR STRENGTH OF AUTOCLAVED AERATED CONCRETE MASONRY

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ABSTRACT

This paper presents a research of influence of horizontal reinforcement on compressive and shear strength of Autoclaved Aerated Concrete (AAC) masonry. Specimens were tested according to guidelines of EN 1052-1:2000 and ASTM ES519-81 code in case of compression and shear test respectively. Reinforcement in the form of strips of mesh rolled out from a roll, consists of steel cords with an interwoven fiberglass roving was used. The influence of this type of reinforcement was also compared with the results of tests of AAC masonry walls without reinforcement, reinforced with truss type reinforcement and reinforced with synthetic mesh respectively.

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MOBILITY PATTERNS OF THE PORTUGUESE POPULATION DURING THE COVID-19 PANDEMIC

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ABSTRACT

SARS-CoV-2 emerged in late 2019. Since then, it has spread to several countries, becoming classified as a pandemic. So far, there are several vaccines to prevent the disease, but we need to continue the practice of social distancing to prevent transmission between the population. However, it is not easy to measure the effectiveness of these distance measures. Therefore, this study uses data from Google COVID-19 Community Mobility Reports to understand the Portuguese population's mobility patterns during the COVID-19 pandemic. In this study, the Rt value was modelled for Portugal. In addition, the changepoint was calculated for the population mobility patterns. Thus, the mobility pattern change was used to understand the impact of social distancing measures on the dissemination of COVID-19. As a result, it can be stated that the initial Rt value in Portugal was very close to 3, falling to values close to 1 after 25 days. Social isolation measures were adopted quickly in the beginning of the pandemic. Furthermore, it was observed that public transport was avoided during the pandemic. To speed up the production of vaccines already approved by the European Medicines Agency and other international medicines agencies, with the aim of vaccinating about 70% of the population to have herd immunity, all pharmaceutical companies should establish agreements in order to produce the vaccines under license from the company that has the international patent. The European Commission must promote these profit-sharing agreements with the production and sale of the approved vaccines. This is clearly a unique and rare opportunity for policy makers and transport researchers to work together and take the momentum to devise new policies in order to change our everyday living and choices toward more environmentally sustainable life and work. The public transport system needs to be improved to allow physical distancing of the users during the COVID-19 pandemic. The telecommuting (working from home) must be promoted even as restrictions are eased so that only necessary travel occurs. The work beginning times in institutions and companies can be staggered to lower the number of employees traveling at the same time. The active mobility (cy-cling, walking) must be promoted because it improves the environment (reduces GHG emissions), reduces the necessary number of public transport vehicles, and increases the population health. The road space in cities can be reallocated to accommodate active mobility and to increase physical distancing of cyclists and pedestrians. The utilization of electric bikes must be promoted to allow longer trips. Finally, policy makers and transport researchers have an excellent opportunity to work together and design new transport policies toward more healthy and sustainable life.

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PROTECTION PERIMETER OF A NEW MINERAL WATER IN AN ESSENTIALLY URBAN ENVIRONMENT: THE CASE OF THE SÃO TIAGO MEDICAL SPA (PORTUGAL)

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ABSTRACT

São Tiago medical spa is an integrated structure in a new Health Tourism Complex, in Penamacor, Portugal, recently legalized. That medical spa bases its exploration on the natural mineral water obtained from the Well P1. Thus, to facilitate the preservation of the quality of the resource, natural mineral water, one of the fundamental instruments is the implementation of a Protection Perimeter of Well P1 and its associated aquifer system. In this sense, in this paper, after briefly presenting the basic geoenvironmental aspects that are the base for the elaboration of the Protection Perimeter, the methodology of its elaboration is explained, with the final solution, which constitutes a territory organized by three zones: Immediate Protection Zone, Intermediate Protection Zone and Extended Protection Zone. The official restrictions legally foreseen for those zones are mentioned and the official systematization of the current occupation of the territory is presented, in terms of the Municipal Master Plan (PDM), while emphasizing the potential sources of existing pollution. Finally, some comments are made about the future orientation regarding the occupation of the territory in the interior zones of the Protection Perimeter, so that the new Health Tourism complex, consisting of a medical spa, hotel, and aqualudic spaces, endures in the time, and helps the sustained economic growth of the region.

THE SPA SPACE OVER TIME. THE CASE OF THE SÃO PEDRO DO SUL MEDICAL SPA (PORTUGAL)

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ABSTRACT

São Pedro do Sul medical spa are supplied by natural hot mineral water, from several groundwater abstractions, one of which is a natural hot spring with 68.6ºC, which maintains a constant flow of about 10 L/s, registered along the last decades, but probably, according to the available data, that flow and temperature constancy is millenary. Well, a natural resource, with these characteristics, was certainly a place of search and even disputes, most probably since the time of the last glaciation, more than 10,000 years ago, in which the entire region where São Pedro do Sul is currently located, it would be essentially covered with snow. This situation, since the most remote times, had an occupation that led to various constructions that suffered metamorphoses over time, with perfect evidence at the time of the Romans, around 2000 years ago, then at the time of the first king of Portugal (King Afonso Henriques) around 1169 years ago, until the last Portuguese Queen (Queen D. Amélia), around 120 years ago. Currently the São Pedro do Sul medical spa have two bathing facilities operating simultaneously: the Termal Center (known today as D. Afonso Henriques Bathhouse), and Rainha D. Amélia Bathhouse. It has been the Medical Spa of Portugal that has had the most revenues for several decades, having already exceeded in some years the 5.000.000 € /year, essentially from the classical health thermalism, although in the concession it is also official the use of wellness thermalism, the sale of cosmetic products and of energy from the heat of the resource. Thus, due to the importance of this resource, it is important to have research on the various areas of knowledge associated with it. In this paper, after a brief presentation of factual elements about the place, characteristics of the resource and economic elements, a synthetic presentation of the main architectural aspects of the various buildings over time is made, referring relationships between the individual and the place in the context of practices and rituals in an architecture of the senses, also showing the relationship with other hotel and leisure facilities around the medical spa.

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MEASURES TO PREVENT SURFACE LEAKS IN A PERIURBAN AREA USING RESPONSIBLE ENVIRONMENTAL APPROACHES

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ABSTRACT

Climate change and environmental degradation are an existential threat for Romania and for the whole world. Restoring nature will be a central element of the EU's recovery plan from the coronavirus pandemic, providing immediate investment opportunities to revive the European economy. Both urban and industrial development are changing landscapes from permeable vegetable surfaces to a series of interconnected impermeable surfaces, resulting in large amounts of rainwater runoff, which requires management. Rainwater runoff is treated by the authorities as a liability and a nuisance that endangers human health and property. Starting from this aspect, over time, systems for collecting and transporting rainwater directly to watercourses have been designed, but without considering the conservation of ecosystems. Rainwater runoff is a source of pollutants washed off hard or compacted surfaces during rain events. These pollutants can be pesticides, herbicides, hydrocarbons, traces of metals but also organic compounds. Water Sensitive Urban Design (WSUD), Low Impact Development (LID), Sustainable Drainage System (SuDS) are spatial planning and technical design approaches that integrate the urban water cycle, including stormwater management, groundwater and wastewater and water supply, in urban design to minimize environmental degradation and improve aesthetic and recreational attraction. The article presents possible solutions applicable to a locality in the west of Romania that is facing the drainage of meteoric waters. This locality was one of the most affected by the recent floods, with over 6,700 ha of almost destroyed crops, 300 flooded houses, 70% of compromised gardens, the most affected being the new residential neighbourhoods. Timiş County is one of the Romania counties with the largest network of hydrotechnical arrangements (about 480,000 ha on which hydro-amelioration works are executed and over 11,500 km of drainage, irrigation and soil erosion control channels), it risks becoming a swamp again due to the indifference or ignorance of some of the decision - makers, the lack of appropriate legislation, the non - application of the existing one and the low underfunding after 1990.

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INVESTIGATING THE VALUES OF MODERN ARCHITECTURAL HERITAGE IN DUBAI, UAE

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ABSTRACT

In the last half century, the world has witnessed a fast-paced technological development where cities have been changing tremendously in terms of infrastructure, public health, and quality of life. Looking into the Middle East and specifically in the Gulf states, the rapid urban growth started at the late 20th century has made the status of heritage structures more vulnerable. Cultural heritage in general and modern architectural heritage in particular, are threatened by the destruction, which in turn leads to the loss of cultural identity and memory. The paper investigates the modern architectural heritage of the United Arab Emirates (UAE), taking Dubai as a case study. Due to the constant urban and architectural growth that Dubai has been facing since 1950's, its 20th century heritage has been put in extreme danger of neglect, or extreme physical alterations and, in many cases, demolishment. The UAE governmental bodies have started launching initiatives for the study and preservation of the modern architectural heritage, beginning with the Dubai Municipality's initiative in 2017, and continuing on a wider scope with the UAE's Ministry of Culture and Youth initiative in 2019. The purpose of this paper is to contribute in this process by establishing a chronological overview of the various architectural expressions of the modern era in the UAE. The paper introduces a set of commercial architectural examples built in Dubai during the transitional period between 1960s and 1980s. As well, it identifies and analyses their cultural and architectural characteristics, and assesses their values based on a chronological, morphological, and stylistic overview. The paper provides preliminary results and key findings, and discusses possible guidelines and evaluation criteria to identify and evaluate Dubai's modern built environment with the aim of aiding their identification and ranking process, as well as promoting the shaping of conservation policies.

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URBAN REGENERATION AND BUILDING RETROFIT: A STRATEGY TOWARDS INSTILLING A CULTURE OF INNOVATION AND ENTREPRENEURSHIP

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ABSTRACT

The United Arab Emirates' economy is transitioning to a knowledge-based economy by promoting innovation and research development. Supporting the UAE's Vision at becoming among the best and most innovative nation in the world by 2071, the Government has developed frameworks that recognize the importance of innovation to an economy's growth and development. This paper presents the results of a design research where the domain of architecture and engineering blend with economics and social studies to the serve the UAE's vision, proposing urban solutions to launch the country in its 'next 50' years, with an eye for the preservation and revitalization of the exiting and valuable resources. The research project proposes a different geography of innovation and introduces urban regeneration strategies to stimulate innovative policies for the built environment of the entire UAE territory. With the intent of forming an intangible connection between the seven Emirates, the proposed intervention can be situated in every state. The study especially looks into the three neighboring Emirates or Dubai, Sharjah, and Ajman, and finally select the latter to test the introduction of strategically designed spaces in degraded (and disconnected) locations to encourage the community to innovate while at the same time reusing/refurbishing the existing resources/buildings/facilities. The specific case study involves the design of an incubator facility in an obsolete villa community in Ajman, formerly hosting locals (therefore luxurious) that now have left for better locations and cannot manage to resell their properties due to the decadence of the neighbourhood. The incubator, a building articulated in the interstitial spaces in between the villas, would reactivate the district by attracting young and innovative entrepreneurs, who settle there for both working and living, exploiting the incubator complex as a parasite of the existing villas. If successful, the project will revive the district, provide it a new brand, and create a new financial stream to self-support its gradual regeneration.

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DISTRICT – LEARNING AN INNOVATIVE APPROACH TO UPGRADE THE UAE EDUCATIONAL SECTOR

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ABSTRACT

Education is the process that ensures the transmission of the knowledge, skills, and values necessary for the next generations. It also paves the way for future progress for nations, highlighting today's global tendency towards a knowledge-based economy. Hence, there is a need to bridge the academic gap in the educational system of the UAE to enhance the nation's innovation. This gap is addressed from three different levels, policy level, pedagogical level, and socio-urban level. On the policy level, the UAE is working on developing its educational system through the UAE future policies, and the Ministry of Education's new pedagogical requirements launched in 2019, that enhances the educational system in the country. On the pedagogical level, the significant gap between public schools' educational system and the industry's demand must be merged. In public schools, a large number of students is not aware of their real potential and interests due to the lack of programs offered. This outdated educational system affects the social and urban level, resulting in a large number of Emirati students enrolling in private schools or even studying abroad to get better education, granted by the updated teaching techniques. This pedagogical/demographical issue, boosted by locals' shift from coastal regions to suburbs after the oil discovery, resulted in a significant number of public schools becoming under-loaded or even abandoned. This research aims to achieve UAE's future strategies and policies, applying the Ministry of Education's new requirements and adding a new set of pedagogical facilities to prepare the future generation for the professional challenges and develop their skills through an approach that improves the country's pedagogical system without neglecting the already existing educational infrastructure. This research was conducted by analyzing the historical development and future trends of the educational system in the UAE, studying the relevant literature and the related national and international cases, and especially by critically reviewing the previous work done to upgrade the educational system in the UAE. After accurately sizing the new required facilities, several limitations were found in retrofitting each existing school building. For this reason, this study proposes the "District Learning" an urban-level approach to multi-school neighborhoods, with the aim of providing the new pedagogical functions in a separated building that serves the entire educational district. This approach required comprehensive mapping and site analysis of all the educational districts in UAE and their classification based on several factors. Al-Jurf 2 zone in Ajman, considered the most suitable to test the new upgrading strategy, was selected as case-study. The concept behind the "District – Learning" strategy is to enhance the connection between the schools in the same district, toward improving the students' learning experience. Applying the "District – Learning" idea to each emirate would enable them to share resources, creating a sense of connectivity through sharing and open-source philosophy. This non-physical connectivity is translated into a physical one through safe circulation paths that connect each school to the new building. The construction process fosters modularity and flexibility, allowing the project to fit the demand of the different districts.

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PERFORMANCE OF MULTICRITERIA EVALUATION AND HEURISTIC METHODS IN THE DELINEATION OF GREEN INFRASTRUCTURE IN AREAS WITH FRAGMENTED LANDSCAPES

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ABSTRACT

The EU Commission has established Green infrastructure as one of the tools to preserve biodiversity and grant the provision of ecosystem services that reduce impacts on natural values like those produced by climate change. Therefore, a European green infrastructure strategy has been created that commit member states to incorporate green infrastructure to their territorial planning. Yet, methodologies to delimit green infrastructure so as to facilitate its inclusion in territorial plans are still scarce. The available methods are mainly based in multicriteria evaluation and focus on zoning general green infrastructure areas taking into account the provision potential of just a few ecosystem services. Considering the provision of a wide range of ecosystem services to delimit green infrastructure elements is key to grant their multifunctionality and increase their efficiency mitigating climate change impacts in natural values and human population. However the lack of data or the high cost to accurately map ecosystem services provision potential, leads most of the time to infer it from land cover data. This creates problems when using these maps to delimit green infrastructure in areas with fragmented landscapes; since identified green infrastructure areas may be irregular and scattered. There are heuristic methods like simulated annealing that have been used to identify ecosystem services hot spots which consider the regularity and size of the identified patches. These methods can be used to delimit green infrastructure in fragmented landscapes finding a balance between the regularity of the areas and their potential to provide multiple ecosystem services. In the current work, a comparison has been made between the performance of simulated annealing and current multicriteria evaluation methods to delimit green infrastructure multifunctional buffer zones in an area of north-western Spain with a very fragmented landscape. Results have shown that simulated annealing delimits more regular multifunctional buffer areas but with a less average potential for providing multiple ecosystem services. The conclusions of the paper indicate that simulated annealing is good at finding a compromise solution. A suggestion is made to develop ecosystem services provision potential mapping methods that consider landscape pattern in order to improve the performance of green infrastructure delineation methods in fragmented areas.

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FEM ANALYSES OF DYNAMIC BEHAVIOR OF FULLY-COUPLED TUNNEL-SOIL-ABOVE GROUND STRUCTURES

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ABSTRACT

The seismic response of structures depends on many factors, including the Dynamic Soil-Structure Interaction (DSSI). The study of DSSI is fundamental because: it changes the frequency content of the system; it modifies the stress-strain level in the structure and the soil; critical phenomena can occur at the soil-foundation interface (sliding or uplifting); the presence of the structure modifies the expected accelerogram at the soil surface. DSSI analyses should be encouraged to achieve not only the safest but also the most economical design possible. DSSI phenomena can be analyzed using preliminary studies at the local or urban level, aimed at accurate microzonation studies. Alternatively, detailed studies concerning single case-histories can be performed by full-scale or small-scale tests, simplified approaches and advanced numerical modelling. The latter are powerful tools, allowing initial and boundary conditions, soil profile, geometry, soil nonlinearity, soil-foundation interface to be more realistically taken into account. As for the first approach, several urban areas in the Mediterranean have already been subjected to seismic microzonation studies to determine the acceleration expected on the ground surface, but these studies have been generally related to free-field conditions. The present paper shows innovative seismic microzonation maps based on a large-scale estimate of DSSI effects on design accelerations for a reference area of the city of Catania (Italy). The proposed procedure combined the geotechnical characteristics with the building features; moreover, the seismic hazard and site effects were evaluated by 1D seismic response analyses, using artificial and recorded seismic inputs. Basing on this information, considering both the fixed-base building configuration and the flexible-base configuration, fundamental structural periods and related spectral accelerations were evaluated. Their respective ratios were mapped in the Google My Maps environment. These maps offer essential information for planning the seismic retrofitting of investigated buildings, suggesting more detailed analyses of SSI phenomena when spectral acceleration ratios are more significant than 1.15. As for these more accurate studies, the present paper shows fully-coupled numerical analyses concerning a school building located in the above-mentioned investigated area. The soil properties were carefully defined using in-situ and laboratory tests. To consider the soil non-linearity, modified shear moduli and soil damping ratios were evaluated, firstly according to EC8 (2003) and secondly considering the effective strain levels using an iterative approach. Various 2D numerical analyses were performed, considering both free-field conditions and soil-structure interaction, for evaluating the known differences between the two types of condition quantitatively. The model was analyzed in the time and frequency domains. The main goals were: investigating the soil filtering effect, comparing the achieved amplification factors and response spectra with those furnished by Italian Technical Regulations, evaluating the influence of different modelling of soil non-linearity on the dynamic response of the system.

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RESIDENTIAL PROPERTY BEHAVIOR FORECASTING IN THE METROPOLITAN CITY OF MILAN

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ABSTRACT

Through a careful research and synthesis of the theoretical framework regarding residential properties performance measurement and forecasting, this paper deepens in the proposition of properties development in an asset class that represents the biggest share of Italian property market but yet is avoided by the big portfolios. The methodology worked with three categories of independent variables: Structural characteristics of the house, Neighbourhood environmental characteristics and Accessibility characteristics (following the categorization of Fanhua, Kong et al, 2007). The analysis is based on the development of correlation indices to evaluate two different behaviors, the first one evaluates through a Geographic Information System (GIS) the relation between the rent/price performance with the different external and intrinsic variables (structural, neighborhood, socioeconomic and accessibility characteristics) of a residential property; the second one evaluates the autocorrelation through time, in order to quantify how much price levels anticipate subsequent changes within the urban stucture of Milan city and its' Metropolitan Area. The behavior of the real estate market and, in particular, the residential sector, in a large city varies from that of small, medium-sized and large cities; it is necessary to consider the main differences due to the size of the sector and the dynamics of a metropolitan city. Moreover, it is necessary to add that housing markets are not homogenous across metropolises. Aggregating data at the national level may disguise the true volatility at a local level that homeowners face and care about. In the same way, the areas of a metropolitan city may not reflect the general behavior of the neighborhood or even the sector. It is precisely this context that the Research Project of Relevant National Interest (PRIN) "Metropolitan cities: territorial economic strategies, financial constraints and circular regeneration" includes their research results. The three-year research project aims to investigate the evolution over time of the relationships between the central city and the metropolitan suburbs through census data of the functions and activities hosted. It also intends to deepen the trend of public investments, taxation relating to the metropolitan city, and finally the analysis of the profile of land and real estate income from the center to the periphery of the metropolitan cities.
As anticipated, one of the aims of the research is to represent the trends in ten Italian metropolitan cities and, for Politecnico di Milano research unit, the in-depth study and analysis of the trend of real estate values in the Metropolitan City of Milan.

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DESIGN METHOD FOR END-PLATE BOLTED CONNECTIONS

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ABSTRACT

The design of buildings envelopes is more elaborate than it has ever been. Starting from the design method of nodal space frames made of one layer of structure and covered in glass, this paper presents e new type of end-plate beam to beam connection. Specific to this is the fact that both end-plates are welded inside of the tubes, having a minimum gap between them of 2 mm. This will reduce considerably the in-surface and welding-induced end plates tolerances which appear at classical end-plate connections. Through the pre-tensioning of the bolts, a continuous contact surface is assured along the cross-sections of the hollow profiles. Several tests were run with the software Gas Win in order to establish the maximum capacity of the connection. This was considered to be achieved when the neutral axis goes out of the cross-section and the connection started to open (the entire cross-section was in compression). Installation hand-holes were also considered. In order to get a better understanding about the force flow, an FEM analysis was run using the Abaqus software. A comparison between the results followed. It has been noted that the location of the neutral axis governs the capacity of this type of connection. Even if the bolts and the end-plates would be able to take more load, once the connection starts to open, the contact surface does not run any more over the entire cross-section. The installation hand-holes with this dimensions and locations do not play a key role in establishing the maximum capacity of this end-plate beam to beam connection. The obtained results look feasible which means that the basic design theory of the space frame could be applied also on this type of connections.

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STUDIES ON THE RECONSTRUCTION OF THE ORIGINAL APPEARANCE OF THE "ROMANTIC TOWER" AND THE „HUNTING LODGE" IN WODZISŁAW ŚLĄSKI

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ABSTRACT

"The Romantic Tower" in Wodzisław Śląski, also called „The Bastion Tower" or „The Knights Tower" - is one of the landmarks of the city. The recent years have seen a growing revival of local patriotism, which is closely correlated with the increasing need for research into the history of the so-called "Small Homelands". Due to its location and history, Wodzisław Śląski used to be a multicultural urban centre inhabited by Poles, Germans and a Jewish community. The spatial structure of the town was based on a mediaeval settlement layout with a hill on which a fortified settlement used to be located until the mid-13th century. After the fire of 1822, which almost completely destroyed the town, a rapid reconstruction of this urban centre took place. The trends of historicism and romanticism in Europe followed soon afterwards. Edward Brauns, a landowner, retired colonel, romantic and dreamer initiated the construction of a hunter's lodge in the form of a tower with adjacent buildings in 1867-68. There was a restaurant therein from 1925 onwards, for about 10 years. Several twists of fate caused that only the neo-Gothic tower survived until present and it used to function as an observation spot for many years. After being set on fire by some unknown perpetrators in 2004, it fell into ruin. The walls and the façade were refurbished in 2012, while in 2020 the works on the tower's revitalization have begun with the intention to restore its observation spot function. The measures taken to rescue this valuable structure highlighted the need to reconstruct the original shape of the hunters' lodge, which could be useful while defining its revitalization extent, for example in the form of a miniature based on the iconographic and photographic materials, archaeological and other research and this, after relevant studies, was done and resulted in the form of a model exhibited in the Town Museum of Wodzisław Śląski.

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DEVELOPMENT OF URBAN RESIDENTIAL ZONES OF SARAJEVO DURING THE OTTOMAN PERIOD FROM 1455-1604

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ABSTRACT

This paper theoretically and graphically analyzes the basic trends of development and expansion of urban residential zones-*mahalas,* of Sarajevo during the Ottoman period from 1455-1604. This research position is conditioned by the available historical sources that enable this specific analysis - Ottoman cadastral *defters*. Available data on the number of households from the preserved *defters* were analyzed in conjunction with other relevant historical knowledge, and as a final result, a basic simulation of the expansion of the city was presented in graphical form. The results of the analysis provide an insight into the basic trends of development and expansion of the city of Sarajevo in the classical period of Ottoman rule, which is a valuable information and a scientific basis for a correct approach to the process of protecting this and similar urban historical zones.

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IDENTITY OF TRADITIONAL FORUM OF THE SARAJEVO CARSI – FORMATION AND CHARACTERISATION

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ABSTRACT

Preservation of complex urban cores like the Sarajevo *carsi* requires understanding of all the different meanings attributed to the social group that has co-participated in transfer and preservation of values. This paper defines the basic identity construct of this traditional social forum. When describing its identity and features, relevant social occurrences have been analysed, primarily the *muafyet, odjakluk timar, and ayanship,* as well as the social context in the initial phase of forming the original *a priori* identity and its subsequent final transformation into the interest identity of the *carsi* forum.

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QUESTION OF AUTHENTICITY OF STEEL SHEET ROOF COVER ON TRADITIONAL HOUSING UNITS IN URBAN ENVIRONMENT

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ABSTRACT

Elaborating on the theory of analytical philosophy and conservation doctrine, and a case study of a selected sample, the paper discusses the authenticity of the secondary roof cover of steel sheets on traditional Bosnian houses built for housing or economic purposes. Although such steel sheet replica of a shingle or *šimla* wooden cover is registered and defined as authentic in rural areas, its authenticity in urban traditional areas, where it can also be found, although not as often, has not been doctrinally examined. Comparative analysis of results of theoretical base and statistical data obtained from the selected sample determines the context where it is possible and recommendable to treat the steel sheet roof cover as authentic when carrying out restoration and reconstruction.

MODEL RESEARCH FOR SHAPING THE OPTIMUM HOUSING INTERIOR FOR A DEFINED USER PROFILE

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ABSTRACT

The housing market in Poland continues to develop. A record number of 222,000 apartments were delivered for use in 2020 (the data includes apartments in multi-family buildings as well as in single-family houses). It is particularly important because despite the continuous increase in the number of completed flats, there is still a significant housing deficit in Poland. Multi-family buildings are mainly built by developer companies. The qualitative research of these apartments shows that their shape, size and functional layout do not fully meet the needs of the users. The vast majority of the old functional patterns, developed in the mid-20th century, are reproduced, which do not correspond to modern dreams of own house, or to the changing social structure. For this reason, an important task for a designer is to search for new, model solutions for housing spaces. Especially those that take into account the dynamics of the changeability of the modern world, allow for more flexible shaping of the internal space, adapt to the changing users and their needs. This feature of residential space is also part of the trend of pro-social and pro-ecological solutions - the ease of transforming the structure, introducing new technical and functional solutions, allows residents to stay satisfactorily in their place of residence for many years. In search of a solution to the issue of a modular residential interior that can undergo internal transformations and adapt to the individual needs of users, the author of the article conducts model research with students of the Faculty of Architecture of the Silesian University of Technology in shaping residential interiors in a model space, including the aspect of artistic creation. For this purpose, the spaces contained within a cube with dimensions of 6 x 6 x 6 m and cuboids: 4.5 x 6 x 9 m and 9 x 6 x 3 m were tested. The technical assumptions for the designed spaces allow for the shaping of multi-family structures from such modules. Diversed, variable systems of functional solutions are tested in each of the proposed model spaces. The functional program includes the basic issues related to the living space - physiological, behavioral, social - enriched with individual needs of the chosen hobby, plant or domestic animals breeding. The research material for the formulation of conclusions and design recommendations for contemporary multi-family buildings is several dozen of analyzed student designs made under the supervision of the author of the paper. The formulated conclusions concern the possibilities and limitations of shaping residential interiors in the assumed model spaces. They allow for deliberations on the direction in which new multi-family housing investments should go in order to reduce social aversion to this type of housing, and to reduce the need for residents to move to suburban areas to single-family houses. The conducted model studies also allow for the determination of certain spatial parameters and making technical and technological recommendations so that the newly designed living spaces meet modern ergonomic requirements without generating losses related to the occurrence of excessive space.

ROLE OF COLORS IN FUNCTIONAL ZONING IN UNIVERSITY STUDY ROOM

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ABSTRACT

The purpose of the research is to study the way multiple activities existing simultaneously in a university study room can be integrated in a space designed according to completely different comfort, construction and materials and study process concept. The article studies the role of colour as an important means for visual differentiation of single-purposed functional zones in a multi-functional common space of university study room. Reasons for updating and reorganizing higher education spaces are discussed. Data from surveys upon activity preferred places in a university study room and upon preferred colour combinations conducted by the team is analyzed and compared with results from similar external researches. Aspects of colour application in university study room in accordance with activity zones are specified and conclusions are made. Practical recommendations are defined.

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ENTRANCE PORTALS AND GATES IN DOWNTOWN LODZ. CLOSURES OR OPENINGS?

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ABSTRACT

Entrance portals and gates are the elements of the city's architectural environment with which we commune on a daily basis, often unknowingly. Now and again, they contain architectural codes that convey to us relevant information about the building or its function. Gates and Portals create an occlusive, orderly space which brings together, and at the same time divides three worlds: the street, the house, and the backyard. This article aims to show that the building entrances not only constitute its closure, but can and often are the carrier of information about the building and their functions or what is in their interior. Therefore, they are also openings to something new, often something interesting, hidden in the nooks of the buildings' architecture. In addition, portals and gates, and especially their doors, are sometimes small works of art that show extraordinary carpentry, woodcarving or metalwork craftsmanship. Others, on the other hand, do not stand out at all, but it are worth looking inside and searching for traces of splendor past and present. The entrance to a building is an important architectural element, which we use involuntarily when crossing the invisible barrier between the inside and the outside, between the private, semi-private and public zones.

RESTORATION OF A HISTORIC BUILDING AND SIMULATION OF THE BEHAVIOR OF INTERNAL INSULATION IN A CASE STUDY OF A PUPPET THEATER IN KOŠICE

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ABSTRACT

Main topic of the article speaks about historic building renovation in Košice. Nowdays, the builidng is in use as puppet theatre. The theatre suffers from various disorders caused by humidity. The envelope of building has been renovated several times, however, over time, the faults return over and over. The article can be divided into three parts. The first one presents the results of moisture analysis of the support wall. The samples from the facade probes were evaluated by gravimetric method. The next step was to detect the presence of salts in the samples. In this section are also suggested remediation measures based on the results of the humidity survey and visual inspection of the building. The second part describes the internal environment where the wall was monitored in contact with the soil. Air temperature, relative humidity, surface temperature at 0.25 m and 2.2 m were measured and marked. The validation of the simulation HAM model of the support wall was possible based on these outputs.The third part of the article discusses the interior insulation of a historic building. Internal insulation is one of the solutions to reduce heat loss of historic buildings. The use of this type of insulation brings risks that affect the thermal-humidity behavior of the perimeter structure. These risks are assessed using a simulation model. In addition to the risks, the thermal properties of various thermal insulation materials suitable for indoor use as well as their impact on the indoor environment were evaluated. Based on the simulation results, we can assess which of the selected insulations is suitable in terms of thermal-humidity behavior of the perimeter structure. The study shows that the initial humidity of the perimeter structure is an important factor for internal insulation. Before applying the internal insulation, it is necessary to examine the moisture and material properties of the masonry. Based on these results, choose the right type of insulation material.

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IMPACT OF EXTERIOR DESIGN ON INTERIOR SUSTAINABILITY

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ABSTRACT

Human beings, in general, spend 90% of their time indoors and the rest in movement from one place to another, leading to a very large amount of time spent indoors which ideally directs us to the most important question if the Indoor Air Quality of the building is good enough for humans to live in? Considering that most people live mostly inside buildings, it imposes a responsibility on all architects and interior designers to construct buildings that prioritize on indoor air quality and develop a trend wherein the building exterior interacts with the building interior and vice versa. Recognition of this interconnectedness of the buildings, people, and community is essential for creating an environmentally responsible built environment. This could only be possible by the inclusion of all stakeholders, like government officials, architects, interior designers, and contractors, who are crucial for a thriving built environment that supports the occupants' health and well-being. There are many design characteristics that are to be fulfilled before labelling a building green and environmentally sustainable. This research in particular focuses on the interconnection between architecture and interior design. The mutualism between green architecture which involves the incorporation of green natural elements into roofs, walls, building facades and also the benefits of incorporating architectural green elements on the indoor air quality and well-being.

PARAMETERS OF SAND-TYRE CHIPS MIXTURE FOR HARDENING SOIL SMALL CONSTITUTIVE MODEL

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ABSTRACT

Hardening Soil model with the small strain extension (HSS) is lately one of the most popular constitutive models to describe soil behaviour. It is versatile – includes the phenomena of shear strength, stress history, dilatancy, volumetric and shear hardening, hyperbolic stress-strain relationship in axial compression, stiffness dependency on stress and its degradation with strain, as well as the regain of the high stiffness after sharp loading reversals. Even though the model is advanced and complex, accordingly to its authors, it is relatively easy to calibrate based on results of standard tests and empirical formulas. In this paper an attempt was undertaken to estimate the parameters of untypical anthropogenic soils – mixtures of sand and scrap tyre rubber in order to build a database for future numerical analyses. A literature review was conducted and, eventually, the material parameters were determined based on results of a series of laboratory tests (cyclic and monotonic triaxial with bender elements, direct shear) published by researchers of Wollongong University of Australia.

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ASSESSMENT OF URBAN UNFILL SOCIO-ECOLOGICAL AND ECONOMIC EFFICIENCY

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ABSTRACT

The purpose of this study is to assess the impact of urban infill on the socio-ecological and economic efficiency of the spatial structure potential. Efficiency is an objective property of any system and its functioning, it is associated with the concepts of benefits, costs and harmful consequences. In urban studies it is associated with the application of spatial potential and change of tangible and intangible values of the environment as a result of architectural and town-planning actions. The efficiency concepts are studied in various academic fields: sociology, economics, ecology, management, etc. The studies are based mainly on economic justifications and methods for the economic assessment of the benefits and harms of the impact of urban planning and economic activities. The software of ecological monitoring, forecasting and modeling of the state of the environment and processes dynamics is substantiated. The components of town-planning activity and decisions concerning their influence on the efficiency of the spatial structure and city potential application are allocated. The system of indicators of decision efficiency includes social (also aesthetic and comfort characteristics), economic and ecological indicators, but considers them separately. The model of five-dimensional space suggested by the authors allows to organize the system of density and efficiency indicators on a common methodological platform. The model includes measurements of "man - functions - conditions - geometry - time" and considers two-, three-, four- and five-dimensional combinations. From the standpoint of the theory of urban planning, socio-ecological-economic efficiency is associated with the space disorder considering time, structure, resource, parameters, and inconsistency of the processes. Each of them is determined by indicators and such characteristics as usefulness, resource consumption, harm to human and the environment, safety, aesthetics, and comfort use of the system. The most effective solutions are characterized by the best interrelation of these characteristics. They are difficult to achieve, so we justify the idea of compromise and the search for socio-ecological and economic optimum. Examples of the impact of infill on the spatial structure of the Lviv city are provided and the effectiveness of urban solutions is assessed, in particular: 1) intensive construction of Poltva valley - the only natural "ventilation" channel of Lviv center located within the Lviv basin, will have negative environmental consequences for the city and its central parts in the future. 2) exacerbation of transport problems due to overcrowding. Experts suggest the idea of Lviv as a city of short distances and the inexpediency of developing a street network. For compact systems, to which the city belongs, this is an objective advantage, which also has negative consequences. Compact systems are deprived of territorial resources. This imposes restrictions and special requirements for territory preservation, including those that are reserved for transport function; 3) increasing spatial chaos due to uncontrolled consolidation of residential areas in the city. The conclusions of this study were drawn as followings. There are no new ideas, principles of organization, and macro characteristics of urban development. There is no systematic housing policy. The composed practice causes not only urban but also social problems and negative consequences for the environment. Requirements and architectural and town-planning decisions, principles of social-ecological-economic efficiency increase due to increase of benefits and reduction of expenses and negative consequences from urban infill in terms of the whole city are proved.

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SITE CHARACTERIZATION AND ASSOCIATED DISPOSAL COSTS FOR ILLEGAL DUMPSITES LOCATED IN THE MUNICIPALITY OF LA GRANJA, CHILE

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ABSTRACT

Chilean Legislation dictates that Municipalities are responsible for household solid waste management, but this doesn't include the clean-up of illegal dumpsites. These in-city dumpsites usually are located on public roads, parks or abandoned sites; have a wide variety of origins, from household trash to business waste, and feature a high component of construction debris. One of the main problems that municipalities have managing these sites is that when they are cleaned, the dumpsites immediately reappear. Therefore, a site survey and visual characterization was performed for these illegal dumpsites at the Municipality of La Granja, and a cost analysis associated with the constant clean-up costs was performed. La Granja Municipality has an established clean-up program with a frequency that varies from one to three withdrawals a week per dumpsite. Santiago is Chile´s capital and is divided into 32 municipalities, the general population of the city is 5.250.565 habitants, according to the 2017 census. La Granja is one of Santiago´s municipalities; according to the last census, it has 116.571 inhabitants and a total of 34.423 households divided into 69 neighbourhoods. The social economical income of the municipality corresponds to a medium low to lower level. The study detected 35 critical sites that were catalogued as recuring dumpsites. The mayor cause of these dumpsites corresponds to illegal dumping of construction waste, mayor appliances and household waste, and only one dumpsite did not present construction debris during the length of the study. The average volume measured in site, for most of the dumpsites varied from 1 to 3 m^3 and only 2 sites exceeded 8 m^3. The most important characteristics of the dumpsites were the ease of accessibility (82,4%), followed by the total lack of public illumination, high vehicular traffic and two or more intersections (67,7%). The equipment and personnel costs were estimated for the clean-up service of the 35 dumpsites. The cost analysis showed that the associated cost of the clean-up corresponds to a 5,8% of the municipal budget for solid waste management. As a result of the study, 4 sites were intervened through the generation of green areas or small parks, with an emphasis in the protection or blocking of the access and roadside.

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ANALYSIS OF VENTILATION EFFICIENCY IN THE EARTH COVERED MAGAZINE FOR AMMUNITION STORAGE USING NUMERICAL SIMULATION

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ABSTRACT

Internal environment parameters such as temperature, relative humidity and air flow velocity in ammunition storage facilities have a significant impact on the condition and overall life of ammunition, especially on the process of ammunition degradation in situations when their values deviate from required standards for safe storage. High temperatures inside the magazine, as well as in the ammunition packaging, can have a very negative effect on the structure of ammunition and explosives, and high values of relative humidity can result in corrosion and rapid decomposition of chemical compounds. Therefore, a properly designed ventilation system should ensure that the values of internal temperature and relative humidity are within the permitted limits, which is a very important aspect of the storage process itself, so that ammunition and explosives can be completely safe and ready for transport, use and handling. Experimental studies conducted in several magazines of ammunition and explosives in Bosnia and Herzegovina (BiH), had aim to monitor changes of environmental parameters such as temperature, relative humidity and air flow velocity. During these experimental measurements, high values of relative humidity in these magazines were observed, as well as uneven air flow in some ventilation ducks. The main cause of such measured values can be related to the inadequate performance of the natural ventilation system of the analysed magazines. Using numerical simulations (finite volume method) in the ANSYS – Fluent program, the analysis of the existing ventilation system of earth covered magazine in BiH from the aspect of air flow velocity was performed, as well as analysis of modifications that can improve air flow within the analysed magazine. The results of numerical simulation for the existing state of analysed magazine corresponded to the results of air flow measurements at certain places in the magazine. It was confirmed that the existing ventilation system does not provide proper ventilation, which further causes higher relative humidity values. The results of numerical simulation for the proposed modifications of the ventilation system have shown significantly better air circulation in the magazine, i.e. that a more efficient natural ventilation was achieved.

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BROKEN RACE – SAFE ARCHITECTURE

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ABSTRACT

In the era of a pandemic, when the race for success, money, all kinds of experiences, crossing broadly understood boundaries was interrupted, we started to become aware of our basic, primal needs, the self-preservation instinct and the will to survive came to the first plan. Architecture- as it is created for people, is to provide shelter and a sense of security - faced a number of (new) challenges. Designing closed and open public spaces, cultural facilities, health care, education, etc., as well as residential ones, requires redefining, especially in terms of functional and spatial program solutions. What will be their scope? What will the main trends be? These are the main questions that have been attempted to answer. The aim is to specify basic solutions that will reduce the sense of threat, break out of suspension and return to action - i.e. they will enable the creation of a safe and functional architecture, effectively corresponding to contemporary needs. The way to ensure social contacts on the one hand and social distance on the other becomes a priority requirement. The question is: Is it even possible? In the era of a pandemic, it is important to realize what we should do, what steps we should take as architects to enable a comfortable life. It becomes necessary to synthesize many factors that make up architecture - coordination of many elements and knowledge from various fields, therefore cooperation in interdisciplinary design teams. In order to raise awareness of local needs, social participation in project processes becomes necessary. These are obvious elements of the integrated design processes that have been known for years. Thus, it seems that the change of the mental approach based on the paradigm of sustainable development and the assumptions of integrated architectural design become an opportunity for the implementation of architectural objects that provide the possibility of social and economic awakening.

APPLICATION OF BIM TOOLS IN PARAMETRIC AND GENERATIVE DESIGN FOR THE CONCEPTION OF COMPLEX STRUCTURES

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ABSTRACT

The present research applies the Parametric Design (PD) and Generative Design (GD) for the generation of complex structures, through the BIM methodology, being implemented in design phase of a new modern proposal for Pavilion J1 of the National University of Engineering from Perú. The research aims to study the PD and DG considering the interoperability provided by BIM tools, propose procedures that help solve PD and DG problems, understand the benefits of process automation through generative and parametric algorithms. The conception and design phase of projects are developed in a traditional way using CAD Softwares for drawing plans or BIM Softwares for the design and/or modeling of structures, carrying out manual tasks either for the extraction of measurements, exchange of information or modeling, this implies a lack of efficiency in many processes because despite having modern computational tools, the full potential they offer is not used. This is reflected in the productivity of the construction sector as it is one of the lowest compared to other sectors such as manufacturing, commerce, agriculture. Due to this problem, new technologies were studied, such as evolutionary algorithms supported by parametric design for the conception and design of structures. Subsequently, as a test, this new methodology was applied to various types of structures, testing the parametric behaviour and understanding the operation of these new methodologies. As a result of the previous tests, key procedures were defined to cover parametric and generative problems, developing algorithms in textual code (Python), visual algorithms and applying generative algorithms (NSGA-II); capable of creating structures automatically adapting to the designer's criteria. Based on the last stage of the PD and GD procedures, the algorithms for the formulation of the structure were implemented in Pavilion J1, demonstrating the applications and benefits in various tasks such as modeling, loads generation, structural design and software interoperability.

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FROM LAYERS OF HISTORY TO A FADING MEMORY

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ABSTRACT

On a plot that was not once, but twice a famous historic restaurant, currently stands a flat, neglected surface unworthy of its former glory days. Cafes and restaurants have always been the essence of social life. Sarajevo has a long history of cafes, dating from the XVI century, the ottoman era. This particular one that will be the subject of research was built with Hotels and Baths in Ilidža (Sarajevo west entrance), with waters springs and natural sulphuric baths, it became a popular and fashionable place from the XIX century. The restaurant that was built was “Cur Restauration”, a hedonistic paradise that complemented the entire area, as a popular tourist destination, mostly for the elite. This restaurant and hotel complex was the place for the Habsburg royals – King Franz I stayed there in 1910, as Bosnia and Herzegovina were a part of the Monarchy. That was the place where the Archduke and successor to throne Franz Ferdinand stayed with his wife Sophia the night before their assassination in Sarajevo that triggered the First world war. The object itself was a romanticized combination of local and alpine region architectural style with elaborate and delicate wooden carvings and details. The structure was classical masonry with wood trusses that were also laced with intricate wood carvings as a part of its architectural expression. In the 1970-ties a new modernist style Restaurant “Kristal” was built on the same spot. Its architecture was an ode to purist modernism, post and beam structural system with large glass-pane windows and cantilevered roof that hovered over a large area, complemented with outdoor terrace, space that floated between interior and exterior. This was an iconic place, from a social and architectural point of view. This structure was destroyed during the war in 1992, and currently it stands empty. This emptiness is an indication that our society at the moment is not able to absorb or evaluate its meaning and importance. We cannot allow a place that was full of life and piece of history be just a faded memory, final layer to be destruction or oblivion. If the site is discussed among professionals and politicians most prefer a facsimile reconstruction of the first restaurant, since the hotel complex still exists. But this approach is simplification and even perhaps a form of décor. This paper will explore how can we articulate this place, is it possible to embody its layers of memory through architectural means? This is a place where memory, heritage and contemporary architecture meet. The answers will be in continuity through function, inclusion, recognition of past, but mostly in creating a structure that will carry the distinction and poetic, seductive features (sometimes overly romanticized notion) of its predecessors.

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SPECIFICS OF MULTI-STOREY WOOD-BASED BUILDINGS

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ABSTRACT

Wood is one of the basic natural renewable materials. Knowledge of its basic properties is the first prerequisite for its proper use in various industries and in human life. Wood is the most versatile and most used material (industry, construction, agriculture, everyday life). Due to its natural character, natural drawing, favorable physical properties, it is an increasingly desirable element of the environment. In the world, but also in our country, the trend of wooden buildings is becoming more and more widespread, not only in the understanding of cottages, wooden houses and family houses using wooden elements. We are talking about office buildings, non-residential premises, but also wooden high-rise buildings. Multi-storey wooden structures are a promising area of application of wood, which requires much less energy for their production compared to other "classic" materials. The aim of this paper is to present selected aspects of multi-storey wood-based buildings and their application at present.

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CONSTRUCTIONS OF BUILDINGS BASED ON SOLID WOODEN ELEMENTS

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ABSTRACT

Wood has excellent physical, technological, aesthetic and utility properties. Thanks to them, wooden buildings are very popular and allow to build economically advantageous and modern wooden buildings with long life and durability and thus a positive impact on the ecological and so-called. clean future. Knowledge of its basic properties is the first prerequisite for its proper use in various industries and in human life. In the world, but also in our country, the trend of wooden buildings is becoming more and more widespread, not only in the understanding of cottages, wooden houses and family houses using wooden elements. Massive prefabricated log buildings are a typical representative of wood-based buildings. Massive log buildings have undergone some development and currently in construction practice, this system for the construction of wooden buildings in various more modern modifications. The aim of this paper is to present selected aspects of traditional but also blue log constructions and their application at present.

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POSSIBILITY OF USING COTTON KNITTED FABRIC WASTE IN CONCRETE

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ABSTRACT

The use of waste and recycled materials in construction industry, especially in concrete production, is becoming increasingly popular. The production of cotton underwear generates a certain amount of knitted fabric waste. This study was conducted to investigate the possibility of using cotton knitted fabric waste (CKFW) in concrete and explore its potential application in the construction industry. The aim of the research is not only to reduce the waste but also to add positive properties to concrete. A total of 4 mixes were prepared for testing purposes. CKFW were cut into small pieces of size about 6-8 cm x 2 cm. The addition of CKFW was a substitute for aggregate and replaced 0, 2.5, 5 and 10% of the total volume of aggregate in the concrete mix to lighten the concrete. All mixes have the same amount of cement, water and superplasticizer. The knitted waste was saturated in water before mixing with other concrete components. The properties of the fresh mix were determined using the slump method. The dynamic modulus of elasticity, flexural strength and compressive strength were tested on 28 days old concrete specimens. The σ-δ diagram is also presented. Specimens with CKFW were found to have better flexural strength and higher ductility but lower compressive strength than the reference concrete mix. The mix with the highest percentage of CKFW reduced the compressive strength by 28%, while the specimens with lower percentage of CKFW increased the flexural strength by 20% with respect to the reference mix. The capacity to capillary water absorption of concrete is closely related to its durability. The water absorption by capillarity was measured after 2, 4, 8, 15, 30, 45, 60 min, and 4 and 24 h. The increase in the amount of water absorbed was found to be higher than that of the reference mix. The increase in the amount of water absorbed was related to the percentage increase in the knitted waste and the values obtained ranged from 3.3 to 5.6% by mass of the dry sample. The greatest reduction in concrete density was 3.8% relative to the reference mix. Based on the obtained results, recommendations for further tests are given.

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DESIGN PROCESS AS A TOOL TO IMPROVE HEALTH AND WELLBEING

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ABSTRACT

The paper analyses innovative methods of designing a public interior, especially administrative interiors. Our research focuses on the concepts of ecological and dynamic multisensory designing approach with the optimization of physiological functions. Stimulating and healthy interior architecture is created mostly by participatory solutions of clients, architects and experts in the social sciences (sociology, psychology). This paper therefore also analyses collaboration and communication process among creative groups involved in the designing process. The interior is the kind of space in which the user spends the most time on average. Therefore, the active communication process with the client or group of clients in the stage of designing is crucial. For designers themselves, an active understanding of the versatile demands of users and a comprehensive understanding of the processes taking place in the proposed interiors becomes a decisive moment. The pandemic changes the way we act. Interior scale has always played one of the strategic roles in the search for mental balance, finding feelings of happiness, satisfaction and the support of the so-called facilitation. The study provides several perspectives in the context of the topic. Attention is primarily focused to open office concepts that are undergoing changes due to the pandemic situation. In our paper, the results of research carried out within the KEGA project schemes, realized at the Faculty of Architecture and Design - Institute of Interior and Exhibition Design in Bratislava, will be partially interpreted.

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ANALYSIS ON THE OPTIMAL DAMPER QUANTITY OF ENERGY DISSIPATION STRUCTURE

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ABSTRACT

In practical application, the design of energy dissipation usually adopts the concept design, in which the structural setting damper quantity is used to estimate after repeated calculation, while there is no quantitative analysis of energy dissipation structure. This paper proposed two analysis methods to reach the damper quantity of energy dissipation structure. One is the multiple-yield-strength method, and the other is the damping-performance-curve method. Both of them can calculate the optimal damping quantity of the structure which is added metal dampers. The multiple-yield-strength method means that the yield strength of the metal damper is set by the multiple of the yield strength of the original structure. The optimal damper quantity of metal dampers can be analyzed by time history analysis. The damping-performance-curve method means that the target story displacement is be set of the original structure. According to the relationship between the target displacement and the shear force in the damping-performance-curve, the stiffness of the original structure to achieve the target inter story displacement angle is derived, the stiffness is taken as the optimal damping of the metal damper. The optimal damping quantity is added to the original structure for comparative study which is calculated by the two methods. Both of them have reference value, and it could be beneficial for the promotion of energy dissipation.

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HISTORICAL PRESERVATION IN GLOBALIZING NANJING: THE CASE STUDY OF LAOMENDONG, NANJING, CHINA

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ABSTRACT

China provides a unique context to explore urban heritage within the current trend of globalization. In 2014, the Youth Olympic Games held in Nanjing, the impact of the Olympics is not only limited to improving urban branding, but also as a main driven force of urban transformation. This paper examines the role of historical buildings in reshaping the new space of post-industry cities. Focusing on heritage space through a detailed case study of Laomendong, a historical feature area located in the inner city of Nanjing, which attracted consumers and tourists with its historical buildings and culture. Historically, it is the main area connecting the inner city and city wall of imperial Nanjing. During the Ming-Qing period, Laomendong was a booming area, as residents and commercial activities were located here. After reconstruction, the dilapidated historical area has turned into a chic entertainment quarter which was operated by developer and architecture, with supported by the government. This paper argues that the historical preservation in contemporary Nanjing serves the same goal of urban development, and in urban transformation process, how the historical buildings in built environment are selected and inserted in the newly built space.

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EXPERIMENTAL STUDY FOR THE ANALYSIS OF THE POTENTIAL ENERGY CONVERSION OF WASTEWATER DISCHARGED FROM INSTALLATIONS AND EQUIPMENT'S OF THE CIVIL AND INDUSTRIAL BUILDINGS

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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. The article explores the conversion of potential energy from wastewater of the technological processes, into electricity. The study was performed on an experimental stand designed to be connected to the drainage system of a water-to-water heat pump. The efficiency of potential energy conversion for applicability to wastewater discharging systems of equipping civil and industrial buildings was analysed.

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MATHEMATICAL MODELLING AND OPERATION SIMULATION OF THE INDIRECT CONNECTION SCHEME OF THE HEATING INSTALLATION AND OF THE CONSUMPTION HOT WATER PREPARATION IN AN ACCUMULATING STAGE

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ABSTRACT

This paper presents the mathematical model and simulation of a thermal system for heating and supplying hot water to industrial or residential consumers consisting of a heat exchanger on the heating circuit and a heat exchanger provided with an accumulation tank on the domestic hot water circuit, this scheme is generally adopted in the industrial thermal points and increasingly in module-type thermal points for residential consumers. The mathematical model is based on the mathematical equations describing this system and developed using the Matlab-Simulink program. Thus, as a result of the simulations, we can see the evolutions in time of the water temperatures on the heating circuit and the domestic hot water circuit, as well as the quantity of heat delivered by them.

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LEAKS, PIPE BREAKS, AND PREVENTIVE MAINTENANCE

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ABSTRACT

A better understanding of leak related effects has implications for pipe rehabilitation, system economics, customer disruption, and environmental sustainability. Reducing leakage be a result of a well-suited preventive maintenance program. The purpose of this study is to inspect approximately 10% of the runouts (branch pipes) between the plumbing fixtures and the risers to estimate the extent of serious corrosion of the runouts that may cause leaks in the future. For collecting the site data for our study we visited the building and investigated piping through 57 different access openings in 31 randomly selected apartments. These apartments were selected to allow observation of a variety of risers at varying elevations. We observed in about 20% of the runouts inspected, the remaining thickness of the steel pipe was less than 60% in the areas that we could access. The runouts are in danger of developing leaks. Because of the high potential cost of leaks and the possibility of that 20%, or 120 pipes, could leak soon, recommend replacement of all the runouts. System performance can only be reliably characterized through monitoring and analysis of relevant data. Performance monitoring is concerned with measuring system efficiency and to what extent the system is delivering the parameters what it was designed for (i.e., flow, pressure, energy, water quality, etc.).

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SIMPLE LAMINATED GLASS PANELS WITH EMBEDDED POINT CONNECTION UNDER A SHORT-TERM SURFACE LOAD

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ABSTRACT

Glass is a very attractive material for contemporary architecture. The trend is to achieve a maximum transparency of structures; therefore it becomes common to use glass as a material for load-bearing structural elements. Glass facades, roofs, beams or columns are widely used in buildings. The problematic part of a glass structure design is a connection between the glass itself or between the glass elements and substructures from another material (e.g. steel, concrete etc.). The connection must be capable of bearing the stresses performing during the lifetime period and it should be as unobtrusive as possible at the same time. The ongoing research at the Faculty of Civil Engineering of the Czech Technical University in Prague is focused on an embedded laminated point connection for glass structures. Within this research, the real-scale glass panels were tested. The samples consisted of two glass plies bonded together with the EVA foil. For the undrilled ply, the float glass was used in all cases. The thermally toughened or the heat strengthened glass was used for the previously drilled ply. There was one embedded steel countersunk bolt with HDPE liners placed in each corner of the sample. During the experiment, the samples were vertically placed using the embedded bolts. The surface load-bearing capacity was tested. The load was applied in several loading and unloading cycles until the collapse of the first embedded connection. If the glass panel failed before the connection, the sample was completely unloaded and then the load was gradually increasing until the collapse of the connection. Vertical deflection and the stresses in two different points were measured during the whole time. The humidity and the temperature were also monitored. The experiment showed the way of collapse and a short-term surface load resistance of a laminated glass panel with four embedded point connections.

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CONSTRUCTION WASTE PRODUCTION IN MACROECONOMIC CONTEXT

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ABSTRACT

This article aims at presenting the economic impacts of implementing the basic principles of construction demolition waste management in terms of saving construction costs. Emphasis is placed on fulfilling the 3R principle, i.e. reducing waste, reusing it, and recycling resources and products. Construction and demolition waste represents the largest mass waste flow in the EU, e.g. in 2018, it represented 36% of the total waste production in the whole EU-27. The European Union is gradually introducing measures to reduce the production of construction waste compared to the Czech Republic, where the share of construction demolition waste on the total production was up to 42% in 2018. This value exceeds the EU-27 average. The article analyses available statistical data from the national CZSO and the European statistical office EUROSTAT on the waste production classified according to EWC-STAT, which is a classification of waste according to Directive No. 2150/2002. Items monitoring the waste produced by the construction industry are listed on the 41st to 43rd place of the EWC-STAT list of all monitored waste. The data obtained allows comparing three branches of construction production, the 41st Building construction, 42nd Civil engineering, and 43rd Specialized construction activities. Another possibility to obtain data is to use a division according to the waste producer economic activity (CZ NACE). The data obtained in this way is compared with the performance indicators of the national economy. By comparing the size of the construction demolition waste production with the performance of the national economy (especially the GDP indicator), the degree of their interdependence is determined. The aim of the analysis is to assess the relation between the country's economic performance and the production of construction and demolition waste. The next step is to perform an analysis from the point of view of the 3R principle in order to examine the impact of measures to reduce the construction demolition waste production in connection with the already initiated processes of its possible recycling or reuse.

SIGNIFICANCE OF ADHESION THEORIES IN AREA OF FLEXIBLE BONDED STRUCTURAL JOINTS IN CONSTRUCTION SECTOR

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ABSTRACT

The issue of bonding has been a part of humanity throughout its history. The greatest development in this area occurred in the second half of the 20th century and the issue of bonding has gained a lot of interest from the scientific community. Over the past 80 years, there has been a significant increase in scientific research and grants aimed at defining adhesion. We now know that examining the adhesion of materials, determining the adhesive properties or simply evaluating the test results and assessing the failure of the test specimens is not possible without understanding the basic principles and theories of bonding, i.e., adhesive joining. The presented paper is focused on the description of fundamental adhesion theories and their usage in the field of structural bonding in construction industry. The importance of understanding to adhesive properties of used products is demonstrated on an example of four different surfaces in combination with representatives of high strength flexible adhesive systems intended for façade applications. Representatives with high surface polarity, medium-high polarity and low polarity were deliberately selected. The one-way ANOVA was performed to analyse the impact of surface adhesive properties on adhesion of bonded joints. It was confirmed that the riskiest is bonding of polymer-based materials. For all selected materials it was concluded that the hypotheses of the adsorption theory, which, to some extent, also includes the assumptions of other adhesive theories, seem to be the most fundamental for the presented researched area.

ARCHITECTURAL VALORIZATION: LIGHTING DESIGN SOLUTION FOR THE BELL TOWER OF "SAN PASQUALE A CHIAIA" CHURCH

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ABSTRACT

Christian churches and their bell towers represent a big part of the historical architectural heritage in Italy, and they had a major role in the development of the urban and social fabric of the Italian cities. During the centuries, several renovations have been carried out, according to the sensibilities and the architectural theories of the times. Nowadays, as the urban scenarios continue to evolve and the churches' surroundings keep changing, the role of the churches' exterior becomes even more important than in the past, as the only formal manifestation of the monument in the urban context. Also, in most cases, the renovations, which occurred through the centuries, included lighting systems on the façades and the bell towers, but most of the times, without a real project designed to valorise the formal characteristics of the architectures. Therefore, this study is focused on the design of a lighting renovation for the bell tower of "San Pasquale a Chiaia" (Napoli, south of Italy). The lighting refurbishment is designed with the aim of: (i) emphasizing the architecture of the bell tower facades and (ii) providing a figurative and emotional role to the whole building. The research activity started with the analysis of architectural and surface features of the bell tower façade, as well as the existing lighting system. In order to define the best design solution, a virtual model of the bell tower has been developed in the simulation software DIALuxEvo. Also, several lighting scenarios have been implemented, in order to compare the different luminaires types and arrangements on the basis of the effectiveness in valorising the architectural characteristics of the bell tower, as well as the energy performances of the different design solutions. Finally, the best case has been further implemented, considering different lights scenarios upon varying the (i) period of the year (Christian holidays), (ii) the day of the week (weekdays or weekend) and (iii) moment of the day (dusk, night and dawn), in order to take into account the different needs of the historical building as well as the enhancement of the surrounding urban spaces.

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LIGHTING SOLUTIONS TO IMPROVE THE VALORISATION AND FRUITION OF PARQUE DEL RETIRO IN MADRID

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ABSTRACT

Urban green areas are an essential component of cities, able to affect the users and the city's appearance. In particular, parks help increase the quality of life, affecting workers and citizens positively from both psychological and physical points of view. Artificial lighting can improve the appeal and fruition of parks as well as encourage citizens to use the parks as long as possible at night. This research concerns the Retiro Park, located in the historical centre of the city of Madrid (Spain). The Park dates back to 1692 with its primary function of the Royal Palace Garden. The Spanish dynasties monarchies modified and expanded it with many new areas appointed to different purposes. During the Spanish War of Independence, the Park was badly damaged and almost completely destroyed since it was used as the Napoleonic troops' headquarters. Later, King Fernando VII proposed to rebuild the destroyed elements and to introduce new buildings to bring back the value of the Park. The main objective of this paper is to suggest a lighting retrofit able to valorise the Retiro Park and improve its fruition during the night. With this aim, a virtual model of the Park was built into the simulation software DIALux evo. Different types of luminaires were used for each specific zone of the Retiro Park: (i) Puerta de Espana, (ii) the Paseo de las estatuas de Reyes and (iii) the minor paths. Particular attention was given to the quality of the light as well as the visual comfort of the visitors. Finally, the different lighting scenarios were compared from the visual and energy points of view so as to identify the best design solution. The results highlight that the best lighting design refurbishment solution allows improving both the usability and valorisation of the Retiro Park as well as to optimise the energy consumption.

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DESPIĆ HOUSE - HISTORY OF THE CITY: STRUCTURAL REPAIR AND RESTORATION OF THE FIRST THEATRE IN SARAJEVO

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ABSTRACT

The development of modern society is conditioned by the accelerated pace of development of technological awareness. Our urban environment is increasingly exposed to radical transformations, leaving no room for perception and adoption of the new, almost excluding the feeling of belonging to the transformed environment. Such changes, caused by the expansion of construction activity, often violate the ambient and original values, in the transformed environments of "captured" cultural and historical heritage. Objects of cultural and historical heritage possess historical, artistic and aesthetic value, readability in all their historical changes and the symbolic value of the tradition of the society to which they belong. Preservation of spiritual, formal and traditional originality, with all the technical characteristics they carry with them, emphasizing the uniqueness and representativeness of heritage in a modern environment, is an imperative in preserving one's own identity. The constructive characteristics of the historical heritage building were dictated by the degree of technical knowledge, experience and intuitiveness of the builders of that time. The specificity of structural systems and construction techniques have a direct impact on the architectural character of buildings, and thus the approach to structural repair, considering the problem exclusively from the point of view of structure and application of modern methods of numerical analysis and technology, can be a cause of disavowal of these buildings. Thus, questions arise: How sovereign are new knowledge and methods over the old, or is it necessary to awaken the intuitiveness of today's builders? How to achieve compatibility of old and new, where necessary? In this paper, the case study of a specific sample of the cultural and historical heritage of Despić House will provide answers to the questions asked. Despić House, where the first theatre in Sarajevo was founded, is one of the few material evidences of life in the city at the turning point of the Ottoman and Austro-Hungarian periods. Atypical in relation to the local way of building, it is a unique example of a combination of the traditional heritage of the Ottoman period and the " *breakthrough of European creativity into the culture of this area*". This paper presents a complex research process of establishing the genesis of the Despić House, as well as the consequences of the influence of urban transformations in the spatial framework at the level of the architectural object and the level of the urban-architectural ensemble. On the example of established and implemented measures of structural repair of this building, the importance of a multidisciplinary approach to detailed research and conservation-restoration works for cultural and historical heritage buildings will be confirmed, taking into account its original values.

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LOOKING FOR THE FUSION OF CULTURAL ENVIRONMENT AND MODERNITY IN A CITYSCAPE. WESTERN GATE IN JELGAVA

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ABSTRACT

The research is based on the examination of the cityscape transformation processes and a search for the fusion of the cultural and historical space and the trends of contemporary modernism in architecture.
Over the last three centuries, Jelgava (Mitau), the capital of the former Dutchy of Courland, has changed the height, the density and the structure of its building. The process of transformation was determined by crisis situations in the state, by rapid growth of the trade and domestic economy, as well as by the period of state independence and downfall of the national economy. Splendour and misery of the city has raised and destroyed houses, parks and churches in Jelgava.The historical map of the city originates in the beginning of the 18th century on the left bank of the Lielupe River with a linear building canvas formed by small wooden houses and a net of dirt roads. During the 19th-20th centuries, the city is developing radially around the ancient central built-up area, sketching the structure of the city map based on the network of the trading routes: the Western gate – Dobele, the Northern gate – sea, the Southern gate – Lithuania. The East is a crossing point to reach Jelgava Palace. The direction to Riga led along the river, as the eastern part was a marshland. The research provides a detailed examination of the territory of the Western gate starting from 1804, when typical medieval dykes around cities were destroyed and protection channels were buried during the existence of the Dutchy of Courland. Jelgava experienced new development in the western direction behind the channel connecting Svete and Driksa rivers. During the 20s-30s of the 20th century, this territory was filled with gardens and elegant wooden summer houses, occupying about 200-300 m wide line along the channel up to the Svete River. In the 70s of the 20th century, a new building circle appears westwards in 500 m from the channel – a mixed-use development consisting of residential buildings, a school, kindergartens. Certain industrial territories are also preserved – car repair areas, warehouses, a nursery garden, roadbuilding and manufacturing areas etc. In the 20s of the 20th century, a one more building circle appears in the Western gate area, which is connected with the ring road, linking the northern and the southern bridges of the city. Based on the results of examination of historical data and materials, the research analyses the urban environment of the city in terms of its transformational processes. Considering the trends of development of contemporary modernism in architecture, a conceptual solution has been elaborated during the process of the research. The aim of the research: to identify the processes of transformation of the urban environment and to provide the architectonical spatial solutions for the territory of the Western gate in Jelgava city.

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POCKET PARKS CHARACTERISTICS FOR ENHANCING SOCIAL-LEARNING ACTIVITIES IN MALAYSIAN PUBLIC UNIVERSITIES

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ABSTRACT

Recently, small nearby outdoor spaces have become an important tool to improve academic outcomes by enhancing students' social and learning activities. However, nearby open spaces of Malaysian public universities lack the promotion of social interaction and informal learning activities that affect the learning experience, especially in the outdoor spaces. Therefore, there is a need to enhance students' social and learning activities on campus grounds to improve the learning outcomes in Malaysian public universities. This study aims to identify the characteristics of outdoor nearby spaces in the Malaysian public universities to promote students' social and learning outcomes; this is in line with the Twelfth Malaysia Plan for 2021-2025. This study employed a questionnaire survey conducted in three public Malaysian universities, including Universiti Malaya (UM), Universiti Putra Malaysia (UPM), and Universiti Kebangsaan Malaysia (UKM), to assess the attitude of 401 students toward the pocket park model proposed to enhance on-campus activities. The results confirmed the need for successful pocket parks to be provided, with specific characteristics to promote outdoor social and learning activities in the Malaysian public universities for better academic outcomes. These characteristics include elements and activities, shade, sociability, proximity, facilities, participation, and environmental factors. This study contributes to integrating pocket parks in social-learning activities to improve the academic learning outcomes in the Malaysian public universities. The study is useful in providing a reference for academic administration, policymakers, landscape, urban planners, and researchers in this field to create liveable, educational, and socially responsive campuses.

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THE RULE OF FRAGMENT IN REDEFINITION OF HISTORICAL SETTLEMENT: THE CASE OF LVIV

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ABSTRACT

In the last decades, preservation has become an unrestrained impulse all over Europe. What would matter in this context is a continuity of narrative, form, physical medium. However, due to the major paradigm of preservation, exclusionary consideration of selected materiality results in the gentrification of heritage sights, which value often converted into an exchangeable commodity. While selected segregated fragments perform as agents of the culture of consumerism, the areas out of the consideration undergo uncertainties of fluid practices. That leads to irreplaceable reorganisation of a dynamic entity, results in discontinuity of urban present, of what it is and what it was. In this context, the city of Lviv is a paradigmatic case of a gentrified urban landscape. The city became the cultural and touristic centre of Ukraine after the nomination of its core (Old Town) as a world heritage site. However, the identification of defined parts as valuable structure separated from the surrounding context has negative consequences for the resilience of urban layout. Firstly, this study intends to identify the expressions and consequences of gentrification policies in a historical urban context and its duality. Therefore, it brings as a case study the discontinuous urban narrative of Lviv's former Jewish community with two urban fragments of rich historical background presented as polarities. The settlement within preserved Old Town poses a problem of commodified history, while former Zhovkivske neighbourhood outside the edge of preserved area is a crosspoint of destruction and safeguarding awaiting the recreation. Secondly, based on such analytical regard, the study proposes potentiality for connections originating from the historical traces, to recreate links between historical urban fragments. It makes it possible to read a city as a combination of systems interrelated by unique narratives. Finally, a methodology based on this critical approach aimed at outlining a possibility for the urban regeneration process, that not necessarily lie in the formal production of architecture but can be expressed as configurations anticipating future morphologies by reconstructing the urban layout as a resilient organism.

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ASPECTS OF REVERSIBILITY AND ENERGY EFFICIENCY OF PREFABRICATED STRAW STRUCTURES – GUIDELINES FOR SUSTAINABLE DESIGN OF ARCHITECTURAL INTERVENTIONS OF 21ST CENTURY

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ABSTRACT

The architectural space of the 21st century confirms, for the umpteenth time that, architecture is a personified image of society: The products of architectural interventions are the final creations in time and space. The whims of the market, the linear economy model, and users' pluralistic needs generated by cultural preferences mutually develop "white elephants" - inert material, useless and expensive to deconstruct. In response to social, environmental, climate, and economic changes, the construction sector needs to revalue existing construction techniques. The lack of broader application of the circular economy model, the use of inorganic materials and chemical bonds in architectural structures, due to the loss of cultural significance or the appearance of natural disasters, are deprived of their function and produce a large amount of waste. Therefore, the reuse of organic materials derived from renewable energy sources is becoming essential for pushing further the boundaries of reversible design and energy efficiency in architectural interventions. Limits of use of the old – new materials - compressed straw are defined by comparing the results of thermal properties of the building envelope elements - U and R values and levels of reversibility through two opposite approaches to construction, on the example of the conceptual design of a housing unit affected by natural disasters. Analyzing the three levels of reversibility that 21st-century buildings should possess, given the existing research, the material level limit is shifted in terms of returning to nature with potentially zero environmental waste. Comparing the results of the R values of prefabricated straw structures with the R values of materials predominantly used in architectural interventions raises awareness of the importance and benefits of using compressed straw in architectural envelopes. Existing design parameters of straw structures are optimized by valorizing the importance of local climate and materials used. The interaction of native - cellulosic materials breaks down dogmas related to this material and generates the architectural language of reversible and energy-efficient architectural straw products.

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MOBILITY AS CRUCIAL FACTOR OF SPATIAL DEVELOPMENT IN FUNCTION URBAN AREAS – CASE STUDY OF KOSICE REGION

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ABSTRACT

The majority of the population of Slovakia - 53.35% live in 141 cities, with a density of 398.27 inhabitants / km2. which, however, occupy an area of only 14.9% of the total territory of the republic. In 2749 villages occupying 85.1% of its territory, 46.65% of the population lives at a density of 60.98 inhabitants / km2. In the last century, there was a significant migration of the village population in Slovakia to work in the cities. In the Slovak Republic, there are 325.8 dwellings per 1000 inhabitants, this indicator in the original states of the European Union ranges from 390 to 500 dwellings per 1000 inhabitants. The current shortage of flats in Slovakia has also become a political agenda, the current government has to build 25,000 flats a year in the program. The biggest obstacle to the housing construction program is the lack of suitable building plots. It is not possible to find enough plots only in the territory of cities, it will be necessary to organically involve municipalities in the vicinity – I functional urban areas of economically prosperous cities/regional centres in the preparation of suitable building plots and related infrastructure. The development of municipalities so far, as well as the preparation of building plots for housing construction, which relies on the "market will solve it" model, has not proved successful. Developers in the pursuit of financial profit have focused on the production of as many apartments as possible in the vicinity of economically prosperous cities without building the necessary infrastructure. Thus, new "Satellite Cities" were created, with a deficient transport connection to the dominant city. Based on the research made, we concluded that living in a village for workers working in the city requires quick transport between home and work. So effective mobility is a priority but also a necessary condition for young families to decide where to live. Article summarizing research dealing with the challenge mentioned above and offer a case study from Slovakia especially from FUA of regional centre Košice. Case study including the proposal for the mobility model for specific villages in FUA of Košice.

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COOPERATION OF THE CITY MANAGEMENT WITH THE PUBLIC AND PRIVATE SECTOR IN RELATION TO THE IMPLEMENTATION OF CLIMATE MITIGATION AND ADAPTATION MEASURES

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ABSTRACT

The development of urban settlements and the quality of their spaces are related to wide range of different factors, where the basis is natural capital, its components and the benefits provided from them in the form of ecosystem services. The greenery in the city significantly affects the effects of climate change. Green areas are increasing in Slovakia but the cities still do not fully exploit the potential of micro-regulatory ecosystem services. We need to focus more on reducing heat islands, dust, noise, or impacts of weather changes. The impact of greenery in cities has a positive effect on the lives of the inhabitants and urban temperature islands have a negative impact on the health of the people who live in them. The effect of temperature islands can be significantly influenced by "green buildings". We can therefore consider climate change and its negative effects to be one of the greatest threats to stability and prosperity, and it is rightly expected that the urban environment will be threatened to an even greater extent. Reducing greenhouse gas emissions is essential to ensure quality of life in the future. Thus, our settlements should not only urgently proceed to a significant reduction in greenhouse gas emissions, but also systematically prepare for the expected negative effects of climate change. Mitigation of the negative impacts of climate change is vitally important for our cities. Effective measures reducing greenhouse gas emissions (transition to renewable energy sources, changes in land use, changes in the transport system, increased energy efficiency of buildings or sustainable waste management solutions) are the fundamental topics in this field. The second step of adaptation to climate change includes vulnerability assessments, potential risks in all key areas and measures proposed to reduce the city's vulnerability. Main purpose of this paper is to entirely analyse process of cooperation of the city management with the public and private sector in relation to the implementation of mitigation and adaptation climate measures. Concluding, we are providing proposed and implemented measures and activities in the field of reducing greenhouse gas emissions and their practical demonstrations in the city of Bratislava.

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POSITIVE ENERGY DISTRICT REPLICATION – CASE STUDY OF THE CITY OF TRENCIN, SLOVAKIA

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ABSTRACT

Energy efficiency has been of the key topics for urban planning for the past few years in relation to sustainable development, resilience as well as climate change. There are many technological approaches aiming at efficient use of energy, innovative technologies and renewable sources of energy, but what is often missing is its relation to spatial planning and planning system and documentation. Horizon 2020 project Making City is striving to promote Positive Energy District (PED) planning and methodology aiming at development of new integrated strategies to address the urban energy system transformation towards low carbon cities, with the PED approach as the core of the urban energy transition pathway. It is implemented on the level of cities and city districts, having two types of areas – two lighthouse cities and six follower cities. The city of Trencin (Slovakia) is one of the follower cities where multiple urban areas have been selected to replicate the PED concept developed by the project consortium. Trencin is the eight largest city is Slovakia with a rich manufacturing history in textile and arms industry. It is currently focusing on diversified its economic activities in the sectors of tourism, innovation, culture and industry. The PED replication will involve a broader city centre area including multiple municipal buildings (schools and sports infrastructures) and residential buildings (individual housing and apartments). The following paper describes the key notions from the PED concept providing a holistic approach on harmonizing energy and urban planning for energy. It evolved from single, unintegrated, simple “building” based interventions into PED concepts looking forward to reaching energy and climate targets which will lead to an integrated energy planning. The paper further explores this PED approach in the city of Trencin, including the challenges it had to overcome during the implementation, as well as perspectives for its future development. The aim of the project further on is to create a standardized concept ready to be the core of specific urban energy transitions planning processes.

Corresponding Author: Milan Husar

EXPERT INSIGHT INTO THE SPATIAL ASPECTS AND CHALLENGES FACING METROPOLITAN REGIONS IN CENTRAL EUROPE – CASE STUDY BRATISLAVA REGION

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ABSTRACT

Territorial development of metropolitan regions is well described and captured in several international documents, strategies and policies. As follows from the analysis of international and national programming documents there is a pending requirement of sustainable development as the basis of any concepts of development of cities, urban agglomerations and regions. Although there are several sub-concepts in the world, these are basically framed by four core concepts, two of which are more focused on spatial organization and two on the life processes of socio-ecosystems of cities. These four following concepts: Smart City, Eco / Green City, Compact City, and Polycentric City are described in the New Leipzig Charter – The transformative power of cities for the common good. Currently, there is no consensus in defining and defining the criteria for metropolitan regions that would reflect the diversity and real situation in metropolitan regions across EU Member States. Even the OECD favours the definition of a metropolitan region not as an administrative unit but as a nodal territory. In addition, the definition of metropolitan regions clashes with the fuzzy nature of their borders, which change over time and in relation to the aspects of their identification. Paper handles the issue of metropolitan regions in Central Europe with the focus on Bratislava metropolitan region. The aim of the paper is identifying and describing crucial trends and challenges derived based on global megatrends but also local specifics and processes settled within the Bratislava region and framed principles and bases for future sustainable development of the region until 2050. Within the broader relations, it is necessary to take into account the development in the functional urban area of the Bratislava-Vienna agglomeration, the so-called core territory, which also extends to the neighbouring self-governing regions (Nitra and Trnava), the federal states of Burgendland, Niederoesterreich and Vienna and the county of Gyor-Moson-Sopron in Hungary. The outcome of the case study defines trends and their projection for the future territorial development of the Bratislava region based on thematic analysis of economy, social ecology, socio-cultural and environmental, transport, housing, services, social infrastructure, technical infrastructure and energy.

Corresponding Author: Ľubomír Jamečný

STUDY ON THERMAL COMFORT IN INDUSTRIAL BUILDINGS, HEATED BY RADIATION

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ABSTRACT

This paper is focused on a study between different heating systems commonly used in industrial installations. Industrial heating systems generally raise difficult problems in choosing the most economical system. If several solutions technically meet the requirements of the indoor climate, in terms of energy efficiency we must focus on the optimal solution. The study was conducted to choose the optimal heating solution for an industrial hall, from the point of view of evaluating the efficiency of the installation of an exhaust gas recirculation equipment. The heating of industrial premises generally raises difficult problems due to the diversity of the types of buildings encountered, the variety of activities carried out and the need to choose the most economical system, both in terms of investment and operation. The radiation heating system using natural gas offers the solution of this problem, in situations where the classic heating systems (hot air heating or static bodies) cannot ensure optimal indoor conditions (in the sense that they do not achieve a relatively uniform temperature in the heated space, cause drafts and have low yields). For spaces with a high height (over 4m) these systems can only be considered satisfactory in the case of general heating with very high energy consumption. From the study performed, but also from the specialized technical literature, it is concluded that these systems offer an energy saving, compared to the classical systems.

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BUILDING ENGINEERING IN MOUNTAIN REGION OF PODHALE – RELATIONS BETWEEN FOLK ART AND ARCHITECTURE

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ABSTRACT

Architecture issues in the mountain region, designs created over the ages, starting with the traditional wooden architecture are a very interesting subject for the research. Extremely difficult, but at the same time very intriguing for the contemporary architecture designers, is the Podhale Region. The architecture of Podhale Region referred to the traditional patterns what preserved functional, constructional, material and ornamental continuity. The content of the article shows relations between traditional wooden buildings and the contemporary architecture of Podhale Region. Special attention is paid to the characteristic elements, that come from folk art, and their connection to the regional style, which is independent from historical styles. In modern architectural projects we can also notice the natural visual cohesion being the result of applying native colors in the building design. The aim of this article is to answer the following question asked by the author: if at the designing stage of the buildings in the Podhale Region we shall aim at preserving the canons created over the centuries or the tradition which is directly coming from the Witkiewicz's timeless values, so that the Region will not lose its identity and tradition continuity, which is nowadays one of the signals for our civilization crisis.

SOCIO-ECONOMIC IMPACTS OF LARGE CONSTRUCTION PROJECTS IN URBAN DEVELOPMENT

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ABSTRACT

The article focuses on the socio-economic impacts of large urban development projects in cities. In Czech cities as well as in large cities around the world, there is a huge pressure to transform both previously unused areas ("greenfields") and areas that no longer serve their original purpose and are inefficiently used ("brownfields") to a new functional purpose. As a result, representatives of the public administration face a very difficult decision on how to use these areas so that they can be changed in the current zoning plan. The resulting decision have to be explained to the public in such a way that the public feels the decision meets the public needs and interests. Decision-makers need valid and accurate inputs to make the right decision. Therefore, it is necessary to clearly define and describe the procedure for assessing the benefits of these important revitalization or regeneration projects for the various segments of public. Only a small part of the impacts of urban development projects is of a purely financial nature. Therefore, indicated process of evaluation uses modelling of socio-economic impacts, which are financially evaluated, and the decision-makers are therefore allowed to compare most valid impacts with the initial investment costs necessary to convert the territory to new functional use. The research sample consists of important urban development projects in the largest cities in the Czech Republic. Most of these projects consist of territorial study, which was established as the main source of relevant information for these analyses. The outputs of the article follow the previous research of the authors, in which they defined 3 basic variables - Incremental capacity of jobs, Incremental capacity of the population and Incremental capacity of visitors, which are carriers of following socio-economic impacts of the projects in the territory. The research article contains a list of socio-economic impacts defined on the basis of incremental capacities.

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MATHEMATICAL MODELING OF PROCESSES IN APPARATUS WITH FLOWING THREE-DIMENSIONAL ELECTRODES FOR CALCULATION OF GALVANIC WASTE WATER PURIFICATION MODES

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ABSTRACT

The ecology of the urban environment significantly depends on the intensity and toxicity of industrial and other wastewater discharges, both within the city limits and in the areas adjacent to the city. This paper discusses advanced technologies for wastewater treatment from heavy and non-ferrous metal ions in industrial and small enterprises of urban agglomerations. An analysis of the efficiency of using flow-through three-dimensional electrodes for wastewater treatment from harmful reagents is presented. The use of mathematical modeling allows calculating and predicting the results of the technological process, as well as optimizing the process by calculating the effective values of the control parameters, in particular, calculating the modes of treatment of galvanic wastewater from heavy and non-ferrous metals in devices with three-dimensional flow electrodes. The given mathematical models of electrochemical processes in three-dimensional flow electrodes in relation to the extraction of metals from solutions of galvanochemical production allow us to conduct computational experiments. For this purpose, a set of programs has been developed that allows calculating the parameters of the electrochemical process of metal deposition from electrolyte solutions on three-dimensional flow electrodes. The input data for the calculation are the parameters of the deposited component (ion valence, diffusion coefficient), the ion concentration of the deposited component in the solution, the flow rate of the solution, the mass transfer coefficient, the electrical conductivity of the solid and liquid phases of the electrode – solution system, the overall current density, the electrode parameters (porosity, fiber radius, electrode thickness), the electrolysis time. The results of the calculation are: the concentration of metal ions (calculation can be carried out for one or two metal ions contained in the solution), the distribution through the thickness (volume) of the electrode, its conductivity, the mass of metals, the speed of flow of the electrolyte, the coefficients of mass transfer of metal ions, the mass transfer coefficient for oxygen, the potential profiles of the current metals, profile of the current oxygen profile of the current hydrogen, given the profile of the current metals. The solution of a scientific problem of practical importance for improving the ecological state of the urban environment is presented.

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THE USE OF MATHEMATICAL MODELING METHODS IN THE CREATION OF COMPOSITE MATERIALS BASED ON CARBON FIBER MATERIALS

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ABSTRACT

The report provides data on the electrochemical modification of carbon-graphite fibers as the basis for the creation of composite materials. The results of studies of the electrodeposition of metals on pre-electrochemically modified carbon fiber materials (CFM) in order to obtain composite materials based on them are presented. The use of CFM for the creation of composite materials is associated with the possibility of deposition of metals, alloys or their compounds on the surface of their constituent fibers. Electrochemical treatment in aqueous solutions of electrolytes is a promising method for modifying the surface properties of carbon materials, including in order to improve their adhesive properties. Preliminary electrochemical modification of carbon fiber materials in indifferent solutions of electrolytes made it possible to obtain composite and nanocomposite materials with good adhesion of the electrodeposited metal to the surface of the fibers of carbon materials. When metals are deposited on carbon fiber materials, it is necessary to solve the problem of applying a uniform metal deposit or with a certain profile in the thickness of the material. In this case, it is effective to use methods of mathematical modeling of metal deposition processes in a flowing three-dimensional electrode. Depending on the selected modes of deposition of metal sediment on the CFM, some electrochemical parameters of the process and system may be dependent on both the time of the process and the thickness coordinate of the electrode. This is especially true for the value of the resistivity of the solid phase of the system, that is, carbon-graphite fibrous material. Other electrochemical parameters, such as the specific electrode surface, the exchange current and the transfer coefficient of the electrochemical reaction, the porosity of the material, etc., can also change during the electrodeposition of the metal on the CFM. It is proposed to take into account the change in the characteristic properties of modified carbon fiber materials in the mathematical modeling of the processes of electrodeposition of metals on carbon fiber materials in order to determine the technological parameters to improve the efficiency of the properties of composite materials. In order to implement mathematical models used in the calculation of electrochemical processes in the volume and on the surface of carbon fiber materials, a set of programs based on modern computational methods and programming languages has been developed.

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CONSTRUCTION TECHNOLOGY AND MANAGEMENT OF UNILATERAL SUPPORT FORMWORK FOR 16m-HIGH CONCRETE OUTER WALL OF COMPLEX DEEP FOUNDATION PIT

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ABSTRACT

Shanghai Grand Opera House, which is under construction in Shanghai, China, includes two relatively large opera halls, which are named as the large opera hall and the middle opera hall. Below the stages of these two opera halls are two deep stage pits where the mechanical equipment will be arranged after construction, therefore, the structure of these stage pits is designed to be basically hollow with only a small amount of floor slabs on the edges. For the most sections of the stage pits, the depth is 16m, and the arrangement of horizontal supports and lattice columns in the stage pits during the construction period is extremely complicated. To prevent the outer walls of the stage pits from leaking and further guarantee the quality of the structure, the unilateral support formwork, which is composed of multiple steel components as load bearing members, is applied to construct the 16m outer wall of the stage pits. In this paper, first, the specific working principle of the unilateral support formwork and numerical analysis of its construction steps are introduced. Then focus on explaining that through establishing detailed digital 3D models of the complex stage pits during construction period, the practical construction sequence and construction technologies are designed and formulated, meanwhile, the on-site staff can also be guided directly through digital 3D models, which guarantee the visualization of the complex technology and the convenience of on-site construction as well. The construction of the deep stage pits is currently in progress, and part of the outer wall has already been constructed successfully. The cost of the technology is certainly more than common construction methods, but it is still acceptable since most of the formwork members can be recycled and re-use, while the advantages are obvious. Finally, the main characteristics of the construction technology of the unilateral support formwork for 16m-high concrete outer wall is summarized and discussed, which can provide a reference for the construction of similar structures.

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

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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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SITE PLANNING AND ARCHITECTURAL CONCEPTUAL DESIGN OF AN ELECTRONICS FACTORY BASED ON THE COMPONENT METHOD

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ABSTRACT

With the rapid development of the society and the economy, the urbanization have brought a lot of big impacts to China's urban construction. The construction mode of large resource consumption is not consistent with the goal of sustainable development. At the same time, the number of workers in the construction industry is difficult to meet the needs of a large number of construction projects, and the labor cost is growing rapidly. Therefore, the architectural products need to be transformed and we need to build a sustainable urban construction system. By analyzing the transform under urbanization and traditional architectural design methods, the paper research the component method. Then, we show the application of this in site planning and architectural design. The project is in Jiangsu Province, China. The first work of the project was site planning. At this stage, the construction site requirements of prefabricated buildings were specially considered. After that, we entered the stage of architectural conceptual design, designers used component method to decompose the component system into several levels. The first level includes four functional systems, which are structure functional system, enclosure functional system, decoration functional system and equipment functional system. This paper mainly introduces the structure function system and enclosure function system. We hope that through the practice of component method, on the one hand, it can provide a method to link the design content of urban planning and architectural design; on the other hand, it can prepare for city information model.

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FEATURES OF THE FORMATION OF MODERN ETHNO- ARCHITECTURE OF THE RESIDENTIAL ENVIRONMENT OF KYRGYZSTAN

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ABSTRACT

Period of formation of Residential architecture of Kyrgyzstan has a long history. It was based on the stages of housing development from antique time to present day. According to analysis of literary and scientific sources, Kyrgyz people had not only nomadic lifestyle but also a sedentary lifestyle. So many scientists and researchers studied architecture of past eras based on archeological excavations, which testified civilization and life style of Kyrgyz people. Based on this, we can conclude, that Kyrgyz architecture has a history of sedentary and nomadic type of housing with its national identity and coloring, which today should give impetus to formation and to development of modern ethno-architectural living environment of Kyrgyzstan. This study aims to research of architectural spatial solution in formation of modern ethno- architecture of Kyrgyz living environment. The objectives of this research are analysis of the existing architectural planning and volumetric spatial structure of the housing stock of Kyrgyzstan; determining the influence of traditional housing on development of modern design and ideological and conceptual solutions for the living environment; traditions and national color in the development of modern ethno-architecture of the living environment of Kyrgyzstan. The relevance of the research is against the backdrop of current architecture of the living space, among typical concrete and brick buildings of Soviet heritage on one side, either metal glass with decorated expensive facades of structures on the other side, the appearance of the cities of Kyrgyzstan is losing its history and national architecture, through which modern ethno-architecture could be reborn. The formation and development of ethno-architecture should be the main goal of today's architects., which means the preservation of the culture, tradition and identity of Kyrgyz people, as well as the revival of the ideological education of the younger generation. Comparative analysis and research of illustrative facts showed that, in general, the architecture of Kyrgyzstan at this stage began to develop depending on market economic factors, which basically do not carry a conceptual ideological policy. The formation of a dwelling follows the path of material needs and most often pursues a commercial approach. On the basis of this, the relevance of this study is determined, justified by the comparative characteristics of the architecture of the residential environment at the present time and the ways of its development in the future.

INNOVATIVE TRENDS IN ARCHITECTURE – CREATING FULL-SCALE BUILDINGS WITH THE 3D PRINT TECHNOLOGY

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ABSTRACT

Contemporary innovative 3D technologies and machinery to apply them in the 21st century are dynamically developing and cover increasingly more aspects in the area of architecture when making buildings and structures for various purposes. In the recent years, in various parts of the world much focus has been made on the kind of 3D technologies such as printing real-life architectural structures on printers using the method of phased production by the digital three-dimensional model designed in advance for the architectural project. The paper considers various technologies and technical means, their advantages and flaws, and analyzes key areas of applying 3D printers in the process of implementing various architectural structures. The prospects are identified for the development of the highly efficient technology to construct buildings and structures. The functioning principles of 3D printers are described. We covered the developments of construction and architectural organizations in making structures with the help of 3D print. Key challenges have been identified in the practical application of 3D print when building the architectural structures; the ways to improve the technology in the future are presented. The authors analyzed the available technological solutions for 3D print in the process of constructing real architectural structures; presented the relevant data on technical parameters of the contemporary three-dimensional printers; the problems for the development of the technology have been conceptualized, as well as the choice of optimal materials and engineering structures with regard for peculiarities of selected methods of layer-wise extrusion or making buildings parts with their further assembling into the final structure. The paper presents a summary of basic notions in the 3D print area, it mentions key software programs that could help implement all stages of the architectural structures making process when constructing them. The authors suggested a list of traditional construction materials to create architectural projects such as mineral heavy weight concrete with the polymer disperse fiber and chemical additives to regulate the terms for hardening astringency, and the promising other materials to produce buildings such as structural glass, various kinds of plastics, ceramic alloys (produced through selective laser sintering), and salt as a basic material to make complex restoration works in the reconstruction process. The outcome of the undertaken theoretical and applied research is presented by the authors in the findings concluding about key benefits from using 3D printers in creating real architectural facilities for various functions, and the choice of an optimal 3D print method on the specific brand of manufacturing machinery with the most efficient software. The authors identified the application areas of the most optimal, economically and structurally justified construction materials fitting the selected technology to build an architectural structure on a 3D printer. The approach can help create relatively inexpensive, aesthetically and functionally interesting architectural facilities for various purposes. In the process of their construction, they entail minimum costs in terms of labor and material resources. It offers broad perspectives to apply 3D printers in the world's architectural practices.

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ARCHITECTURAL ENVIRONMENTAL, AND TECHNOLOGICAL PRINCIPLES IN CONSTRUCTING MODERN FACTORIES FOR MANUFACTURING ECO-FRIENDLY FURNITURE

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ABSTRACT

Today, a dominant trend in factory construction is to account for the eco-economic aspects of their further operations. It requires sustainable technological solutions, with regard for structural specificities or for production technology used. At the same time, the buildings shall be architecturally attractive and distinct. In the paper, the author considered architectural, technological, structural, ecological, and economic factors for construction of wood-processing and furniture-making facilities. The authors analyzed the actual Project Design to build the type of facility in Krekhiv village, Zhovkva district, Lviv region (western Ukraine) as commissioned by a well-known French company (the authors have been engaged in the design). The study focused on a wood-processing Woodman company designed for the midtech production of edge glued panels and furniture. According to the design documentation by types of products planned, the Project Design provided for the following production units: unit for wood-sawing and drying; unit for mechanical processing of wood, production of edge glued panels and furniture; unit for mechanical repairs; and an administrative and services unit. The anticipated annual production capacity is: for edge glued panels – 600 m³ a year, furniture production – up to 4,000 pc a year. «Wood-sawing unit», according to the Project Design, is organized according to the following principles of production technology based on the stages and operations: stockholding and storage of round timber (sawtimber); cutting the sawtimber into the shaped timber and logs; stocking the sawn timber (untrimmed boards) into stockpiles and on separators for further atmospheric and chamber drying. Sawn timber drying is taking place in the «Drying Unit». It is the process of moisture removal from timber to a certain degree of humidity. The Project Design provided for the atmospheric drying of logs and boards in the furnished stockpiles under the roof, and artificial seasoning in a steam-curing and drying chambers. The artificial seasoning technology for sawn timber and logs is organized with the help of drying chambers and a boiler room with a sawdust bunker. The «Unit for Mechanical Wood Processing, Production of Edged Glued Panels and Furniture» is used for production of the edged glued panels from the sawn timber coming from hardwood (beech, oak). The production process of the edged glued panels includes the following stages: 1) cross-cutting of dry boards; 2) line cutting of board edges for the rough-sawn stock; 3) primary mechanical processing; 4) sorting by quality, color; 5) endways gluing line; 6) log finishing; 7) press-molding of logs into panels; 8) panel surface preparation; 9) size cutting; 10) preservative treatment; 11) quality control; 12) storage and sales. «Administrative and Service Block», according to the Project Design, is an inbuilt part of the Main Building (Unit). It is a two-story insert separated with the fire safety barriers from the manufacturing facilities. It has isolated outside entrances and a technological corridor linking the manufacturing facilities. With account for production process requirements, fire safety, and sanitary standards, the Unit is divided into several personal services rooms for the staff and administrative rooms.

MODEL INVESTIGATIONS OF SCOURING AT THE HRIČOV WEIR USING SHORT-RANGE PHOTOGRAMMETRY

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ABSTRACT

Stilling basins are commonly used to efficiently dissipate energy of flow at weirs. Different types of stilling basins are used at weirs due to different conditions – hydraulic, operational, constructional. At the Hričov water structure a short stilling basin has been built. Its operation over the years showed that it does not dissipate the energy of the flowing water sufficiently, which causes intense scouring in the riverbed downstream. To partially deal with this problem and to protect the riverbed from scours, a rockfill embankment supported with a steel construction was constructed adjacent to the stilling basin's toe. Despite this riverbed fortification, scours are being created in the riverbed and even in the fortification itself for different cases of operation of the weir. A hydraulic research on a scaled model of the weir was used to investigate the problem and to propose a permanent solution significantly improving the scouring downstream the weir. The proposed fortification of the riverbed downstream the weir was tested at different operational conditions, which simulated extreme situations at the weir. To assess the effects of the investigated fortification, the simulations were performed for the weir without and with the fortification. After each simulation, the deformations in the riverbed (scours) were measured and evaluated. For measuring the riverbed deformations on the model, the method of short-range photogrammetry was used as a very effective and contactless method. This method allowed to measure investigated area with a very high accuracy and speed. Digital models of the riverbed deformations created after each simulation on the hydraulic model were used to determine the locations and sizes of the deepest scours. Final assessment of the results showed the improvement in the reduction of scouring by the proposed fortification by almost 50% in the size of the scours. The investigations and the results are described in this paper.

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EVALUATION OF THE FLOW VELOCITY DISTRIBUTION IN THE INTAKE STRUCTURE OF A SMALL HYDROPOWER PLANT

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ABSTRACT

Intake structures are an important part of small hydropower plants, which affect the water flow, turbine operation and total power of power plant. The flow quality is significantly influenced by the flow homogeneity in the intakes, as the inhomogeneous flow velocity distribution has a negative impact to the operation of the hydropower plants, such as uneven load on the mechanical parts which leads to decrease in efficiency and faster aging of turbine parts. The paper describes the flow assessment in the intake structures of a low-pressure small hydropower plant (the Stará Ľubovňa small hydropower plant) with respect to the flow homogeneity. The River2D, 2D numerical modelling software, has been used for evaluation of flow in the intakes. Flow simulations for the current state of operation have been modelled. In assessing the current situation of intake structure, scenarios were modelled. The boundary conditions were changed to approximate the various variants of hydropower plant operation. The simulations proved the negative impact of the construction solution for the flow conditions in the intakes. This appears mostly in profiles of coarse racks and screenings where is a significant unequal distribution of flow and significant deviation in flow velocities from the recommended values. The simulations results were evaluated in turbine intake profiles (profile of screenings), where the distribution of flow velocities was evaluated. The flow velocities in this profile were compared with the average flow velocity in the turbine intake profile. In order to optimize the velocity distribution in the intake structure, the modification of the intake shapes has been proposed. The subject of the proposal was to improve flow parameters. Simulations were created for the modification that were subsequently reviewed. The modification was compared to the current situation of the intakes.

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A BIDIMENSIONAL MODEL OF THE TAGLIAMENTO RIVER

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ABSTRACT

Flood wave propagation is a very challenging topic, crucial in managing the flood risk. In the literature several numerical models have been proposed to deal with this issue; most of them need the roughness coefficients to be assigned by the operator. The bottom roughness calibration of floodplains and channels represents a key point for flood studies, because it can heavily influence the results of any kind of numerical simulation. In this study, a numerical model is applied to the Tagliamento River, in North-East Italy. In in recent centuries the river flooded several times the surrounding territories causing extensive damages and also a few victims. The last catastrophic events date back to September 11th 1965 and November 4th 1966, when the river overrun its banks which also collapsed in a few locations as it happened in many areas in Central-North Italy. However, floods which require monitoring and alertness occur relatively often. Nevertheless, no significant bi-dimensional numerical model of flood evolution has been proposed for this river, and only some one-dimensional models have been discussed. However, the middle course of the Tagliamento river is characterized by wide cross sections, with several intersecting branches, which make the river not suitable to be modelled with one-dimensional models. Moreover, this river is well known for its natural environment, which changes from a very wide braided channel in the high plain to a narrow meandering river moving towards the sea. This makes the bed roughness extremely variable along the river, with different kind of vegetation, braiding, different grain size, meandering, etc. In this regard, particular attention should be paid to the roughness coefficient assignment and calibration. In the present paper, the detailed setup of a bi-dimensional flood wave propagation numerical model on the Tagliamento River is presented. The procedure used to assign and calibrate roughness coefficient is illustrated. Finally, the model is validated against two main flood events occurred in 1966 and 1996.

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RELOCATION OF DREDGED MATERIAL FROM MARANO AND GRADO LAGOON: AN EXAMPLE OF SUSTAINABLE MANAGEMENT

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ABSTRACT

The dynamic balance of coastal lagoon environments is the result of the continuous exchange of sediments between tidal currents and locally generated wind waves, which trigger the main morphological processes. The wave motion can lead to sediment resuspension on the shallow depths of tidal and subtidal flats, and the tidal currents convey the material inside the main channels, where it is deposited during the transition phases between ebb and flow. From an engineering point of view, this poses several problems, in particular the maintenance of the navigability of the waterways and therefore the need for periodic dredging operations. On the other hand, large volumes of dredged material are created, which require to be treated or relocated within the basin depending on whether chemical and ecological compatibility with the environment is guaranteed. Furthermore, even if the material is uncontaminated, some issues still remain unresolved; in particular, where to place the sediments and how, in order to ensure they are stable enough not to be eroded after a short time. This is the case of the Marano and Grado lagoon, a coastal basin in the Northern Adriatic Sea (Italy), which has undergone a net loss of sediments from its tidal flats in the last decades and the consequent periodic silting of its main channels. About 55,000 m^3 of mud are dredged annually from the waterways that connect the tidal inlets with the main harbours located within the lagoon, and this forced the local authorities to define a management plan on the use of dredged material. The best solution from an environmental point of view seems to be not to isolate the dredged sediments, but to use them for the requalification of mud flats and salt marshes, in compliance with the chemical and sedimentological properties. This choice involves the identification of specific areas to relocate the dredged material and the study of its morphodynamic stability with respect to the bottom shear stresses induced by tidal currents and wave motion. The present study is an example of how the morphodynamic modelling can be applied to carry out a sustainable management of materials dredged from the main waterways of the Marano and Grado lagoon. It is based on the coupled model provided by Petti et al. (2018) to reproduce the annual silting of the channels and the main morphological processes of the lagoon. Two areas were considered to relocate the material coming from two channels belonging to the Litoranea Veneta, an important transversal waterway of the lagoon. In order to establish the morphological evolution of the hypothesized interventions and the possible loss of material as a result of erosive processes, two series of simulations were carried out with the developed model. The former consists in the simulation of the behaviour of the relocated mud in the absence of protections; the latter considers the dredged material at the end of two years, assuming a temporary protection lasting one year, such as to allow the sediments to partially consolidate.

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ABSTRACT

The dynamic balance of coastal lagoon environments is the result of the continuous exchange of sediments between tidal currents and locally generated wind waves, which trigger the main morphological processes. The wave motion can lead to sediment resuspension on the shallow depths of tidal and subtidal flats, and the tidal currents convey the material inside the main channels, where it is deposited during the transition phases between ebb and flow. From an engineering point of view, this poses several problems, in particular the maintenance of the navigability of the waterways and therefore the need for periodic dredging operations. On the other hand, large volumes of dredged material are created, which require to be treated or relocated within the basin depending on whether chemical and ecological compatibility with the environment is guaranteed. Furthermore, even if the material is uncontaminated, some issues still remain unresolved; in particular, where to place the sediments and how, in order to ensure they are stable enough not to be eroded after a short time. This is the case of the Marano and Grado lagoon, a coastal basin in the Northern Adriatic Sea (Italy), which has undergone a net loss of sediments from its tidal flats in the last decades and the consequent periodic silting of its main channels. About 55,000 m^3 of mud are dredged annually from the waterways that connect the tidal inlets with the main harbours located within the lagoon, and this forced the local authorities to define a management plan on the use of dredged material. The best solution from an environmental point of view seems to be not to isolate the dredged sediments, but to use them for the requalification of mud flats and salt marshes, in compliance with the chemical and sedimentological properties. This choice involves the identification of specific areas to relocate the dredged material and the study of its morphodynamic stability with respect to the bottom shear stresses induced by tidal currents and wave motion. The present study is an example of how the morphodynamic modelling can be applied to carry out a sustainable management of materials dredged from the main waterways of the Marano and Grado lagoon. It is based on the coupled model provided by Petti et al. (2018) to reproduce the annual silting of the channels and the main morphological processes of the lagoon. Two areas were considered to relocate the material coming from two channels belonging to the Litoranea Veneta, an important transversal waterway of the lagoon. In order to establish the morphological evolution of the hypothesized interventions and the possible loss of material as a result of erosive processes, two series of simulations were carried out with the developed model. The former consists in the simulation of the behaviour of the relocated mud in the absence of protections; the latter considers the dredged material at the end of two years, assuming a temporary protection lasting one year, such as to allow the sediments to partially consolidate.

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DESIGN AND NEW FUNCTIONS OF RURAL CULTURAL INSTITUTIONS

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ABSTRACT

The purpose of the research is to highlight the features of the design and determine the new functions of cultural institutions in the context of decentralization on the example of rural settlements in the Western region of Ukraine. To achieve this goal, theoretical and empirical research methods are used (scientometric method, analysis of domestic experience in designing and building cultural institutions based on literature sources and design materials, on-site survey of rural clubs), comparative analysis, classification and generalization. Studies conducted in the villages of the Western region of Ukraine showed that the centers of popularization and preservation of traditional culture and folk customs in the village are clubs or houses of culture. In the process of decentralization, each newly created community has the opportunity to implement its functions in the field of culture and is obliged to maintain. Most of them are in disrepair and need all sorts of repairs, modernization and reconstruction. Researchers have shown that there have been changes in the cultural and artistic life of communities that have an impact on the preservation and promotion of traditional culture. And the change of directions and type of activity of cultural institutions need to be reformatted according to the needs of local residents, reorganized and transformed. Festivals, competitions, creative exhibitions, folk and religious holidays in the united territorial communities are celebrated in a new way: bright actions, photo and video recording of events, a large number of invited guests and organizational training. Communities seek out their identities and develop concepts for cultural service centers. Accordingly, rural cultural institutions have received new functions, and new functional zones have appeared in their structure. All this determines features of the architecture of the rural center of cultural services. Architectural and planning is the organization of the auditorium, stage and ancillary facilities; circle-studio zone with interactive equipment; areas for folk and religious celebrations, festivals, fairs; areas of the National Museum and exhibitions of works of fine and decorative arts. Architectural environment design: adherence to the principles of safe, energy-saving environment; principles of space composition, color scheme, lighting, landscaping; use of traditional building materials and elements of folk architecture. The topic of the study remains relevant, as in the context of decentralization residents of communities should receive the most useful cultural services, which should be reflected in the organization of architectural and planning decisions of cultural institutions.

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ARCHITECTONICS OF DOMED TEMPLES OF MODERN UKRAINE

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ABSTRACT

The article highlights some results of scientific work conducted by the Institute of Architecture and Design of Lviv Polytechnic National University, Department of Fine Arts and Design, Ternopil Pedagogical University, Department of Design Architectural Environment Lviv National Agrarian University and Art Theory Vasyl Stefanyk Precarpathian National University. Scientists study the art of temple building on the territory of Ukraine. The analysis was conducted based on reliable sources - archival, publications of leading scientists, their own field research. The method of field inspections included visual inspection of sacred complexes, architectural measurements, photography, sketches, etc. The aim of the scientific work is to study the genesis of the architectural and constructive creation of the sacral dome space through the tradition of Ukrainian shrines and the development of modern trends in temple building. Tradition is one of the most important components and means of creating Ukrainian church architecture. It is an expression of national features and characteristics, its identification. The most canonical type of Ukrainian churches is the cross-domes churches, which is associated with the adoption of Christianity. This tradition is closely connected with the liturgical process and is based on a combination of Eastern and Western building traditions. In figurative and compositional expression, the dome is dominant, and tectonic accent. The architecture of dome temples depends on the capabilities of structures and building materials, which are important factors in the formation process. The authors explore the traditional ways of erecting cross-dome temples on the territory of Ukraine, which are indicative and expressive features of Ukrainian temples. An important group of dome temples are buildings created in the modern period, when architects were looking for signs of Ukrainian national style. Particularly valuable is research related to the construction of neoukrainian traditional and neoteric temples designed by Ukrainian architects. Their planning and spatial decisions directly depend on new construction materials and design solutions. Some temples are described, which are an example of innovation, but at the same time are based on national traditions. Thus, the article examines the genesis of the creation and architecture of the Ukrainian cross-domed temples. Defined peculiarities of the search for national features and identification in the Ukrainian temple building in the interwar period was determined. Highlighted contribution of modern architects and designers to the process of revival of temple building in Ukraine.

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CALMING TRAFFIC IN HISTORIC CITY CENTERS - A CASE STUDY

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ABSTRACT

The goal of the paper is to compare the existing transport service solutions in the city centres of Bydgoszcz (Poland) and Hasselt (Belgium), where the widely understood idea of traffic calming is implemented. The method of research work consisted of the literature review, available documents, and local visits. The analysed solution has been operating in Hasselt since September 2018, and in Bydgoszcz since September 2019. Technical and architectural solutions were analysed in terms of traffic-calming in these areas. Implemented principles, methods, and traffic-calming measures lead to a necessary consensus between traffic and accessibility of the study area. This research confirmed that the elimination of traffic not strictly related to a given area – so-called through traffic, is the main and primary measures to obtain areas centers as areas of “livable city". Implementation of restrictions on the cars availability while maintaining accessibility to public and residential buildings and creating preferences in terms of accessibility for pedestrians, bicycles and public transport is the most important challenge. In both cities, significant attention was paid to shaping public spaces for pedestrians and the development of street fronts with facilities for attractive functions for center users and tourists. Analyzed examples of two cities: Bydgoszcz and Hasselt, showed that the implementation of separated cycling infrastructure in the historic structure of centres is not easy to achieve. In the “livable city" vision, special emphasis is placed on functional solutions and forms of pedestrian areas, and requirements of conservation protection, aesthetics and road safety have to be taken into account.

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TRANSPORTATION NETWORK SPATIAL ANALYSIS TO MEASURE PEDESTRIAN SUITABILITY THE CASE OF HILLY CITIES

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ABSTRACT

The current climate and environmental emergency, together with the growing traffic congestion and pollution in urban areas, make mobility and its sustainability a priority in current transport policies. It is essential to change citizen's behaviour in order to increase the use of less pollutant, economic and egalitarian transport modes, such as walking, combining it with other public transport modes. For this change to happen, it is necessary to provide feasible alternatives to private cars, namely through the offer of high-quality pedestrian infrastructures, adapted to the cities' specific characteristics and their citizen's needs. These aspects are particularly important in hilly cities, where traveling by foot requires an additional effort. The present study aims to contribute to the promotion of soft mobility in hilly cities by creating a support instrument to assess the potential of existing pedestrian infrastructures. Three variables are considered in the analysis: trip generation poles, population density and pedestrian network characteristics, with especial consideration of slopes. These variables were processed with spatial and network analysis tools available in Geographic Information Systems (GIS) and combined using a multi-criteria decision analysis to obtain a measure of the pedestrian infrastructure potential. The identification of areas with high pedestrian potential supports the definition of intervention priorities programs on the public space and a better allocation of human and financial resources. The proposed instrument was validated through its application to a case study, the hilly city of Covilhã (Portugal). From the results obtained it is possible to conclude that the variable with more impact on the pedestrian infrastructure suitability value is the location of the trip generation poles, influenced by the foot paths longitudinal slopes. The instrument also allowed to identify the main city expansion areas, corresponding to places presenting a good pedestrian potential and relatively low values of population density.

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This article/material has been supported by the Polish National Agency for Academic Exchange under Grant No. PPI/APM/2019/1/00003

URBAN PLANNING AND SOCIAL DISTANCING IN DOWNTOWN OF URBAN AREAS TO COMBAT THE COVID-19: CASE OF NEKEMTE TOWN, ETHIOPIA

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ABSTRACT

The world is suffering from respiratory illness caused by a novel corona virus, COVID-19 and it has been rapidly spreading. Thus, it becomes more frustrating that countries proclaimed different regulatory restrictions on human basic activities both in urban and part of rural areas. Among those activities, peoples' free mobility in urban center is highly affected due to the pandemic restrictions and social distancing. However, socio-economics, transportation and urban space facilities of developing countries like Ethiopia are the challenging factors to implement the social distancing. Proper implementation of social distancing needs adequate road infrastructures to support basic human movement within the urban area of the country. The purpose of this study is to identify the factors Affecting the Implementation of Social Distancing to fight against Corona Virus in down town urban areas. Questionnaire Survey, Observation and review of Nekemte town Master plan were used to evaluate factors affecting the implementation of social distancing. Factor analysis was used to identify variables that most importantly forced the pedestrians' movement with social distancing. It was examined with ordered logit model to see the influence of these factors with road users' socioeconomic characteristics. The result showed that in Nekemte down town areas, over crowdedness and streets blockage by temporary storage of construction material, Vendors, low enforcement for the master plan, poor traffic management, road distribution plan, and road side parking are the major factors affecting the implementation of social distancing against COVID-19. To achieve appropriate implementation of social distancing in down town areas, it needs a programs and policy to restrict on streets parking, streets venders and using pedestrians' ways for others rather than for motilities hence social distancing implementations.

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THEORETICAL PREDICTION OF PUNCHING CAPACITY OF FLAT SLABS WITHOUT SHEAR REINFORCEMENT STRENGTHENED BY CONCRETE TOPPING

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ABSTRACT

The main reasons for strengthening flat slabs are the change of the use of a building, increase in the value of loads, degradation of the concrete cover layer or insufficient reinforcement. This paper is focused on the assessment of punching capacity of the strengthened flat slabs without shear reinforcement. One of the possibilities how to enhance punching shear capacity is the addition of reinforced concrete topping. The main goal of this paper is to compare the possibilities for calculation of the increase in the punching capacity by investigation of the influence of different thicknesses of concrete toppings and different reinforcement ratio. A reference specimen is represented by a fragment of a flat slab with the thickness of h = 200 mm supported by circular column with the diameter of 250 mm. Three different thicknesses (50 mm, 100 mm, 150 mm) of concrete toppings were considered together with three different reinforcement ratios for each thickness of concrete overlay. Theoretical predictions of the punching shear resistance of flat slabs were evaluated by design guidelines according to the relevant standards: Eurocode 2 (EN 1992-1-1), Model Code 2010 and draft of second generation of Eurocode 2 (prEN 1992-1-1). The differences in the influence of reinforcement ratio are significant. In Model Code 2010 the reinforcement ratio in concrete topping was considered in equation of moment of resistance. This is unlike in both of the mentioned Eurocodes, where the reinforcement ratio was assumed as a geometric average value of the original reinforcement ratio in the slab before strengthening and of the reinforcement ratio of concrete topping. All the predicted theoretical calculations are based on the perfect connection and bond between the original and new layer of concrete. These predictions should be verified by experimental investigation, which is going to be prepared shortly. By the additional increase in the thickness of concrete topping or in the amount of added reinforcement the attention should be payed to the limitation of the punching shear resistance by the value of the maximum punching shear resistance in the compression concrete strut.

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EMERGENCY SHORING SYSTEM ON MASONRY BUILDINGS AFTER AN EARTHQUAKE

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ABSTRACT

Historical masonry structures that make up the cultural assets of a country constitute the identity of the society to which it belongs. For this reason, it should be protected and should be transferred from generation to generation. Earthquakes are threatening action to masonry structures. The force generated by the ground movement may cause shear cracks in masonry structures that may lead to fragmentation and even collapse of the structure. It is necessary to know the earthquake behaviour of masonry structures to be able to apply appropriate temporary shoring system after a damage caused by earthquake in order to prevent the future damages during aftershocks. Thus, the progress of the damages in the building is prevented and it is ensured to survive until detailed investigation or restoration. However, when the applied temporary shoring system designs were examined, the environmental conditions of the building were not taken into account in any guideline on immediate shoring. In this paper, temporary shoring system for 3 traditional houses of Bey District is designed for possible earthquake damages. This district has many registered civil architectures lined side by side along very narrow streets. Some masonry buildings were changed to reinforced concrete with multiple floors. This study includes the registration status of the buildings, their location, the number of floors to be supported, the heights between floors, the height of the forces that can be brought by the adjacent building elements, the width of the street where the facade to be supported, whether there is a window or door opening in the facade to be supported etc. If there are window or door openings, the distances of the opening to the corner points of the building and the distances between the two openings has to be recorded. According to these determinations, possible damages that may occur in the buildings are defined and a temporary shoring system is designed in accordance with the buildings and the surrounding conditions.

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USE OF WAR RUINS FOR MUSEOLOGICAL PURPOSES: ASSESSMENT OF THE HISTORIC SITE OF KHAZ'AL DIWAN (AL JABIR PALACE) IN KUWAIT

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ABSTRACT

The use of architectural monuments and heritage structures for museological purposes has been common since the beginning of the modern conservation movement in the 19th century. Usually, the structures used as museums are treated in line with adaptive reuse principles. If the structures are in ruins, which is common after wars or natural catastrophes, they are either reconstructed and used as museum spaces or preserved in situ and presented as ruins. While the adaptive reuse of existing heritage structures for museum purposes has gained visibility in the Middle East during the 20th century, the use of war ruins as museums is an under-explored area. This paper investigates the case of the historic site of Khaz'al Diwan (Al Jabir Palace) in Kuwait City, which was shelled during the Iraqi invasion in 1990-91, leaving the site partially in ruins. The paper presents ethnographic survey findings that help identify the conservation state and requirements for the site and the community perceptions about its use as a museum. The survey consists of questionnaire responses of local community members, interviews with heritage professionals, physical observations of the site, and content analysis of the primary documents. The study suggests alternative criteria and strategies for using war ruins for museological purposes.

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SUSTAINABLE CITY- GREEN WALLS AND ROOFS AS ECOLOGICAL SOLUTION

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ABSTRACT

The impact of urban development on the natural environment creates unique challenges for architects and the need to seek a change in design strategies by building green and sustainable buildings. Designing and displaying green elements such as roofs and walls becomes an important element in this sense. Greenery plays a very crucial role in the city space. Green roofs and walls are the missing link between the built environment and the natural environment. They can complement urban greenery. This paper aims to show the possibilities of green roofs and walls solutions in the city, their aspects and impact on the environment and people. The research method is based on the analysis of selected existing objects with greenery solutions and showing their role in creating a sustainable city. The analysis shows that the green roofs and walls offers many environmental, social and economic benefits. They have the ability to improve the microclimate and increase air humidity. Thus, they affect the health and well-being of the city's inhabitants. This technology should be considered a valuable part of the design process to tackle climate change and the energy crisis. Green roofs and facades are passive techniques and provide benefits in reducing the energy requirements of buildings, among other things, but also play a role in shaping a better visual aspect of the city. In the 21st century, people are slowly beginning to realize the advantages of green architecture, which is considered a new perspective also for the urban heat island problem. Thus, the living roofs and walls are of major importance as part of a sustainable strategy for the urban environment. Sustainable cities will exist when society makes an informed choice to move towards a more sustainable lifestyle. The green roofs and walls these are the solution for the future, for better quality of life.

HOTEL REFURBISHMENT AND BUILDING INFORMATION MODELLING

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ABSTRACT

Research on Building Information Modelling (BIM) focused on the design and construction stages of engineering projects. Fewer studies investigated the use of BIM in refurbishment projects. The aim of this research is to examine the process of hotel refurbishment in an operational environment and how this can be enhanced in BIM environments. The research approach is qualitative however quantitative data were used to complement the qualitative data. Questionnaires were completed by industry professionals in the UK. Themes were identified across hotel refurbishments in varying properties. The findings suggest that a close integration between the construction team and hotel operation is paramount to achieving a successful hotel refurbishment process, and highlight the role of the project manager in facilitating communication across stakeholders. This reflects the essence of working in interdisciplinary collaborative BIM environments however BIM is not widely implemented in many refurbishment projects. The research contributes by proposing procedures for undertaking refurbishment in operational hotels.

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RECYCLING OF WASTE MATERIALS THROUGH BITUMEN EMULSION FOR ROAD PAVEMENT STABILIZED BASE COURSES: A LABORATORY INVESTIGATION

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ABSTRACT

The valorisation and reuse of waste materials can enhance the environmental sustainability of road constructions, especially by means of cold recycling techniques, which, moreover, allow to reduce polluting emissions in atmosphere. Among the various technological approaches, the use of bitumen emulsion to stabilize waste materials is very common, especially in case of reclaimed asphalt pavement (RAP) aggregates. However, even other types of waste materials could be considered using a Cold Central Plant Recycling (CCPR) approach. The paper discusses the main results of a laboratory investigation aimed to evaluate the mechanical performance of bitumen emulsion stabilized mixtures for road pavements base courses, prepared with RAP, steel slag, coal ash and glass wastes, used with various percentages. In a first step of the laboratory study, both physical and toxicological properties of each waste material have been investigated, in order to assess their environmental compatibility. Subsequently, an extensive mechanical analysis of the bitumen emulsion stabilized mixtures has been carried out in the laboratory, in terms of indirect tensile strength, indirect tensile stiffness modulus at three temperatures (10°C, 25°C, 40°C) and repeated load axial tests at 30°C. The moisture resistance of the mixes has been also investigated by means of indirect tensile strength tests carried out on soaked specimens. Very good results have been observed, depending on the mix composition: indirect tensile strength at 25 °C on dry specimens up to 0.52 MPa and stiffness modulus up to 4,056 MPa (at 25 °C, for a rise time equal to 124 ms). Therefore, it has been verified that the waste materials considered in the study can be successfully reused to completely substitute conventional aggregates in bitumen emulsion stabilized mixtures for road pavements base courses.

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RE-THINKING EDUCATION IN CULTURAL HERITAGE AND ARCHITECTURAL CONSERVATION: AN EXPERIMENTAL STUDY WITH SCHOOL CHILDREN

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ABSTRACT

The question of 'education' is one of the most highlighted issues within the subject matter of Cultural Heritage and Conservation. In this regard, preservation of cultural heritage that constitutes the cultural capital of a nation, its transmission through generations and the effective implementation of conservation seems to be infeasible without the contribution from society, the genuine inheritor of cultural property. Therefore, raising public awareness and education about heritage remains a priority for many establishments and institutions, primarily UNESCO. This paper is about an experiment which aims to raise an awareness concerning cultural heritage, architectural conservation and historic sites. Thus, the main objective of the study is to provide school-age children with an experience of engaging with cultural heritage and historical buildings that constitute a major part of the local environment, in order to contemplate and analyse the significance of localities with attentiveness regarding history and space. 10 years old students were chosen as the main focus group for participating in the study because of their level of comprehension and due to the content of Turkish educational system. Firstly, the students were provided with information about cultural heritage, historic environments and related concepts in the form of questions and answers; thus, the educational background and opinions of the participants on these issues were noted. Children, who were later taken to a fieldwork in a historical area by their instructors, had a practical workshop. In the third phase of the study, the results of the fieldwork were demonstrated in the atelier atmosphere. During this stage, the participants were asked to make 3-dimensional contributions to 2-dimentional maps with the aim of developing creative and observational skills. In order to evaluate the outcomes of the research, the study was finalised with the repeated discussions on cultural heritage and conservation issues and instructors assessed the results via observations, video and voice records.

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ARTIFICIAL NEURAL NETWORK PREDICTION OF AIRPORT PAVEMENT MODULI USING INTERPOLATED SURFACE DEFLECTION DATA

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ABSTRACT

Establishing the structural integrity of an airport pavement is crucial to assess its remaining life and implement strategies or priorities for action. In this context, the elastic modulus represents an effective indicator of the condition of the pavement which can be calculated through backcalculation procedures starting from surface deflections, obtained from a non-destructive test (such as the Heavy Weight Deflectometer). Nevertheless, the conventional inverse engineering analysis involves the use of an axial-symmetric pavement finite-element program able to evaluate stiffness values exclusively at the deflection measuring points. This study presents an alternative methodology for spatial modelling of the load-bearing capacity of the runway surface pavement layer from deflection data measured at specific points, using Shallow Artificial Neural Networks. The search of the optimal neural model hyperparameters has been addressed through a Bayesian optimization procedure and a 5-fold cross-validation has been implemented for a fair performance evaluation, given the limited number of deflection measures available. Once the optimal model has been defined, the measured surface deflection data were linearly interpolated and resampled gridding data were used as a new input matrix of the neural model to predict the expected value of elastic moduli at non-sampled points on the runway. The optimal BO model has returned very satisfactory results with a value of Pearson Coefficient R averaged over 5-fold equal to 0.96597 and of Mean Squared Error averaged over 5-fold equal to 0.01849. In such a way, a contour map of the runway stiffness has been drawn, to provide a support tool for the planning of intervention priorities.

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PERFORMANCE PREDICTION OF FINE-GRAINED ASPHALT CONCRETES WITH DIFFERENT QUARRY FILLERS BY MACHINE LEARNING APPROACHES

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ABSTRACT

In general terms, an artificial neural network is a distributed processor that consists of elementary computational units interconnected. Such structure is inspired by the functioning principles of the biological nervous system and has proven to be effective in identifying complex relationships between an assigned input features vector and an experimental-investigated target vector for any scientific problem. The current paper represents a forward feasibility study on predicting the mechanical response of asphalt concretes prepared with different quarry fillers, used as alternatives for traditional limestone filler or Portland cement, by Machine Learning approaches which consider the chemical properties of the selected fillers and the quarry aggregate types as input variables. In fact, the case study involved several fillers and stone aggregates that were used to produce Marshall specimens of a specific fine-grained asphalt concretes designed originally for the assessment of filler suitability in terms of adhesion phenomenon. The asphalt concrete variants had the same compositional features: all specimens were compacted by 2x50 blows using impact compactor, filler content was fixed at 10% by volume of the mix, the grading curve is roughly the same, the employed bitumen has a 160/220 penetration grade and is about 6% by volume of the mix. The mineralogical composition was investigated by X-ray fluorescence spectrophotometry tests: it represents a non-destructive laboratory analysis that allowed the main oxide composition associated with the employed natural fillers to be identified. Based on the results thus obtained and applying a categorical variable that distinguishes the stone aggregate type, a neural model has been developed that can predict the stiffness modulus of asphalt mixtures: therefore, this study presents a possible procedure for the development of predictive models that can help or improve the mix design process, when different fillers and stone aggregates are available.

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COMPUTER INEQUALITY OF GENERATIONS OF URBAN AND RURAL RESIDENTS AS AN ASPECT OF THE STRATIFICATION OF SOCIETY

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ABSTRACT

The use and dissemination of information and computer technologies leads to social stratification on a new basis — the level of information and computer competencies of representatives of different social generations and groups, including of urban and rural residents. The emergence of increasingly complex computer programs and tools will probably contribute to this trend. The aim of this work is a sociological analysis of differences between the generations of Russians in General and, in particular, between social groups of urban and rural residents, in the level of digital technologies and the resulting challenges for society. As a factual basis, the materials of the sociological survey "Fathers and children: conflict and cooperation, continuity of generations 2020", conducted in the Samara region (Russia) in early 2020, were used. The number of respondents was 620 people aged 16-69 years. The older group (45-69 years old) it lags far behind other groups in the degree of computer proficiency. In the older group, 41.8% of respondents (or about two out of every five respondents) gave the answer: "I practically do not own a computer". At the same time, most of them are among the villagers (49.0% – almost half). But among the citizens, too, there are very many of them: even among the residents of the metropolis of Samara, 36.8% – more than one third. The lowest number of respondents who gave the answer: "I practically do not own a computer" was in the younger group (16-24 years old) – 3.9% of respondents in the entire sample. But even in this age-generational group, the respondents-villagers-stand out noticeably, among whom about one in nine (10.8%) admitted that they practically do not know how to work on a computer. Thus, there are enough sociological grounds to conclude that there is a serious stratification between different age-generational groups (mainly in relation to the older group) in terms of computer literacy. On the way to reduce (overcome) excessive stratification and the gap in the field of digital technology ownership, however, there are certain obstacles and difficulties not only of an individual nature (abilities, literacy in general), but also of a social nature. First of all, this concerns the general problem of social inequality, in connection with which we are talking about the basic material possibilities of acquiring computer equipment, and about real access to certain information and computer networks. On the part of society and the state, targeted measures and programs are needed to reduce (overcome) excessive stratification and the gap in the ownership of digital technologies by different generations and groups of the population.

ENHANCING RESILIENCE IN A POST- INDUSTRIAL CITY THROUGH THE URBAN REGENERATION OF THE DOWNTOWN DOSTRICT: A CASE STUDY OF PART OF DOWNTOWN IN LODZ NAMED NOWE MIASTO

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ABSTRACT

Lodz is a post-industrial city in central Poland, the third largest in terms of population and with the largest area of downtown districts in the country. The regeneration of historical districts is one of the main challenges of the local urban policy here, as in many other post-industrial cities. Urban regeneration is understood as cohesive changes implemented in terms of social, economic and spatial conditions on degraded areas, according to mechanisms introduced by the Urban Renewal Act. Still, climate changes require an in-depth approach to design objectives, so that, they should include certain solutions increasing the city's resilience to climatic events. In accordance with the European Union's policy, in 2013, the Polish Council of Ministers adopted the Strategic Adaptation Plan for sectors and areas sensitive to climate changes until 2020, looking forward to 2030. The implementation of this plan was entrusted to the Ministry of the Environment, in partnership with 44 cities with a population of over 100,000 residents, including Lodz. The city's adaptation plan to climate changes until 2030 indicates that the most vulnerable areas of the city are those of high-intensity residential development. These areas are particularly vulnerable to the phenomena of urban heat islands, urban flooding, storms, and smog. The article shows the planning assumptions for the part of the centre named Nowa Dzielnica (New District), taking into account urban regeneration and resilience urban planning. The plans include the reorganisation of the transport system. The existing road system, with its sparse street grid and lack of street hierarchy, is to be transformed into a pedestrian-friendly structure formed by new links with slowed traffic and plenty of greenery along the streets. New spaces will be opened up by increasing the urban green spaces and creating a cohesive layout of publicly accessible green areas. The changes have already been partially implemented within the spatial urban regeneration of downtown Lodz. This urban regeneration design project was granted the highest EU financing in Poland. The article presents the methods of taking advantage of the potential in the assumptions of local land use plans. It is an interesting example of implementing local spatial policy at district scale, but also on a much larger scale than usually adopted in local plans. The Nowa Dzielnica downtown section was described in a sequence of four local land use plans, two of which have already been adopted by the city council. This constitutes an example of spatial management at the local government level which may define the direction of changes for downtown districts in other post-industrial cities. It serves as a good example of implementing changes for centres where both urban regeneration and resilience urban planning constitute important elements of urban policy.

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USE OF WOOD WASTE AS AGGREGATE IN MORTARS - AN EXPERIMENTAL STUDY

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ABSTRACT

The construction sector is one of the largest and most active in the world economy, being responsible for consumption of huge amounts of natural resources. Natural sand and gravel are the most important resources in construction, they are mainly used as aggregates, and its extraction often causes environmental damages. Bearing these considerations in mind, the wood waste has been used as partial replacement of natural sand in concrete and mortars to reduce the environmental burden of natural sand extraction. The aim of this paper is to characterize the physical and mechanical properties of natural hydraulic lime-based mortars proportioned with different percentages of wood wastes (0% to 30%) as replacement of natural sand. Thus, several specimens of mortar proportioned with wood wastes have been subjected to different experimental procedures, such as: workability, mechanical strength, water absorption and thermal conductivity. Results obtained showed that the incorporation of wood waste causes a reduction of mechanical resistance mostly due to the increase in open porosity, but on the other hand the thermal conductivity presents an improvement up to 83%. The results obtained are quite acceptable and encouraging for the follow-up studies using wood wastes as fine aggregate in mortars and, simultaneously, to improve the energy efficiency of buildings since this waste material contributes to obtain mortars with improved thermal performance.

ANALYSIS OF FUNCTIONAL PROGRAM OF THE BUILDING DESIGNED FOR PUPILS ON THE AUTISM SPECTRUM DISORDER: CASE STUDY OF ACLAND BURGHLEY RESOURCES CENTRE, LONDON

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ABSTRACT

The article is a case study for Acland Burghley Resources Centre designed by Christopher Beaver and GA Architects for up to 20 pupils on the autism spectrum disorder. This is the inclusive regular school for 1265 students in London, built in 2011. The small part of the building was designed according to the theory developed by Beaver for students on ASD. The school was classified in third place according to Autism ASPECTSS Scores (Mostafa, 2015, p. 67) developed by Magda Mostafa, professor at the American University of Cairo. The case study is based on the diagrams presented in the article which were prepared on the basis of project documentation and photos of the building provided by the architectural office. These materials were prepared to survey opinions of autism therapists on the impact of individual building elements on people with ASD. Pupils on the autism spectrum have problems with the perception of many stimuli such as light, acoustic, aromatic, and tactile stimuli. It is important that autistic students who cannot cope with the mainstream school have an independent part of the building with the outdoor decking, social area, learning spaces, 1 to 1 activity rooms, seating spots, and escape personal spaces. The architect designed a calm space in which students feel sensory comfort and can improve their cognitive abilities. These were achieved with indirect light, neutral colors, matte textures, and curved walls. The interdisciplinary research proves that the functional and spatial solutions which are provided in Burghley Resources Centre are appropriate for the therapeutic purpose and support the therapy.

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ARCHITECTURAL SPACE ELEMENTS CREATED UNDER WATER UNTIL 2020, BY LAKE ZAKRZÓWEK NEAR KRAKÓW

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ABSTRACT

After around 80 years, when a SCUBA (Self Contained Underwater Breathing Apparatus) equipped human is able to explore the underwater world, it has turned out that there is a new area of creative possibilities. A huge number of people dive in different places. The most obvious are natural places such as seas or lakes. Among other directions of diving activity there are also disused open-air mines flooded with water. It is clear that there are not the same number of natural attractions. The management of the diving center on Lake Zakrzówek, in order to increase the attractiveness of the site, carried out a number of underwater works. This is an old stone mine flooded with water. The maximum depth is 33 meters, but most of the architectural attractions are between 5 and 15 meters deep. The things placed there created an architectural space. Hundreds of divers have visited this place. The collection of architectural attractions was very diverse. Some things underwater were very original. There are simple structures such as: training platforms, shelters, mirrors, monuments, and some sunken things that are not architectural, such as an airplane, bus, car, and ship model. The study is a case study, describing how primitive construction activity can create an attractive underwater architectural space. Despite the very interesting natural shape of the lake bottom, the underwater architectural space was one of the greatest attractions of this place and a destination for diving trips. Presented work is the case study shows that the space built under the water in Zakrzówek was of great value as a document of the human creation in unusual conditions. Currently, the reconstruction of the border of Zakrzówek is underway. It is interesting if the architectural space will exist there, after.

IMPACT OF THE CLIMATE CHANGE ON SHORT-TERM RAINFALL INTENSITIES AND DESIGN FLOODS IN A MOUNTAINOUS BASIN IN SLOVAKIA

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ABSTRACT

The research focuses on the analysis of future changes in short-term rainfall characteristics and design floods in Hnilec River basin. The area of interest is located in Low Tatras national park in central Slovakia. The Hnilec River basin with final profile in the Stratená water gauging station (ID 8530) has the area of 67.50km^2. In the first part of the research two selected methods were used for the analysis of the future changes in short-term rainfall in the Telgárt climatological station (ID 11938). The analysis of seasonal changes was done by Burn's vector methodology, and trend testing was done by Mann-Kendall trend test. The future changes were analysed from the predicted short-term rainfall intensities using the regional climate scenario the Community Land Model. The Community Land Model was a multidisciplinary project between scientists from several working groups in the USA. The model well relates to the current processes in the atmosphere; it is a semi-pessimistic scenario with a predicted global temperature increase is about 2.9 °C by the year 2100. In the second part of the research, the empirical event-based hydrological model, SCS-CN model, which is relatively easy to use and provides satisfactory results, was applied in combination with a GIS environment to determine the design floods using the actual rainfall intensities and simulated predicted rainfall intensities from CLM scenario. Results show that there is a change in the short-term rainfall intensities characteristics for the future period. The future changes are not significant, compared to the actual and historical data. Based on the results, we can expect the increased value of design floods in the future. All the results presented can be used for water management planning and flood protection measures in the study area.

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STOCHASTIC-BASED RELIABILITY ANALYSIS OF STAINLESS STEEL BEAMS UNDER BENDING

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ABSTRACT

The use of stainless steel for bridge structures is relatively recent, 20 to 25 years. In addition to the traditional use as architectural features, guardrails and handrails, stainless steel is increasingly being used for structural components of decks or in suspension systems, as well as in anchorage components. Material savings in stainless steel structures are just as desirable as in carbon steel structures. Economical design of light and slender systems is a general trend. However, design codes and standards for new stainless steel structures are not as sophisticated as for carbon steel structures. In particular, the long-term behaviour of stainless steel in bridge systems has not been sufficiently examined. The paper presents a study of the bending resistance of a hot-rolled stainless steel EPE 80 profile, which is stressed by bending around the minor principal axis. Resistance is studied as a random output variable, which is a function of input material and geometric characteristics. The paper deals with stochastic analysis of this static resistance. The computational model is created on the basis of the finite element method using geometry and a materially nonlinear solution. Ansys software with 4-node Shell 181 element is used. The input random variables of the stainless steel are taken from previous research aimed at identifying the material mechanical properties based of experimental research of austenitic chromium-nickel stainless steel 1.4307 / AISI 304 L. Statistical analysis is performed using the Latin Hypercube Samplning method. The probability of achieving standard design resistance is estimated and compared with the reliability level in standard EN1990 given by the reliability factor beta 3.8. The article discusses the need for a larger number of samples necessary for reliable estimates of design resistances and for verification of partial reliability factors, which are a challenge for further research.

PREDICTION OF THE MONTHLY STREAM FLOWS USING ADAPTIVE-NETWORK-BASED FUZZY INFERENCE SYSTEM (ANFIS) APPROACH

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ABSTRACT

Prediction of stream flows is of great importance in designing water structures, planning water resources, development of warning system, determining the hydrological drought, irrigation management, reservoir operations, sediments transportation and energy production. Prediction of stream flows is not an easy task because it depends on many parameters. However, it can be done with adaptive neuro-fuzzy inference system (ANFIS), which is a combination of Takagi-Sugeno fuzzy inference system and neural networks. In this study, the applicability of ANFIS to predict monthly average stream flows were investigated. For this reason, the Baykan Station (No: 2610) on the Bitlis Stream, in the Tigris Basin located in the southeast part of Turkey was chosen as a case study. In the ANFIS model, the stream flows of previous months were used as inputs. The most suitable ANFIS model was chosen by dividing the inputs into 3 to 7 sub-sets, using 4 different input variations, and testing all possible membership functions. In the establishment of ANFIS model, 75% of the data (357) were used for training and 25% (119) for testing. The time periods 1970-1999 and 2000-2009 were used for training and testing, respectively. Training and testing performance of ANFIS models were compared according to error rates and determination coefficients (R^2). The model with the lowest error rate and the highest determination coefficient (R^2) was chosen as the most suitable model. As a result of the study, the model with 3-3-3 sub-sets, a hybrid learning algorithm, and 600 epochs was selected as the most suitable model. Furthermore, the results indicated that the ANFIS can be applied effectively in stream flows prediction.

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IMPACT OF REALIZATION OF PROJECTS ON RAILWAYS ON FREQUENCY OF OCCURRENCES ACCORDING TO CATEGORIES

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ABSTRACT

The modernization of railways is very important part of the development of the railway infrastructure. Projects of the reconstruction and the revitalization of railways bring, instead negative impacts in the form of the temporary limitation of the operation on tracks and quite big investment costs, a lot of positive impacts – benefits. Whereas benefits in the form of savings in operation costs, time savings and decreasing of the negative impacts on environment are commonly included into the economic analysis evaluating the economic efficiency of the project, benefits in the form of the increasing of the safety and reliability of the railway, which use to be related with the projects of modernization of railways as well, currently are not included into the economic analysis. The paper is focused on the presentation of the partial output of the project oriented on the evaluation of the increasing safety and reliability of the railway due to the realization of projects of the modernization of the railway infrastructure. The output of the paper is focused on the evaluation of real impacts of realised projects on the frequency of appearance of occurrences on the railway. The evaluation is done on the sample of 33 projects carried out in the Czech Republic and it follows the previous results of the project from the year 2020. The subject of the paper is to analyse in detail the impact of the realization of these projects respecting the classification of occurrences and to evaluate, which categories of occurrences are most connected with the decreasing of the frequency of their appearance.

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COMPARISON OF THE NEW TYPE MODULAR PANEL FOR GREEN ROOFS AND CLASSICAL CONSTRUCTION OF GREEN ROOFS BY STORMWATER MANAGEMENT

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ABSTRACT

Proper stormwater management is one of the main problems cities today face. In order to understand how to properly manage urban stormwater it is first necessary to construct roofs with new construction methods. The first step for controlling urban stormwater is the construction of green roofs. We already know that the construction of green roofs improves water management in cities. But can we make it better? What will happen if we use the same layers for the green roofs but with a different construction method? This article wants to answer these questions. In this article the two green roofs, differing in the construction method, are compared and contrasted in terms of stormwater management. One of the green roofs was built traditionally, while the other has been built using a new type of modular panel. The article then compares their results during laboratory tests. In the conclusion you can read about measured data from tests and possible solutions and development of solutions to improve green roofs in the future.

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PHOTOVOLTAIC SYSTEMS INTEGRATION RULES AND RESTRICTIONS IN THE HISTORIC BUILDINGS ARCHITECTURE

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ABSTRACT

Solar photovoltaic systems integration into historic buildings can change significantly the expenses and energy consumption balance in the most energy-unfavourable urban planning segment. A major challenge of renewable energy sources integration is historical buildings value and aesthetics preservation, subject to present legislation compliance and legacy preservation policies. This publication evaluates the solar photovoltaic systems integration in the scope of finding consistency between legal and aesthetic restrictions. Our state strives to integrate rapidly into the European community. In the near future, it is necessary for us to adopt a series of Decisions of the European community to improve the building efficiency, both modern and historical, and increase the share of renewable energy sources in them. The historical environment is extremely sensitive to any disharmonious influences. The legislation of Ukraine on cultural heritage conservation is mainly aimed at protective (restrictive and prohibitive) rules, without providing sufficient stimulant (incentive) provisions, and does not offer a complete classification by historical and cultural value. The conservation status, by the decision of the Cabinet of Ministers of Ukraine, is granted to architectural monuments when introducing in the register of monuments of the cultural heritage of national and local significance. The overwhelming majority of historical buildings which are not monuments, but create a "traditional nature of the environment" and the basis for discovering new monuments are beyond all classifications. This "partial" acceptance of value makes the task of solar photovoltaic (SPV) systems integration extremely difficult. The publication investigates the possibility of solar photovoltaic systems integration based on the value degree of historical territories and buildings. Based on the own preformed classification of buildings and territories of a conventional historical area by historical and cultural value, to determine the rules and restrictions on SPV systems integration. To set requirements and conditions of their integration into buildings of different value categories.

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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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WATER CONSERVATION IN NEPAL

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ABSTRACT

Since the last decade Kathmandu has been immensely crowded by the high number of populations migrating within the country from different places. One of the major issues in Kathmandu valley today is water management. Nepal, is considered the second richest country for water in the world. 8.4% of the population of Nepal (2015) does not have access to safe drinking water. Nepal has high annual rainfall of 1200 millimeters, but still faces substantial challenges in ensuring water security. The main purpose of the new design for the Sport and Recreation Center project is to conserve the water by reuse, recycling and systematic utilization of water to create a sustainable water efficient building and site. The research literature indicates the feasible way to fulfill water needs is by using rainwater harvesting systems in the center. Nepal historically has has *rajkulos, canals, manmade ponds and sunken water conduits* which are among the oldest techniques of maintaining the water supply. In the Sport and Recreation Center design historic techniques have been combined with rain gardens, ponds for ground water recharge, pervious pavements, and grate inlets in order to manage the storm water on the site. Also, treating the grey water through the Reed Bed Treatment System can help and conserve water for the site and project. In the landscape design, specific native plants will be used that conserve water. The buildings will have low flush and composting toilets, sensored taps, rainwater collections and use. Overall, with the conservation of water on the site and creating a water saving building design this can be one of the most effective ways to promote other public buildings to do the same, so that the people can have adequate residential drinking water. This can help to reduce the scarcity of water as a whole in the society and teach us to use the rainwater and grey water in a more efficient way in all future new projects.

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THE FUTURE OF LARGE PANEL BUILDINGS ASSESSED USING BPS TOOLS

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ABSTRACT

In the EU the residential sector amounts to approx. 25% of the final energy consumption therefore all existing buildings require upgrade to the highest energy performance standard. The aging word-wide stock of Large Panel System (LPS) buildings is a major contributor to power usage and the deep thermal retrofit might not only bring them the new lease of life but also significantly reduce the energy demand. The BPS tools provide a good analytical tool for virtual testing of technical solutions before implementation thus providing the projected energy savings and estimated refurbishment cost. The research compares the available simulation software for the purpose of modelling and assessing the existing building rather than new development. The 3D model created in BIM technology is built from Large Panel elements, therefore the software provides the schedule of original elements used. The research investigated the future possible uses of such a database with geolocation annotated for all elements. The research concludes that the BPS is a good tool for implementation the most cost-effective policy of retro-fitting the LPS buildings while the BIM software can be used for the recycling of reinforced concrete panel elements during possible future demolition projects.

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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HYDROLOGIC PERFORMANCE OF EXPERIMENTAL GREEN ROOFS STANDS AS THE EFFECT OF CLIMATE CONDITION

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ABSTRACT

The water storage capacity of a green roof forms several benefits for the building and its environment. The hydrologic performance is traditionally expressed by the runoff coefficient, according to international guidelines and standards. The runoff coefficient is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land). The paper is presenting 3 experimental stands of green roofs. Each stand is unique in terms of its construction. The aim of this paper is to highlight how green roof responds to real clima events. The experiment provides mathematical graphs and behaviour of the geen roof stands from 03/2019 to 03/2020.

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A METHOD OF MONITORING THE CROSS-SECTION DEFORMATION OF TUNNELS USING THE STRAIN DATA FROM THE FULLY DISTRIBUTED OPTICAL FIBER SENSORS

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ABSTRACT

Fully distributed optical fiber sensing technology allows the high-density strain to measure the overall curvature and cross-section deformation of tunnels. However, there are few studies on the use of longitudinal strain along the tunnel to measure the cross-section convergence deformation, and the method of obtaining the strain along the tunnel loop is costly. To address this issue, a method of monitoring the cross-section deformation of tunnels using the strain data is proposed. First, a model of the relationship between strain and deformation in tunnels is constructed to obtain the overall settlement using the longitudinal strain. Second, based on the finite element method (FEM), the deformation law about the strain measured points and non-measured points on the cross-section of the tunnel is proposed, and on this basis, the correlation coefficient is presented. Using the product of overall settlement and correlation coefficient, the cross-section deformation at non-measured points is obtained. The results of numerical examples shown that the proposed method can effectively expand the monitoring scale and realize high-density cross-section deformation measurement of tunnels.

Corresponding Author: Yang Liu

RESEARCH ON THE PRESENT SITUATION AND DEVELOPMENT TREND OF SUBWAY TUNNEL INSPECTION VEHICLE

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ABSTRACT

For the operational subway tunnel, the manual inspection accounts for the majority in terms of detecting the diseases and damage of tunnel. The accuracy of manual inspection mainly depends on the professional level of the detection personnel, and the whole detection process always is inefficient, which cannot meet the needs of actual tunnels. To address this issue, the intelligent mobile tunnel detection vehicle emerges as the times require. By using advanced technologies such as laser scanning and high-speed camera array, the subway tunnel detection vehicle has achieved the advantages of simple operation, comprehensive function and automatic detection. However, the current subway tunnel detection vehicle mainly realizes the scanning detection of tunnel surface diseases, and the detection of tunnel structural diseases is less involved. Based on the track and tunnel detection requirements, this study analyzes the current situation and existing problems of subway tunnel detection comprehensively, puts forward the development direction of tunnel structure detection, and the application prospect of intelligent detection vehicle in subway tunnel is prospected.

Corresponding Author: Yang Liu

ADVANCES IN VIBRATION-BASED SCOUR MONITORING FOR BRIDGE FOUNDATIONS

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ABSTRACT

Scouring around bridge foundations is one of the main factors causing structural damage of bridges. Traditional scour monitoring techniques generally require a large number of sensing devices set up underwater, which is difficult to be implemented for actual bridges. To address this issue, scour monitoring technology based on structural vibrations is paid attention gradually, because this technique can work well with less equipment and can be free from the influence of the submerged environment. This study presents a systematic summary and analysis of the selection of scour indicators, sensor deployment principles and other related research involved in scour monitoring technology based on structural vibration. On this basis, the research status of the bridge scour monitoring method based on vehicle excitation is further summarized. Finally, the prospects for the application of vibration-based bridge foundation scour monitoring technology are presented, discussing the technologies that are currently missing and urgently needed for this monitoring method and the challenges faced today.

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CONSERVATION OF HISTORICAL BUILDINGS IN KUALA LUMPUR: THE ECONOMIC ANALYSIS

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ABSTRACT

The paper reveals some answers pertaining to the relationships between the economic aspect and conservation activities in Kuala Lumpur. The main aim of this research is to determine if there is correlation between economic growths with the conservation of historical buildings in Kuala Lumpur. In addition, this research is also undertaken to determine the locations and types of conservation projects proposed in the city in relation to economic aspect. Specifically, it covers the locations and types of conservation and redevelopment of historical buildings in Kuala Lumpur from 1993 until 2007, a period that spans two economic growth cycles of the Malaysian economy. The research has been focused on the old parts of the Kuala Lumpur city centre as outlined in the 'Garispanduan Pengekalan Bangunan Di Dalam Kawasan Pusat Bandar Kuala Lumpur' published by the Kuala Lumpur City Hall in 1996. These parts of the city cover among others areas along Jalan Petaling, Jalan Tun HS Lee, Jalan Tuanku Abdul Rahman, Jalan Sultan, Jalan Tun Perak and Jalan Ipoh. The numerical data collected has been analysed using descriptive statistics. A correlation between the economic growth data with the number and estimated costs of the conservation and redevelopment projects is then identified through graphic comparison and scatter plot diagram. The strength of the relationship is measured by the coefficient of correlation. Sources that have been used to identify the possible reasons that could explain the correlation have also been analysed. The research has produced a few findings. Firstly, there is a correlation between economic growth and the conservation of historical buildings in the areas of study in Kuala Lumpur. This finding suggests that economic expansion and contraction have had certain influence on the conservation of historical buildings there. However, through charts comparison, scatter plot diagram and correlation coefficient, it could be concluded that the correlation is a weak one. As a result, it is difficult for the finding to be used as the general indicator applicable to other areas in the city, let alone the country. In addition, this finding is only applicable to the areas of study within the period of 1993 until 2007. Secondly, the research has also identified that a negative economic growth would hamper the conservation of historical buildings there. However, the relationship is also weak thus could be explored more in future research undertakings. Finally, another significant finding is that all of the conservation works proposed are driven by the private sector.

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DRYSTONE WALLS IN THE ALGARVE, PORTUGAL CHARACTERIZATION AND INTERCONNECTION WITH THE GEOLOGY AND LITHOLOGY

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ABSTRACT

Drystone walls can be frequently observed along the Algarve, south region of Portugal, performing both support and property division. This region is also known by its geological diversity and, consequently, lithology, which are intimately related to the orography and therefore to a subsistence type of agriculture, including the silvopastoral system. The combination of all these factors allowed the proliferation of this traditional drystone walls during the last centuries, and they represent not only an important element of the landscape, but also a perspective of the social, economic and technical bases of our heritage. This article intends to present this diversity and the relationship between its various facets. In order to achieve the objectives, several field surveys were carried out to different geological zones, with the intention of gathering information related to the natural material used, its construction technique, as well as interaction with local inhabitants. These visits were supported by bibliographic and “Web-graphic” research, to substantiate the hypotheses. Based on the data results it is possible to identify a close interconnection between the geology and wall structure typology, since they are made with the natural rock fragments (raw material) found nearby. However, its function is more related to the orogeny and lithology, the latter defining the type of agricultural culture. The study is enriched by the enormous diversity of rock types, although the Algarve is a relatively small region. The main limitations found during the development of the study are related to the physical access to the walls and the interviews with the locals. The first brought some challenges since the abandonment of the rural areas and subsistence agriculture, lead to a lack of land maintenance, allowing vegetation to invade and destroy walls, and therefore masked them among the chaotic vegetation. In order to overcome this limitation, “Google Earth” was occasionally used, which proved to be a valuable tool. The second limitation was due to the pandemic situation brought by the COVID-19 virus, preventing the oral inquiries. In view of the scarcity of bibliographic elements associated with this subject, in the studied territory, the elaboration of documents that allow the identification, characterization, geo-location and dissemination of the object of study, is considered as an asset for this theme. Last but not least, the study aims to alert and counter the tendency to abandon this type of heritage, valuing it and making it known.

Corresponding Author: Ada Feroldi

ADAPTATION AND REVITALIZATION OF INDUSTRIAL FACILITIES INTERIORS ON AN EXAMPLE OF A BUILDING OF 'THE OLD POWER PLANT BIALYSTOK'

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ABSTRACT

The topic discussed in the article concerns adaptation of the interior of the Old Power Plant Bialystok building to a museum space related to transport. The justification for taking up the topic is paying attention to the unique aesthetic values of post-production elements of interior infrastructure with a view to giving them a new architectural spirit. The idea behind this issue concerns the possibility of constructing a coherent composition, showing contrasting aspects: historical and modern, relating to both museum facilities and exhibits on display. The aim is therefore to show the creation of a new public space that is an interesting alternative to classic museums. Numerous functional and spatial changes, created during many years of exploitation, lead to a kind of chaos inside buildings, which was observed on the example of the interior in question. In the era of globalization, industrial development and as a result of urban processes, the buildings that used to be centers of economic development, today have been absorbed and surrounded by urban fabric. Deserted and devoid of its original function, they deteriorate, giving the image of breaking the emotional ties with the achievements, which were a priority for our ancestors. Attention should be paid to losing the authenticity of building interiors and extracting the essence of industrial beauty, which should be emphasized in accordance with the implementation concept. Cultural heritage has not only a material but also a sentimental dimension. Creative activities within the historic structure should be carried out with full respect for the existing structure, taking into account the overriding issue, that each interference affects the original form in the existing spatial arrangement.

Corresponding Author: Kinga Palus

PARAMETRIC STUDY OF CONCRETE MEMBERS WITH GFRP REINFORCEMENT SUBJECTED TO BENDING AND AXIAL FORCE

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ABSTRACT

The paper deals with the possible replacement of steel reinforcement by GFRP reinforcement for concrete elements subjected to bending moment and compressive axial force. For the last 15 years, Fibre Reinforced Polymer (FRP) bars became more popular and commercially available as reinforcement for concrete elements. Composite FRP materials are still new in construction and many engineers are not familiar with their properties and characteristics. FRP has certain advantages over steel reinforcement. It is a durable material that is not subject to corrosion, does not conduct heat, is an electrical insulator and conducts electrical current, and is non-magnetic. In contrast, FRP also has certain deficiencies such as sensitivity to higher temperatures, alkaline environments, and reduction of mechanical properties at high levels of long-term stress. In the case of FRP reinforcements, the plastic branch is missing in the σ-ε diagrams, what leads to a sudden failure of the reinforced concrete element, either by tensile rupture of the reinforcement or by crushing the concrete. The most used FRP reinforcement is made of glass fibres - GFRP reinforcement. The paper deals with the possible replacement of steel reinforcement by GFRP reinforcement for slab and beam elements. The text describes a parametric study for different reinforcement ratio with GFRP reinforcement and steel reinforcement. The study is performed for a cross-section of 400x400 mm for a column element and a cross-section of 1000x300 mm for a slab element. The effect of longitudinal GFRP reinforcement in elements under compression was investigated. The study contains a comparison of P-M diagrams of concrete elements with steel and GFRP reinforcement. For design of GFRP reinforced concrete elements, it is necessary to consider different material characteristics such as tensile strength and modulus of elasticity. The contribution of the GFRP reinforcement in compression was neglected due to the anisotropic nature of the GFRP reinforcement and the low modulus of elasticity. The main reference basis for the elaboration of a parametric study is the fib Bulletin No. 40.

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SHEAR ASSESSMENT OF EXISTING PRESTRESSED BOX GIRDER BRIDGES

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ABSTRACT

The paper deals with the shear assessment of existing prestressed concrete box-girder bridges. Mainly focuses on the historical development of technical standards used in the design of prestressed concrete road bridges in the Slovak Republic. The standards for bridge design have been amended several times. A parametric study was performed on a model post-tensioned concrete bridge with a box-girder cross-section, which compares the internal forces along the length of the bridge using various standards and technical regulations., The differences in design principles and shear capacity were investigated while the amount and geometry of the longitudinal prestressing of the bridge were the same for all cases. Case of study is a road three-span post-tensioned concrete bridge with a main span of 50 m and end spans of 40 m. The single box-girder cross section height is constant of 2.5 m. The bridge is straight without any curvature in the horizontal plane. The thickness of the bottom slab is variable near the inner supports. The prestressing is formed by 19-strands tendons with a strand diameter of 15.7 mm with a polygonal cable geometry. The numerical model is considered as a beam element with neglecting of the torsional effects of the load. The parametric study points out the differences in the internal forces with use of different design regulations and standards. It also focuses on the shear resistance of the walls of the box-girder cross-section of the bridge. Differences in design methods are presented by the required area of shear reinforcement in the wall of box cross-section. The aim of the study is to point out the historical development of design from the point of view of shear resistance of prestressed bridges. When assessing existing older bridges and trying to achieve reliability according to the current Eurocodes, there is subsequently a requirement for additional shear reinforcement.

Corresponding Author: Jaroslav Baran

ANALYSIS OF CONSTRUCTION SUB-PROCESSES FOR EVALUATING THE ACTUAL PERFORMANCE OF TOWER CRANES

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ABSTRACT

Labor productivity in construction production is primarily dependent on the efficient deployment and use of construction machinery. However, the actual performance of construction machinery is not stated by the producer, as it is difficult to determine due to the dependence on the specific construction conditions. One of the essential machines in the building construction, providing secondary transport of material on a construction site, is tower cranes. To evaluate the effective use of these machines on a construction site, using a deterministic or stochastic approach, one needs to prepare a relatively extensive and accurate set of data describing the operation of a specific tower crane. The data express the real requirements of ongoing constituent construction processes for the use of tower cranes. This article deals with the analysis of crucial construction sub-processes in the construction of reinforced concrete monolithic buildings in relationship with the secondary transport on the construction site. In particular, it describes the preparation and processing of these data to evaluate the actual time requirements for tower cranes.

Corresponding Author: Rostislav Doubek

A DESIGN APPROACH AS A POSSIBLE ORGANIZATION OF PUBLIC SPACES IN EMERGENCY AREAS

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ABSTRACT

The paper tries to identify, through strategic design axes, some areas in emergency contexts to locate collective spaces serving the local population, such as schools, community centres and spaces for aggregation. These public places have the purpose of regenerating the surrounding context by improving the quality of life and above all by strengthening the identity of the place through social and cultural spaces that the community identifies as landmarks of the settlement fabric. Through the analysis of some case studies in East Africa and the Middle East, the research tries to highlight some infrastructural axes which to locate permanent public services by reducing the distances between inhabited areas and primary services. The aim is to link the scattered and fragmented settlements in the territory without identity, with an axis of public services that could accommodate more functions and at the same time increase their size according to the needs of the local community. A design approach allows these areas to be developed strategically with a new configuration of services along certain infrastructural axes. A well-managed and effective regeneration of these areas in emergency contexts is essential to strengthening the identity of the place. The comparison of case studies in the selected emergency areas could represent an opportunity to rethink the planning of services in emergency areas to provide guidelines for practitioners involved in these particular contexts. And once again the paper wants to demonstrate how an architectural approach can solve a possible organization of spaces within fragmented contexts.

Corresponding Author: Letizia Cattani

DIY HOUSE: AUTHORS' PROJECT CASE STUDY

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ABSTRACT

Self-building a house constitutes merely a margin of investors' and designers' choice. Nowadays, building process is largely professionalized and industrialized, making investors very rarely want to participate in it. Nevertheless, a self-building direction in designers' and investors' research exists, with the Segals Method being used for decades as one of the examples. Self-building methods entail the necessity of developing a technology accessible by non-professionals. One of the challenges in that area could be DIY houses – designed for self-assembly and delivered in a complete package to the building site. Using the research by design method the authors of this publication present and analize an original design concept of a small DIY house. Wooden construction building uses original solutions in terms of the choice of materials and putting them together into more complex systems, allowing an assembly by no more than 2 people. The specific nature of design solution includes simplification of building solutions, developing a technology that allows easy assembly, minimalizing the risk of faulty assembly, and application of modern digital material processing for producing precise and repetitive elements. The design applies Mideuropean conditions (Poland). Following the concept presentation, the authors discuss the advantages and drawbacks, and compare it with other examples of similar type. They emphasize the economic aspects, satisfaction from self-building and an emotional connection with the place of inhabitancy.

Corresponding Author: Stanisław Kempa

INFLUENCE OF VENTILATION HABITS ON INDOOR AIR QUALITY IN MULTI-FAMILY DWELLINGS IN MADRID

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ABSTRACT

People spend most of their time inside residential buildings; therefore, it is essential to maintain good air quality (IAQ). It is necessary to provide an adequate ventilation rate in these spaces (low occupancy density) taking into account that materials (finishes and furnishings) are one of the main sources of indoor pollution. For that purpose, this research has been based on data from 4 dwellings in different areas of the city of Madrid in which measurements of formaldehyde, TVOC, CO2 and ventilation habits were taken. It shows the influence of materials, habits, threshold of pollution concentration in the calculation of a ventilation rate that guarantees a good IAQ. This study also reflects the need to meet an overall TVOC pollution concentration threshold, below which a safe level of indoor pollution exposure is obtained.

Corresponding Author: Eduardo López-Fernández

VERTICAL ELEMENTS IN ARCHITECTURE – CHARACTERISTICS OF MINARETS BUILT DURING THE OTTOMAN PERIOD IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Our built environment include variety of elements among which vertical elements are usually observed as an accent or dominating structure. The reason for their construction could have been derived from different cultural identities, ideologies, beliefs, even as a sign of prestige and power. In observing religious buildings throughout history, it is possible to find common essence or attitude in architectural expression, such as calamity and harmony of architectural elements. In close observation however, there could be seen vertical dominants, such as minarets of mosques, towers of churches and cathedrals etc. This paper aims to discuss importance of minarets in contribution to the local architectural vocabulary, as well as structural peculiarity of these specific vertical elements. In particularly, focus of this research is on minarets of Bosnia and Herzegovina built during Ottoman period (15th-19th century). They could have been built as squared, polygonal, rounded, made of wood or stone. Accordingly, their structural behaviors depended on material selection, form (geometry) and height. Finally, these structures reflect mastering in constructing slender vertical architectural elements of the time and space in which they were built.

Corresponding Author: Amir Causevic

TIO_2 COATING ON COTTON FABRICS WITH APPLICATION IN BACTERIAL INACTIVATION AND SELF-CLEANING FOR POTENTIAL USE IN BUILDING FACADES

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ABSTRACT

Titanium dioxide (TiO_2) is considered one of the most used catalysts because of its non-toxicity, low price, biocompatibility, and photocatalytic activity. TiO_2 can degrade contaminants and has self-cleaning and bacterial inactivation properties. These properties implemented in different construction materials, used in building facades, such covering fabrics, would allow generating surfaces with potential application in self-cleaning and antibacterial civil structures. Currently, textile facades are part of the global trends in architecture and construction. The fabrics modified with TiO_2 have been applied in bacterial inactivation, pollutant degradation and self-cleaning processes, but their potential implementation in large-scale processes is still emerging such as in the construction industry. TiO_2-coated on cotton fabrics prepared by spin coating with TiO_2 Degussa P25 (TiO_2/Cotton Fabrics) and its application in self-cleaning and bacterial inactivation is reported hereby. Spin coating method, that is widely used on smooth surfaces, was implemented in spin-coating deposition of TiO_2 Degussa P-25 on rough cotton fabrics. Rotation process was made using horizontal rotation at 1000, 2000, and 3000 rpm for 25 s. TiO_2/Cotton fabrics were characterized by SEM, HRTEM, EDS, ATR-FTIR, UV/Vis, DRS, and XRF. Self-cleaning performance of the TiO_2/Cotton fabrics under simulated solar light was evaluated in bacterial inactivation of E. coli and the discolouring of wine stains. E. coli was inactivated within 90 min of irradiation, after that there was not re-growth in the dark. On the other hand, TiO_2/Cotton fabrics prepared at 1000 rpm had the best behaviour in removing the stain through the photoinduced processes. Stable performance of the coated fabrics was confirmed by repetitive cycles of self-cleaning and bacterial inactivation processes. The TiO_2 spin coating on rough cotton produced a material effective in the discoloration of the stain and bacterial inactivation, making them fabrics with potential application in cladding facades.

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MECHANICAL BEHAVIOR OF A RESIDUAL SOIL FROM IGNINBRITO ROCK OF SÃO MIGUEL ISLAND – AZORES

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ABSTRACT

Azores consists of nine islands and several islets, located in the North Atlantic to 1600 km from Continental Portugal and is distributed between latitudes 36º 55' to 39º 43' N and longitude 24º 46' to 31º 16' W. Azores archipelago is in a convergence zone of a series of dynamic tectonic structures, that are responsible for seismicity and volcanism, geological and petrological of these islands. The island of São Miguel, an eastern group, in addition to other petrology's in its geology, has ignimbrite, which is a pyroclastic rock with a dacitic or rhyolitic composition, resulting from the deposition of materials in semi-melting at high temperatures from a pyroclastic flow. At the site of Olhos d'Água, the residual soil sample resulting from the ignimbrite alteration was taken and was evaluated with the interest of studying its application or use as construction material. The soil was subjected to physical and chemical classification test, compressibility, and stress-strain behaviour. This material shows good mechanical characteristics, although its chemism is potentially corrosive.

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SHRINKAGE AND DURABILITY OF CEMENT MORTARS WITH RECYCLED AGGREGATES

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ABSTRACT

In recent years, the rapid growth of economy and urbanization process in China resulted in the massive construction and demolition (C&DW). The reutilization of C&DW as recycled aggregates (RA) fully or partially to replace natural aggregates is an effective way to solve the environmental and economic problems caused by C&DW. The properties of cement mortars could be influenced by recycled fine aggregates due to their high absorption and the quantity of fine particles. This paper presents the main results of the research to explore the effect of recycled aggregate (RA) on shrinkage and durability properties of masonry mortars. Four strength levels of mortars were designed to be M5, M10, M15 and M20. The percentage of replacement of natural aggregate by RA was controlled at 0%, 30%, 50%, 70% and 100%. The shrinkage, the water loss, the water absorption and the freeze-thaw resistance were measured to evaluate the properties of mortars, and the SEM analyzation was carried out to study the microstructure of mortars. Some conclusions have been found based on results of experiments. The shrinkage and the water loss increased when the replacement percentage of RA increased in all strength levels mortars. The water absorption of mortars increased with the increasing of RA content either. A better freeze-thaw resistance of mortars with higher RA replacement percentage and higher strength level was presented, and the maximum freeze-thaw cycles reached to 75 cycles. More microcracks were found in interfacial transition zone (ITZ) in mortars with high replacement percentage of RA, resulting in the weak ITZ.

Corresponding Author: Wencui Yang

LANDSLIDE TYPE MUDFLOWS BEHAVIOR: PHYSICAL AND NUMERICAL MODELING

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ABSTRACT

Landslides constitute one of the natural phenomena that cause the most economic losses and deaths worldwide. After failure occurs, landslides can trigger mudflows. Understanding how mud is transported is very important in infrastructure projects that coincide with hillside areas due to the high risk of this phenomena occurring due to the high slopes, which can imply high risks and produce disasters, generating great costs. In this work, the evaluation of a mudflow is presented, from the execution of a scale experiment in the laboratory and its validation from numerical models, considering two material behaviour: as a Newtonian fluid and as a non-Newtonian fluid. The physical model was developed through a channel with dimensions 3m long, 0.5m high and 0.7m width, with slope control, and a mud composed of a silty material with 60% of moisture. Experimental tests were made with slopes of 5% and 10%. During the experimental test, deposition lengths and heights was measured after mudflow transited through the channel surface. The numerical models were carried out in ANSYS FLUENT software. First, the numerical model was calibrated with the results of the physical model with a slope of 5% and it was validated with the results of the model for the slope of 10%. Results of the numerical models were compared with the experimental results, and they have shown that these have a great capacity to reproduce what is observed experimentally. In addition, when the material was considerate as a Newtonian fluid, a similar behavior was found respect to a mudflow as a non-Newtonian fluid.

Corresponding Author: Fredy Alexander Muñoz Cano

LAND USE READJUSTMENT FOR ROI ET GOVERNMENT CENTRE, THAILAND

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ABSTRACT

Roi Et Provincial Government Centre was established in 1970, comprising a city hall, a courthouse, and a police station. Later, as the city has been growing, the government center extends its premises. However, a land-use plan for the government center has not been developed yet. Therefore, the center had several problems, such as insufficient parking spaces, a flawed drainage system, and infrastructure management. Therefore, the land use readjustment plan aims to allocate the best use of land available and plan the future uses on the existing site, with the proposed concept of passive environmental design. The new land use is planned for the number of working areas estimated for the future services. According to an urban design process, the design process is carried out that focuses on listening to stakeholders, who are mainly the government officers working in the government center. Two meetings are set up for the representative agents as the stakeholders. The first meeting is to receive the required assets, and the second meeting is the review and feedback process. The users' requirement has been obtained and focuses on sharing pulled resources. The concept of passive environmental design has been used due to the area is in a tropical climate. The land-use readjustment design promotes local identity and the pedestrian network, linking to the surrounding areas of the city, the large natural reservoir. It promotes the built environmental design with the sense of identity of an ancient Khmer city that influences the urban landscape style in Thailand's north-eastern region.

Corresponding Author: Supagtra Suthasupa

REDEVELOPMENT OF HUAI KHWANG HOUSING PROJECT RESPONSIVE TO USERS' SPATIAL BEHAVIORS

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ABSTRACT

Huai Khwang Housing is a public residential project. It was developed since 1972, located in the land which was called a fringe of Bangkok at that time. Through times the city has been expanding so now Huai Khwang Housing turns to be in the center of the city. There is a subway station 400 meters away from the site; therefore, the land value and potentials of this housing project has been greatly increased. However, the physical conditions of the buildings are rather rundown since they have been utilizing for more than 50 years, resulting the low quality of life of the residents, the tenants of this housing project. National Housing Authority of Thailand, the owner of this residence, has a plan to redevelop this housing project. The primary public hearing was set to inform the community about the future changes and intend to receive opinions from the residents. It is noted that most of the tenants are elderlies who have been residing in this community since it was built. Therefore, the behavior of elderly is of interest in this study. As such, this paper aims to investigate the behavior of elderly residents in Huai Khwang Housing, in terms of spatial behaviors in their daily lives. The methods used include interviews with the residents and observation their housing units. The results show that the housing units are used in multi functions, storage areas are greatly needed, a smell-locked and partitioning cooking area is required, a ventilating and sun-drying area for laundry is needed, and spaces for air-conditioning units as well as satellite discs and washing machines are required. It is suggested that the redevelopment housing scheme should meet these requirements.

Corresponding Author: Supagtra Suthasupa

BUILDING´S HEAT POTENTIAL ON RESOURCES IN RESPECT OF A CO2 AND PRIMARY ENERGY EMISSIONS REDUCTION (CASE STUDY)

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ABSTRACT

The renewable energy is proved to be commercially viable for a growing list of consumers and uses. The renewable energy technologies provide many benefits that go well beyond the energy alone. More and more, the renewable energies contribute to the three pillars of the sustainable development in the economy, environment and the society. Several renewable energy technologies are established in world markets, building global industries and infrastructures. Other renewable become competitive in growing markets, and some are widely recognized as the lowest cost option for stand-alone and off grid applications. An increased utilization of renewable energy sources in the heat and electricity generation is one of priority tasks of the Slovak Republic to boost the use of domestic energy potential and thus to decrease the Slovakia's dependence on imported fossil fuels. Heat pumps offer the most energy-efficient way to provide heating (central and water heating) and cooling in many applications, as they can use renewable heat sources in our surroundings. It is argued that heat pumps are very energy efficient, and therefore environmentally benign. Within good conditions the energy from low-positional heat, in other way unusable, is used for the price of supplied energy for heat pump performance. The article determines applicability of this system supports utilization of electric energy low tariff rate, which is also valid for the other electrical appliances for long term studied administrative building in the Kosice. From the balances and comparison of the actual operation of the studied building it is possible to confirm the advantage of the application of the heat pump water-water to the energy supply system. Under favorable technical conditions in a heat supply system and suitable application, it becomes the most advantageous solution in achieving: minimum emission production, combined with investment and low operating costs, and achieving human thermal comfort. The application of the system also in the cooling process, where in combination with a suitable heating-cooling system, the convenience increases. According to the capillary mat system balances, a year-round heating factor of COP = 5.5 (5.5-fold primary electricity recovery) can be achieved. In heating mode (low temperature heating 30/28 ° C with COP = 5,0) and in cooling mode (cooling with a temperature of 18/20 ° C at COP = 14, no heat pump operation, only at the cost of pumping work to transport cold water from source-well).

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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, 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 environmentally 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 by 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 pollution in the area contain a petroleum refinery, 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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THE STUDY OF THE PROPERTIES OF ROAD BASE MATERIAL WITH RECYCLED AGGREGATE UNDER THE MEDIAN VALUE OF STANDARD GRADATION

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ABSTRACT

In recent decades, with the development of society and economy, a lot of new buildings and constructions are built, while many old buildings are constantly demolished. Therefore, how to use the construction waste becomes a big global problem. It is an effective way to reuse construction waste as aggregate when constructing new buildings or roads. In this paper, the effect of recycled aggregates with median value on the properties of road base materials was studied. The natural aggregate was replaced by recycled concrete aggregate with the replacement of 25%, 50% and 75% by volume. At the same time the natural aggregate was replaced by recycled clay brick with the replacement of 5%, 10%, 15% and 30% by volume. In addition, the aggregates of the road base materials were replaced by all the recycled aggregates which composed of recycled concrete and recycled clay brick in different proportions. The maximum dry density, the optimal moisture content, the unconfined compressive strength and the drying shrinkage were investigated for road base materials. It was shown that the optimal moisture content would be increased with increasing the replacement of recycled aggregate, while the maximum dry density would be decreased. The recycled aggregate could improve the 7-day unconfined compressive strength and decrease the drying shrinkage of the road base material within a certain replacement percent. When the aggregates were replaced by all the recycled aggregate, with increasing of the replacement of recycled clay brick, the 7-day unconfined compressive strength would be decreased and the drying shrinkage would be increased.

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MECHANICAL PROPERTIES OF GROUT MATERIAL WITH RECYCLED AGGREGATE AT DIFFERET TEMPERATURE

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ABSTRACT

In recent years, more and more waste materials are produced by the construction and demolition industry. The amount of the waste materials has reached an unacceptable level from an environmental, economic and social point of view. Therefore, the reutilization of the waste material has become the hot area of research. For now, using the waste material to produce recycled aggregate of cement-based materials is an effective way to reuse it, since the cement-based materials are the most widely used construction materials in the world. This paper reports on a study with the aim to investigate the fluidity, the flexural strength and the compressive strength of grout materials with recycled fine aggregate at 20°C, 30°C and 40°C. Three water cement ratios of grout materials were designed to be 0.29, 0.37, and 0.45. The dosage of recycled fine aggregate was 0, 25% and 50% for every water cement ratio. The results showed that both the initial fluidity and the fluidity after 30 min of grout material were decreased when the dosage of recycled fine aggregate or the temperature was increased. The dosage of recycled fine aggregate had no significant effect on both the flexural strength and the compressive strength of grout material at 20°C.The flexural strength at the age of 28d decreased when the dosage of recycled sand was 50% at 40°C. The compressive strength at the age of 3d and 28d decreased when the dosage of recycled sand was 50% at 40°C.

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CITIES ON CIRCULAR ECONOMY: URBAN STRATEGIES BASED ON THE STUDY OF PIONEERING LOCAL EXPERIENCES

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ABSTRACT

Today's society is in a critical situation: the prevailing linear model of the economy has led to an overexploitation of natural resources, and it has generated environmental impacts that affect the health of all living beings. An economic model of a cyclical nature, or circular economy, is presented as a solution in this situation. This form of economy facilitates the optimization of the useful life of materials, reducing the environmental impact, allowing products and materials to retain their value throughout the production and use cycle. The main purpose of this work is to identify urban strategies carried out by local experiences in pioneering cities that are actively committed to the development of a circular economy as an economic model of society. Cases such as Amsterdam, London, Paris or Milan stand out. The ultimate goal is to show examples that can inspire other cities and local governments to implement measures towards this new model of economy and urban development. The study of local cases throughout the strategies carried out has made possible to establish relationships between the different experiences analysed and to identify the areas with the greatest development and those in which there is less experience. Efficient waste management is one of the most explored areas and where a greater number of local initiatives have been identified. But alongside this, there are other areas that need to be explored: the efficient management of water resources, energy, or food in the city. In response to these, some urban strategies stand out: regeneration of public spaces, sustainable mobility infrastructures, renaturation of urban environments, urban limits, integration of pre-existences, citizen participation and governance are some of them. The contribution of the work focuses on the identification and classification of a whole series of urban strategies already implemented for their possible transfer to other environments.

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OPTIMIZING BIDDING STRATEGY OF THE ROADWAY PROJECTS – AN APPLICATION OF UTILITY FUNCTION THEORY

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ABSTRACT

Developed countries started "cost/time bidding" (A+B bidding) in the late 1980s and began to be frequently used in the early 1990s which in principle differed from traditional bidding method strategies. The "A+B" bid method is determined by the lowest combined bid. Contractors must greatly shorten construction time to be able to win bidding competitions. However, the risk under the shortened duration of construction increased rapidly. For this reason, it is important to propose a bidding strategy to acquire the best composition of construction cost and time. This research targeted contractors with a questionnaire regarding A+B bidding in Taiwan by applied “Utility Function Theory” to construct a decision model of the best construction cost and time. It was found that the optimal profit regressed from the modified utility function differs from contractors’ preliminary bids. In the situation that the difference in basic profits is not large, contractors can set up a decision maker’s utility function based on their ability to take risks and simulate the major competitors based on experience to judge the potential success and risk from shortening the construction time. The initial decision tree model can be reconstructed to change utility functionality. After reducing the optimal profit, the profit result of various reduced construction schedules can be incorporated into the regression of modified utility functions. Due to optimal profit cuts, the expected value of the largest utility may not be when this strategy is reassessed. In this way, bid winners should consider risky events and ratios into consideration in choosing a program to reduce the effect of reducing the duration of construction on the chances of winning a bid.

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GLOBAL SENSITIVITY ANALYSIS OF ULTIMATE LIMIT STATES OF STAINLESS-STEEL STRUCTURAL MEMBERS

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ABSTRACT

One of the most widely used methods for examining the relationships between inputs and outputs of stochastic computational models is Sobol sensitivity analysis. Regarding civil engineering, the popularity of Sobol sensitivity analysis has a growing trend that correlates with other disciplines. The article presents global Sobol sensitivity analysis of a rolled member in tension made from austenitic chromium-nickel stainless steel of type 1.4307 / AISI 304 L. The statistical characteristics of yield strength and of the geometry of the rolled steel IPE cross-section are presented on the basis of published experimental research. The Latin Hypercube Sampling method was applied for the computation of sensitivity indices. The model output is the static resistance computed in each run of the Latin Hypercube Sampling method. The estimation of the sensitivity index is based on double-nested-loop simulations. The sensitivity analysis showed the dominant effect of the yield strength on the static resistance. The second dominant variable is the flange thickness. Higher-order sensitivity indices oriented at detecting the presence of interaction effects between input variables are very small. The characteristics of other types of sensitivity analyses oriented at quantiles or the probability of failure are discussed, especially in terms of a higher proportion of higher-order sensitivity indices. The results of Sobol sensitivity analysis of stainless steel are compared with similar results of carbon steels. Although new methods of sensitivity analysis are being successfully developed, Sobol sensitivity analysis is unlikely to be relegated in the near future to minority methods for studying the influence of input variables on the model output.

COMFORTABLE LIVING SPACE: FIGURATIVE AND VERBAL REPRESENTATION

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ABSTRACT

The creation of comfortable living space represents scientific interests for specialists from many fields, in particular architects and environmental psychologists. The current study is devoted to the analysis of the comfortable living space properties by an empirical method with the use of figurative and verbal representation. On the one hand, it considers architectural requirements for the organization of human habitat. On the other hand, it focuses on the psychological tools to identify the characteristics of the living environment, inherent in a comfortable space. We assume that there are differences between these two types of human perception of the living space. These differences can be determined, theoretically substantiated, and empirically validated. In addition, these differences may indicate the existence of a particular level of spatial literacy measured by such criteria as “the degree of spatial organization” and “the level of spatial familiarization”. To test the formulated hypothesis, we have used several methodological tools. First, the projective drawing technique “I and my dream house”, which makes it possible to obtain figurative information about the “stereotypical”, more imposed image of the living space or an ideal desirable architecture, which is determined by the institutional influence. Second, the projective drawing technique "I’m in a comfortable space", which allows us to get figurative information about the peculiarities of a person's own ideas about a comfortable space or desirable medium. Third, the "spatial semantic differential” (a verbal, linguistic matrix), which allows us to determine the representation of living space by such indicators as size, structure, dynamics, strength, as well as pragmatic, aesthetic, and ethical indicators. This methodological tool was used to assess the drawings made by the respondents according to the scales presented in the spatial semantic differential. The research was conducted by an interdisciplinary team of specialists from the field of environmental psychology and architectural design practice. A qualitative analysis of the data done by the method of descriptive statistics lets us identify indicators that allow architects and psychologists to describe two types of drawings. The quantitative analysis of the data was done with the use of descriptive and mathematical statistical methods, in particular the analysis of significant differences. It lets us obtain information about those indicators of space representation that are significant for the image of the “dream house”, and those relevant for the image of the “comfortable space”. The current article presents intermediate results of a pilot study conducted among respondents with a diverse background: the first and second-year students from different faculties and regions.

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CHANGE IN THE OFFER PRICE OF REAL ESTATE IN RELATION TO THE LOCALITY - A CASE STUDY

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ABSTRACT

There are many factors that affect the real estate market. They can be classified into internal and external factors. The basic internal factor that affects the offer price is the location. The external location between cities and the internal one in the city is always compared. Since people started moving to cities for better living conditions and better work, real estate prices have changed significantly and there have been significant price differences between cities and the surrounding area (villages). Another internal factor is the location of the property, which is determined by the population, the importance of the site in the village or city, the surrounding buildings, the location of the property in the village or city, driving distance to the center or surrounding villages and towns, environment and other influences. Other important factors are the type of apartment, type of development, technical condition of the apartment, construction and equipment of the apartment, ownership, layout of the apartment, orientation of the apartment and view, floor, age of the apartment, parking space and more. External factors include macroeconomic indicators, which include inflation, average gross wages, interest rates and more. The aim of the article is to point out the percentage differences of the offer price within the distance from the center of the city of Brno. The research includes 3 years of data collection (2018-2020) that shows real estate offer prices. During this period,1,295 samples were collected. The offer prices of real estate in the given localities due to the percentage changes within the distance from the city center of Brno were determined by the arithmetic average. Within real estate, the research was focused only on dwellings, where individual categories of dwelling sizes, condition of dwellings and type of material were considered. The research output is displayed in a clear price map of the selected area.

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LOCATION BASED SOCIAL NETWORKS AND URBAN STUDIES

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ABSTRACT

In this digital era, booming user generated content via social media creates an ever-increasing amount of usable and dependable data which gives the researchers and planners an opportunity to analyse urban dynamics on the lines of people's perception, opinions, sentiments and behaviour in urban environments. Prevailing Social Networks when tweaked to include the location dimension to generate Location Based Social Networks (LBSNs), lead to voluntary sharing of location indexed social media data, thereby producing virtual trails of users manifested through their interests and activity patterns. LBSNs are, thus, a technological advancement in the field of urban studies wherein the traditional methods of surveying, data collection and recording observations for prolonged periods can be omitted to rely on crowd sourced real-time content generation and updating. This study aims to analyse the LBSNs and their relevance in the field of urban studies while also establishing application domains of these. The relationship between LBSNs and Urban Studies is established through explorations in the Locative Social Media and the examining of LBSNs under Categories, Types and Data Analysis Methods. The study is also supported with a case example reflective of the mentioned parameters evident of the incorporation of LBSNs in Urban Studies. It intends to debate the possible advantages of incorporating LBSNs in studying the urban realm while outweighing the underlying disadvantages.

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A STUDY ON THE CHANGE OF WORK AND TRAVEL PATTERN OF THE MEMBERS OF BANGLADESH INSTITUTE OF PLANNERS DUE TO COVID-19

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ABSTRACT

The novel corona virus has brought unprecedented change to the world. People had to adapt themselves in a new way in our very familiar circumstances to protect themselves. Distancing measures make less interaction with others which further make people to find alternative way to fulfill their duty. It is understood that the pandemic has changed the work pattern of the working people significantly which eventually change the travel pattern. As this is a new phenomenon, till now very few studies were conducted about the impact of COVID-19 in home and abroad. This study aims to find out the change brought by COVID-19 in work pattern and travel pattern of the planners of Bangladesh and show the comparative scenario of before and during pandemic. The study is based on primary data. Respondents are surveyed through Google form. With the response of 241 members of Bangladesh Institute of Planners (BIP), primary data were processed and analyzed through Microsoft Excel and SPSS. Descriptive analysis, Paired sample T test, Anova test etc. were conducted to carry out the output. The study reveals that, there are significant changes in work pattern due to COVID-19. People have shifted from offline to online activities. They have also made their task compatible with online. There is significant change in travel pattern too. Travel time and trip frequency per week has reduced greatly. The usage of bus has reduced rapidly. Instead, people have started to walk or use rickshaw, bi-cycle etc. In many cases, offices have provided vehicles. Though these changes are applicable to all subgroups of people but degree of changes is different for different variables. This study is a good documentation revealing the scenario. So, it may lead to further studies about the impact of COVID-19.

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COMMUNITY RESILIENCE AGAINST UNCERTAINTIES: EDUCATION, COVID, AND OPPRESSIVE OCCUPATION IN PALESTINE

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ABSTRACT

The latest COVID-19 pandemic proved the importance of having adaptable and resilient infrastructures in the 21st century cities. While many countries were equipped with proper technologies and facilities to apply the recommended social distancing by W.H.O; other countries, especially those battling other uncertainties for survival, did not. In Palestine, while struggling to endure Israeli imposed spatial and temporal challenges, the recent COVID-19 pandemic added to the already existing burden. Despite the short-term governmental plans of surviving the harshness of everyday life, Palestinians showed great levels of adaptability and resilience especially in sudden transitioning and applying online education. This paper explores the role of Palestinians in coping with the pandemic crisis despite limited resources as a bottom-up approach. By basing the argument on Portugali's seminal work, *Self-organizing Cities* (1997), the present study argues that coping with the education requirements of the pandemic in Palestine is a gained skill aging back to the lived crisis of the Israeli Invasion in 2002. Palestinians learned, the hard way, how to manage their everyday urgent needs irrespective of the lack of compatible Palestinian top-down or self-determining government and of the ongoing Israeli urban violence. In doing so, Palestinians not only create opportunities to keep learning, but also ensure living another day to resist Israeli occupation.

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CIM AND CIM PLATFORM PRACTICAL USE IN CHINA REVIEW

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ABSTRACT

City Information Modelling (CIM) is becoming an important base model of Smart City and Digital Twin City, which can realise intelligent city design and management. Lately, CIM has become the focuses of urban planning and design studies. Under the influence of building information model (BIM), smart city and three-dimensional city simulation, city-level information modelling, CIM connects different BIM levels integrates the spatial expression effect of GIS. This review introduces CIM development from using generating procedures, such as rules and typological processes, to analyse urban scenarios to form the city full information scene through the integration of BIM, GIS, and IoT. The paper also overviews the technical path of construction with CIM implementation, problems existing in the current practice of CIM technology, including all information of digital and lightweight data, scene fast calls and data standard uniformity, etc. Following the latest CIM progress, the paper puts forward some ways to realise the effective use of CIM in urban planning and design. Further review focuses on big data security, publicity, urban design element and CIM platform practical use in China.

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DESIGN AND ECONOMIC ANALYSES OF POWER SUPPLY OF A STAND-ALONE COMMUNITY BASED ON WIND POWER AND PUMPED STORAGE POWER PLANT

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ABSTRACT

It is known that classical energy resources are depletable and energy needs are growing at a rapid pace. This necessitates a rapid increase in the use of energy from renewable resources, which is a particularly important priority worldwide. In this context, the European Parliament has imposed on the Member States, including Romania, a mandatory target for 2030, namely, to increase the share of renewable energies to at least 30% of the overall energy mix. In this strategic framework, an important objective among other is to find adequate decentralized power supply solutions for small communities situated in isolated areas where there is no electricity network. In these situations, common in Romania especially in mountainous regions, it is necessary to use mainly renewable energy sources such as wind turbines and / or solar panels or others. These renewable energy sources are sustainable, but at the same time are subject to natural fluctuations. The wind does not always blow, and the sun does not always shine, but the electricity supply (i.e., the load demand) community must ensure a stabile power supply. Therefore, energy storage requirement will become a key component of these local electrical energy supply systems especialy to balance and to stabilise the energy demand and energy supply. In this regard the classic Pumped Hydro Power Storage widely discussed in the literature with considerable scientific results and technical applications, especially in the last decade is one of the suitable electricity storage system especially where the topographic and relief conditions are favourable for such an arrangement. It is to mention that the existence of a watercourse is not necessary, knowing that Pump hydro storage plant recirculates water by pumping, respectively turbine. In this context the paper presents an example to design and economic analyse of a stand-alone power supply system for a community located in an isolated area where there is no electricity network. The electricity supply system is consisting of wind turbines combined with a Pumped hydro storage plant for balancing the wind energy fluctuations. The sizing of the wind turbine, the establishment among order the power curve and the electricity production are based on the knowledge of the multiannual average wind speed and of the use of the Rayleigh distribution for the speed frequency. The water volumes for the pump hydro storage plant with annual, compensation will be determined using the capacity factor of wind energy which is a frequently used parameter in energy applications. For the economic analyse the estimation of the amortisation time will be used.

Corresponding Author:

FUNCTIONAL PERFORMANCE EVALUATION OF HOSPITAL RADIOLOGY FACILITIES AND EQUIPMENT USING FA AND AHP – A CASE STUDY

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ABSTRACT

Abstract. Result of evaluates the usage function at radiology facilities and equipment based on the professional opinions of radiology department relevant medical personnel in Taiwan, using of factor analysis (FA), analytic hierarchy process (AHP), and simple weight method is : The among the four evaluation dimensions for the usage function evaluation model of radiology facilities and equipment, the safety equipment dimension is far more important than the other so that needs to be improved (The total number of institutions, whose evaluation score falling below the dimension average value, are 9, 4, 7 and 5, respectively). Of the 17 medical institutions, the overall performance of the best (90.95) and the worst (61.47) the gap between is up to 47%.

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EXPLORATORY FINITE ELEMENT ANALYSIS OF MONOLITHIC TOUGHENED GLASS PANES SUBJECTED TO HARD-BODY IMPACT

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ABSTRACT

The paper reports the results of an extensive experimental campaign, in which simply-supported toughened glass samples with the dimensions of 500 × 360 mm^2 and three thicknesses (6, 8 and 10 mm) were subjected to hard-body impact. A steel ball (4.11 kg) was released from different drop heights, starting from 10 cm above the sample and increasing by 10 cm in each step until glass breakage occurred. In this way, for all samples a critical drop height (causing fracture) was determined. Experiments were carried out for 35 samples for each thickness, thus 105 samples were tested in total. In the paper, a numerical study was aimed at analytical reproduction of the experiments and determination of the maximum principal stress in glass that occurs during the impact. A 3D numerical model of the experimental set-up was developed using the commercial finite element analysis (FEA) software ABAQUS and Implicit Dynamic solver. To reduce the number of FEs and increase the computational efficiency of the simulations, only a quarter of the nominal geometry with appropriate boundary conditions were modelled. The simulations were performed for a given weight of the steel impactor, glass thickness and the corresponding critical/breaking drop height found in the experimental campaign. In this way, the impact strength of toughened glass could be retrospectively evaluated. The simulations were used to investigate the impact history in terms of stress in glass, acceleration and velocity. Moreover, resulting history of impact force was determined.

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INTEGRAL DIAGNOSIS ON THE USE OF SUSTAINABLE WATER TREATMENT TECHNOLOGIES

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ABSTRACT

The water sector problems are framed by the low rate of adoption of technological innovation, in addition to the great environmental challenges. In Colombia, due to its topography, the provision of the aqueduct and sewerage service is difficult, causing the association of small rural communities to try to supply their need for drinking water for daily activities in a handcrafted way, this added to the increase of the limitations of the different natural resources, becomes a challenge to guarantee the fundamental right to water and sanitation. This article, based on the UN's Sustainable Development Goals: "Health and well-being"; "Clean water and sanitation"; "Sustainable cities and communities"; "Responsible consumption and production" presents the results of a research carried for the validation of sustainable technologies for safe water treatment systems in communities. Data were collected for a qualitative analysis through interviews applied to representative actors of the sector: water quality laboratories, aqueducts and utility companies. The study provides information on the different needs identified for each segment, provides information on the decisions companies make regarding investment in sustainable technologies, highlighting the existing gap in the water sector in innovation management, and presents a diagnosis on the uses of technologies on the water treatment market.

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ADVANTAGES AND DISADVANTAGES OF THE MODULAR CONSTRUCTION, INCLUDING ENVIRONMENTAL IMPACTS

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ABSTRACT

Like in all fields, the field of ground construction tends to make constant progress. There is an increasing demand for construction of new buildings regarding the speed of the construction process, the economy, and minimization of the negative effects on the environment, i.e. sustainability. These requirements can be solved by using prefabrication in said construction. One of the technologies of prefabrication is modular construction, which is becoming especially popular worldwide. The topic of this article is the use of the modular construction, even from the sustainability view. There is a basic overview of the modular construction, its history in the construction field, an overview of the materials used, and the possibilities of its application. Furthermore, this article provides an overview of the advantages and disadvantages of the modular construction. The advantages are listed in terms of quality, economy, time, and ecology. Furthermore, in terms of construction flexibility and work safety, both during production and assembly on site. The disadvantages of modular construction discussed in the article are the complicated transportation of modules, demanding coordination of production and construction, the requirement for detailed construction planning and a non-acceptance of this construction technology by the general and sometimes professional public. The article also deals with the comparison of modular construction technology with classical construction technologies. It points out the possibility of reusing materials from disassembled modular buildings. It also points out the ways to control and alleviate the impact of modular construction on the environment throughout the life cycle of the modular building including CO2 emissions and waste treatment. Only after a thorough analysis of these aspects of modular construction, it's possible to explore other ways to further increase the efficiency of this technology in all directions and also to make even better use of its environmental impact minimization potential.

CREATING A LOGIC MAP FOR DRONE USE IN CONSTRUCTION SITES USING RISK PARAMETERS

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ABSTRACT

Monitoring risks on site for the construction industry and reducing accidents is a major concern for site management. Different solutions are always being proposed especially in large projects where monitoring is more challenging. Construction industry is looking at the application of using drones to improve construction site safety as well as other potential areas of site management. The use of drone technology in construction sites will continue to expand with other innovative technology applications that can be an intermediary solution to avoid workers injuries in a hazardous environment. This is part of a developing automation trend where the technology by which a process or procedure is performed with minimal human involvement. The objective of this paper is to create a logic map for the use of drones in procedures such as building thermography, modelling delivery systems, and aerial access to extreme and dangerous environment for surveying, inspection and monitoring, automated drilling, excavation, and earth moving. This map will create logical paths based on the information collected from the site showing a virtual illustration of the site status, resources, risks, and predicting outcomes when possible. This should help in the programming of drones' data collection and analysis methodology for construction site evaluation. The paper proposes a probabilistic model for monitoring being a more suitable approach for risk analysis rather than more deterministic approaches which can ignore unforeseen factors. The output consists of assignment and scheduling map which is proactive to risk factors. This is part of a machine learning development in risk analysis.

STUDENTS PERCEPTION OF THE LEARNING ENVIRONMENT IN MALAYSIAN PUBLIC UNIVERSITY

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ABSTRACT

The United Nation highlights Sustainable Development Goal 4 is to provide quality education that targets to ensure tertiary education learners to acquire knowledge, skills, values and attitude necessary to ensure all inhabitants play an active role locally and globally in resolving global challenges that can be acquired through education for sustainable development (ESD). Effective learning environment is an essential factor in determining quality of education. University planning and physical learning environment can affect student's behaviour. This study attempts to assess student's perception of learning environment in two public universities in Malaysia; Universiti Sains Islam Malaysia (USIM) and International Islamic University Malaysia (IIUM). The methodology used in this study is a quantitative approach using survey questionnaire to evaluate student perception of their external educational environment that focused on four aspects of convenience and comfort, social, security and aesthetics. The survey uses a random sampling technique where a sample size of 460 respondents were obtained. The questionnaire consists both closed-ended and subjective ended questions that were distributed evenly to both universities online and personally. Using Statistical Package for Social Science (SPSS) Version 26, data from the questionnaire was analysed. The findings suggests that factors such as social interaction, safety and mobility mode effects social behaviour in external learning environment. The findings also indicate that much thought on the design and planning of Islamic University in Malaysia exist but can be improved and will hopefully continue to breed with full cooperation from all stakeholders for a future oriented-design. Further research can be done to explore in-depth analysis of individual universities in Muslim majority societies and modern technological advances adaptation at the University.

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LOW-COST GEOGRAPHIC INFORMATION SYSTEM FOR MUNICIPAL ROAD SIGNS MANAGEMENT IN DEPOPULATED AND LOW-DENSITY AREAS

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ABSTRACT

The current national and regional economical conjuncture in many countries, requires a sustainable management of different urban infrastructures, including road signs. From the set of possible solutions to improve the existing infrastructure's management, analysis and spatial representation, Geographic Information Systems (GIS) have proved to be an essential tool for the functional competencies of local administration (municipalities), managers of municipal road networks. This study presents a framework of existing national regulations on road signs, as well as the shortcomings in the definition of methodologies for GIS-based management systems implementation. The paper continues with the critical assumptions considered in their definition and the municipalities specific competences needed for their implementation. A low-cost methodology is proposed and applied to a case study in a small Portuguese village: Belmonte. The results have shown the potential of these low-cost systems, revealing relevant time and economical gains, providing municipalities with fundamental information for the definition of realistic and well-founded strategic plans and budgets, and allowing better information to their citizens. The gathered information can help in inventory, inspections, maintenance and replacement allowing detailed reports and geo-referenced electronic database of a municipality's signage (including maps) at reasonable costs. These maps and reports are the starting point to forecast the projected lifespan of the municipality's signage allowing more accurate project sign management budgets for future years. Aspects that need further development in order to improve the proposed system are also addressed.

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MOBILITY IN TRANSPORTATION SURVEYS

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ABSTRACT

Problems with the growing demand for travel and the spread of urban areas, with associated negative social and economic impacts, are felt worldwide. There is no doubt that from the point of view of shaping transport systems, studying the factors influencing the number of trips and the choice of individual means of transport is a fundamental element. The article attempts to identify several factors influencing the number of trips made by inhabitants of towns with various population numbers. Mobility is one of the primary transport organization issues; it is also used in forecasting traffic models. In modeling urban and extra-urban traffic, it is essential to study the transport behavior of residents. Cyclical research may identify trends or indicate factors that directly translate into a change in the number of trips in the analyzed areas. The article aims to present examples of research on mobility carried out in various areas of the country and mobility changes over time. The article also contains analyzes of selected macroeconomic factors. These are, i.a. the variability of the population in a given area or the automotive index, which directly impact the number of trips made by residents living in different areas of the country. Mobility analyzes were based on Comprehensive Traffic and Transportation Study (CTTS) research and own study. The change in mobility overtime was also presented using the example of cities of various sizes.

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ENVIRONMENTAL ARCHITECTURE LIGHTING AND SUSTAINABILITY IN TRADITIONAL BUILDINGS

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ABSTRACT

Sustainable architecture aims to create a safe atmosphere within space by ensuring adequate ventilation, natural lighting, indoor thermal comfort, energy conservation and the reduction of exhaust and harmful gas emissions. Some may believe there is no link between heritage architecture and the field of sustainable energy studies. Some may believe there is no link between heritage architecture and the field of sustainable energy studies. However, because heritage buildings were built to be energy-efficient indirectly, there is a direct link between the two realms. The current architecture is the result of many years of people's efforts to design buildings that adapt to the environment and mitigate the negative effects of climate change, thus providing a suitable built environment with minimal energy consumption, where natural lighting in interior spaces is one of the most important elements for achieving comfort. The aim of the study is to examine and investigate the use of natural lighting in historic Islamic structures in order to create a suitable built environment with minimal energy consumption. Also, to demonstrate how local construction methods and heritage building designs work efficiently by paying attention to the design of openings, their sizes, positions, and treatments, which resulted in reduced climatic effects.

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HERITAGE HOUSING IN THE EASTERN REGION AND THE EXTENT OF ACHIEVING ENVIRONMENTAL SUSTAINABILITY

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ABSTRACT

Since ancient times, man in Saudi Arabia has been interacting with his environment relying on his personal abilities to develop technologies to meet his different needs. This interaction was always accompanied by an internal psychological balance with nature, which from the beginning led to harmony between the environment and human life. All man-made items were natural because the materials used were available in the surrounding environment. For centuries, our ancestors were able to live comfortably in traditional dwellings, because they benefited from the energy available in their local environment. Traditional architecture in Saudi Arabia and the Arab world has provided solutions, not only for climatic problems, but also for aesthetic, sensual and social functions. This study aims to describe some of the elements of traditional architecture developed by these communities over successive generations to provide a comfortable local climate (comfortable Microclimate) using natural and renewable energy, which can be provided by traditional and low-energy architecture to solve many of our contemporary problems. The research study is based on the description and analysis of the traditional urban fabric in Saudi Arabia, represented by Najd province, as well as detailing the traditional ecological housing in terms of design, usage, construction, and the impact of the social and climatic factors on traditional housing design. The research methodology is divided into three parts dealing with: First: A theoretical and analytical study dealing with the presentation of human and environmental factors affecting the formation of urban fabric and traditional housing in the Eastern Province of Saudi Arabia. Second: To conclude the different traditional aspects that affect the design of residential buildings in the Eastern Province which must be preserved.

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NUMERICAL AND EXPERIMENTAL ANALYSIS OF TIMBER PORTAL FRAME ITH SEMI-RIGID KNEE JOINTS

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ABSTRACT

The problems related to development of rotational deformations of a knee joints and crack propagation in rafter elements of timber portal frames were discussed in this article. The rotational displacement, which develops between the rafter and column members due to the bending deformations of the bolts in the knee joint with a simultaneous embedment into the wood, increases the global deformations of the portal frame. Additionally, to axial force and bending moment the rafter elements are heavily loaded with shear force at the sections near knee joint especially. All effects together create very complicated complex of affecting factors. In the current study the design methodology of timber portal frames has been revised with the purpose to develop a more comprehensive set of design conditions for timber portal frames with dowel type fasteners in the knee joints. It is suggested to use the Hoffman failure criterion taking into account the difference of strength in tension and compression to manage the effects of plastic yielding combined with the crack development in wood assumed it as an orthotropic material. It has been proved by case studies of timber portal frames under service loads, as well as by tests and theoretical considerations. The set of design conditions must be supplement by additional clauses comprising Hoffman failure criterion regarding timber sections heavily loaded in shear and cross grain tension. Also it is recommended that the design capacity of dowel type fastener should be decreased when shear force transferred by the bolt acts perpendicular to the grain direction inducing tension cross grain direction. Other measure may be application of some surface strengthening method.

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QUANTIFYING THE SPATIAL EVOLUTION OF BAI PEOPLE'S COURTYARD HOUSES

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ABSTRACT

Bai People's courtyard houses in the rural parts of China's Dali area are a particular type of Chinese courtyard house, adapted to local culture and conditions. These dwellings were constructed in vernacular tradition up until the 1980s but underwent significant changes in the following decades. The goal of this study is to examine the evolution of the spatial structure using quantitative data, and relate it to changes in the social culture of the inhabitants. Three vernacular and three contemporary cases in the village Gushengcun are compared. To enhance understanding and examine the idea of evolutionary change in architecture, the concept of a Spatial DNA is applied, building on a metaphor of the biological DNA. It uses Space Syntax techniques and links numerical values of integration and space type to functional information. Findings show that the integration of the courtyard and bedrooms is decreasing, and space types indicate a change from rings to sequences. In contrast, the kitchen space integration is increasing. These results reveal parallels to changes in the means of subsistence, social structure of the family and conceptions of privacy: Decreasing spatial centrality of the courtyard - once a key space in the processing of agricultural produce - coincides with a shift from work in the primary sector to secondary and third industries. Modern conceptions of privacy and individualism replacing the family as a unit of privacy are related to the segregation of bedrooms. The change in the spatial location of the kitchen is interpreted in the context of abolished gender separation and the changing role of women. This study hence provides measurable evidence to the links between space and culture in an intertemporal comparison of dwelling types.

MECHANICAL PROPERTIES OF TRANSPARENT EPOXY ADHESIVES FOR GLASS STRUCTURES

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ABSTRACT

Adhesive connections are commonly used in many industries as automotive, aerospace, electronics and also in civil engineering. Adhesives in civil engineering are used for non-load bearing structures but nowadays are requirements for using adhesive also for load-bearing structures especially for glass structures. There are many reasons for this trend. Adhesives can be used for connecting different materials, very thin plates, reduce stress peaks (depending on adhesive stiffness), have low weight, reduce thermal bridges, can be invisible. Everything has disadvantages and the same is with adhesives. Adhesives require discipline during technological process, problem is long-term strength in outdoor conditions, its resistance to ageing. Silicones are mostly used adhesives in civil engineering, they have good resistance to external environment but their lower strength and low stiffness does not meet requirements for many applications. For this reason, are better semi-rigid or rigid adhesives, but there is a lack of information about them. The paper is focused on experimental testing of transparent adhesive connection glass to glass. Four epoxy adhesives were chosen for double lap shear joint. Specimen consisted of 3 glass plates with dimension 50 x 50 x 19 mm. The middle plate was bonded 10 mm above outer plates. The bonded area was than 50 x 30 mm. Thickness of adhesive layer was 1 mm. Specimen were exposed to shear test until failure. Shear force and displacement were measured during test. Shear stress, elongation at break, shear modulus and failure mode were obtained from the tests. Only one epoxy adhesive had low adhesion to glass. Specimen with this adhesive had the lowest shear strength. Other three adhesives showed good adhesion to glass and had shear strength 6.5 times higher. Failure mode of specimen with these adhesives was always breaking of the glass.

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THE BEST HOUSING ESTATE IN CZECHOSLOVAKIA

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ABSTRACT

The Brno housing estate Lesna is undoubtedly an important achievement of Czechoslovak urbanism and architecture of the 1960s. It was built on the southern slopes north of Brno in 1962–1970 according to a project by a team of architects Frantisek Zounek, Viktor Rudis, Miroslav Dufek and Ladislav Volak. Although it was a standard housing construction made of prefabricated components, the architects did not want to hide its technical expression. They also fully copied it into the very urban arrangement of long blocks, which contributed to the fulfillment of the vision of the garden city. Close cooperation between the supplier, investor and designer was ensured already in the phase of elaboration of the project task. The architecture of residential buildings is based on the diligent efforts of the whole team to promote the use of a lightweight facade of a prefabricated house using parapet panels and strip glazing in the B 60 construction system. The unusually high-quality solution of the public space in the Lesna housing estate was mainly due to the time of its creation. Political liberalization in the 1960s allowed architects to come up with a generous plan for a free stop and thus perfectly fulfill the vision of a garden city. The population density of the Lesna housing estate, less than two hundred inhabitants per hectare, was multiplied by up to four hundred inhabitants per hectare in other housing estates of the "president Gustav Husak" era due to tightening economic indicators. Public greenery respecting the natural elements of the rugged relief required a different professional approach due to the extent of the exterior design. It was common practice that landscaping were carried out on residential complexes with a delay of several months and years after the first inhabitants moved in. The architects managed to reverse this common practice, so the first inhabitants moved to finished houses with access sidewalks, planted greenery and functioning civic amenities. This could not have been imagined by its inhabitants in the later realizations of housing estates. That is why the Brno housing estate Lesna is rightly called the best.

ARCHITECTURAL PRESENCE AND GENIUS LOCI. REIMAGINED

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ABSTRACT

An unexpected universal shift, unprecedented for the present generation, has lately been dramatically altering the times we experience. The change of the usual global dynamic generated by the pandemic and affecting the medical, social, cultural, economic universe known so far to the contemporary man, has been predictably expanding for the last year towards foreseeable aspects of the everyday life, but has also surprisingly resurfaced long lost beliefs and values, previously hidden under a profit-driven, tinsel tendency of the daily. As seen through an architectural lens, the past challenging year has thoroughly redefined the relationship between inhabited space and its inhabitant, among many other domains related or foreign to architecture. As we gradually closed our doors towards the exterior, we simultaneously opened them towards the interior of our close community, our family, ourselves, unknowingly heading to a deep and long, probably never before experienced introspection. From an architectural point of view, the universal style has therefore been losing its impact and importance, as our perception has increasingly been getting closer to ancient values and ideals because of the precarious pandemic features of everyday life. Due to the increased sensibility created by this global phenomenon, we are nowadays getting closer to the ancient understanding of individual and common space regardless of style or fashion. As what we perceive as appropriate and beautiful, does not just rely on personal perception and taste, but on certain quantifiable, perennial aspects, we intend to analyze and deepen the comprehension of these patterns. They can be understood through types of perception and return to the original without referencing established yet petrified styles, through architectural and gestalt theory, respectively the phenomenology of the *dasein*. The present research therefore seeks to explain the intrinsic unity and inherent clarity, which give meaning to architecture in general and to a certain place in particular, by referencing quantifiable patterns of human values that interact with certain architectural languages on a profound level. As the attention of the modern man has mainly been directed towards the exterior, certain virtues have been introverted. However, this ancient vocabulary resurfaces when one shifts their focus towards the interior. Constancy, meaning, introspection, regionalism reencountered through profound presence in time and space, rediscovered roots and consciousness thereby birth the re-understanding of *genius loci*. A place defined as order, presence and permanence draws its essence from relationships, both encountered as built space and as intangible yet perceptible links between people and their communities. The present research aims to dissect the phenomenology of this profound relationship, in order to move away from the formal language of the architectural style but come closer to the fundamental *gestalt*-based features. The latter will therefore provide access to the original, clarifying how the architectural image no longer belongs to tradition or style, even if it can contain them. The main results of the research would be derived from the search and study of essence, both regarding the material and immaterial, in order to encounter and better define meaning in architecture, as datum.

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SUSTAINABLE TRANSITIONS OF URBAN PROJECTS TOWARDS MITIGATION AND ADAPTATION PROJECTS FOR CLIMATE CHANGE: THE CASE OF MEDELLIN

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ABSTRACT

The research investigates the relationship between cities and climate change by examining how urban projects shifted to mitigation and adaptation for climate change at an urban scale. The article is based upon two complementary approaches, a multilevel analysis from sustainable transitions theory and a framework of interrelations of urban mitigation and adaptation projects. The methodological design is a case study; we analyzed the case of Medellin that, at the beginning of the 2000's, implemented public transport projects, urban parks, educational and cultural facilities, and risk mitigation projects in the surrounding hills. The main findings are that specific projects at an urban scale are operating as niches or experiments, taking advantage of windows of opportunities, and triggering changes in the urban design routines, framing a new sociotechnical system. It is found that governance, leadership, teams of experts and urban planning are drivers for the transition of urban projects, which were initially designed for social and transport needs, to urban mitigation projects for climate change. At the same time, urban mitigation projects such as the Metropolitan Green Belt are transiting to adaptation projects for climate change. The conclusion for this case study is that while most urban projects retain their traditional role, a new generation of projects with mitigation and adaptation features is emerging in the context of climate change. This article contributes to expanding the empirical analysis of the literature on the theory of sustainable transitions specifically related to cities and urban projects. The theoretical framework of urban projects and their linkages with climate change are enriched. The conceptual framework of the analysis is replicable and useful for practitioners in the field of urban design and researchers interested in comparisons to identify patterns or typologies. In addition, the article contributes to sensitize actors involved in public urban design policies in their roles as managers of transitions.

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THE FOURTH GENERATION OF URBAN PROJECTS TO TACKLE CLIMATE CHANGE: A TYPOLOGICAL PROPOSAL

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ABSTRACT

Climate change is the major challenge of our humanity and the relationship between climate change and cities has received increasing scholarly attention from governance, urban planning and infrastructure perspectives. However, the scale of the urban project, understood as the operationalization of climate change actions, has been neglected. The current three generations of urban projects are revisited (modern city, morphologic articulation, large urban projects) and a fourth-generation within the context of climate change is identified as missing; it combines adaptation and mitigation strategies for urban projects. While adaptation strategies are oriented to minimizing the negative impact of climate change on rising sea-levels, floods and rivers' changes through green and blue infrastructures, mitigation strategies are twofold: one oriented to minimizing CO2 gas emissions and the other to reducing the risks of deterioration of natural systems due to human intervention or natural causes. Integrating the four generations, a typology of a 2x2 matrix of urban projects is drawn up. The four quadrants of types of urban projects are explained and accompanied by examples. Potential and desirable shifts between the quadrants are discussed to understand how changes are needed to advance to develop this new generation of urban projects. The paper contributes to expanding our understanding of urban projects in the context of climate change with heuristics purposes for researchers, practitioners and academia, and to prepare public policy makers to encourage the debate of climate change actions of adaptation and mitigation that should be materialized on an urban project scale. Future research may empirically test the typology in different contexts of development.

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MARKET TRANSFORMATION TOWARDS SUSTAINABILITY IN THE 21ST CENTURY BUILDINGS: COMPARING BUILDING PERFORMANCE ANALYSIS BETWEEN THE OLD AND THE NEW IN RIYADH

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ABSTRACT

The study aims to investigate the market transformation towards sustainability in the 21st Century Buildings in Riyadh. A comparative building performance analysis is performed between buildings that are constructed at the turn of the century and buildings that are recently constructed. The hypothesis of the research is that there is a considerable improvement in the sustainable performance of the buildings Objectives of the study : to select a green rating system that could be best suitable for comparing sustainable building performance in existing buildings; to collect data about the performance of each building; to compare performance of the two buildings using the rating system; to select the building that is most sustainable and highlight the reasons for the difference. The market transformation is investigated by using building performance analysis. Two 21st century buildings constructed within the same context will be investigated. One building is recently constructed and the other was constructed at the beginning of the 21st Century. The two buildings are not constructed for sustainability. To control variability in the context, the two buildings are selected from the same location, a private university Campus in Riyadh. The analysis is performed using LEED (Leadership in Energy Efficient Design) rating system categories for existing building. LEED has eight categories which are: Sustainable sites, Water efficiency, Energy and atmosphere, Materials and resources, Indoor environmental quality, Innovation in operations, Regional priority credits. Results showed that the recently constructed building is more sustainable than the older ones. The reason for this that awareness about building sustainability transformed the market towards a more sustainable construction.

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SOCIO-CULTURAL IDENTITY AND ITS CONTEMPORARY FORMS IN MATERIAL CULTURE AS IMPORTANT PART OF SUSTAINABILITY IN SELECTED REGIONS OF SLOVAKIA

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ABSTRACT

Identity as a sense of belonging is deeply inhered. From evolutionary point of view being part of a group increase your chances to survive. Sense of belonging does not need to be related to family based communities. Virtual group with common tokens such as language and other cultural similarities can also initiates biological mechanisms releasing hormones and creating feeling of security. Belonging to place has similar effect, gives to individual sense of known and feeling of prediction. Your hormonal system is prepared. This set leads to wellbeing even if it is invented or imaginary. Culture can be also interpreted as sum of rules that reinsure surviving group as a whole. These rules are evolving due to environmental and socioeconomic conditions. Globalization changes our world too quick and regions can't keep up. This is visible also in material culture. Copying mechanisms 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. Conserving architecture and material possessions has not produced sustainable results. Origin and meaning of every material aspect of living our grandparents faded away. Whole structures and details are copied and use as decorations without deeper understanding. Those details, materials and colours has hormonal reactions in our bodies. 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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APPLICATION OF FLUIDIZED BED FURNACE BOTTOM DUST IN CIVIL ENGINEERING - A REVIEW

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ABSTRACT

For several years there has been widespread and open discussion about climate problems and human responsibility for the generated waste. The number of regulations has led to a search for applications for by-products of combustion. Moreover, the forecasted economic crisis additionally motivates to use every possible material to reduce the cost of manufacturing activities. Efficient waste management is a key element for Polish companies in their efforts to reduce their negative impact on the environment. Fluid combustion of fuels in the Polish power and heat industry still belongs to relatively new technologies. Despite the application of the most technologically advanced processing methods, bottom ashes from fluidised bed boilers are still reluctantly used. The author sees possibilities of using bottom ashes in geotechnical works. The aim of this review is to present the existing source papers relating to the use of bottom ashes in construction processes. A particular area of interest is the use of said ashes in jet-grouting (JG). The paper briefly refers to fluidized bed combustion technology as a source of combustion by-products. The author pay special attention to the characteristics defining the characteristics of the ashes. The reader's attention will then be drawn to jet-grouting technology. References can be found to the methodology of general cement-soil testing. Due to the nature of the use of JG, the focus is particularly on their strength, water-permeability and frost resistance properties. Due to the need to determine the internal structure of the cement-ground, attention was also paid to the possibility of using X-ray computed tomography for soil cement testing.

THE COMPARISON OF VEHICLE HEADLAMPS

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ABSTRACT

The aim of this article is the comparison of vehicle headlamps in terms of pedestrians visibility at night time condition. Study was designed to receive results, which could serve as a basis for the pedestrian-vehicle accident analysis. For the purpose of this study were used comparable vehicles (same vehicle type and model year) with different headlamps type. Three different headlamps (halogen, xenon and LED headlamps) were used for analysis. Experiments were carried out under similar condition (straight road, night time, without disturbing factors). During series of static tests, the vehicle approached at predefined distances to the figurant - pedestrian standing on the right side of the roadway. For the luminance analysis were used Luminance Distribution Analyser LumiDISP - software for analysing the luminance conditions based on evaluation of image data from digital photos.

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HARMONIZATION OF NATURAL AND URBAN STRUCTURES IN THE DANUBE REGION

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ABSTRACT

The deteriorating state of the environment over the last half century has resulted in the current climate and environmental crisis, which is conditioned by the unbearable exploitation of the natural environment. One of the activities that plays a key role in this situation is urbanization with a constant occupation of the landscape, increasing emissions from traffic and buildings. A well-thought-out and consistent strategy for the harmonization of natural and urban structures can mitigate the negative climate impacts in the residential environment. The harmony of natural and artificial elements has a positive impact not only on the environmental but also the aesthetic quality of the urban environment. It can significantly help to strengthen the character of the cities. It was the landscape that significantly influenced their location and characteristic image. The paper focuses on the evaluation of the quality of the urban environment with emphasis on the interaction of urban and landscape structures. The presented research is aimed to the connection of the city with the river and the surrounding landscape. It analyses and evaluates the impact of characteristic natural elements on the formation of urban structures during their development to the present day. It traces significant "traces" of the landscape in the urban structure of selected cities and their evolution. The research is focused to small and medium-sized towns along the Danube in Slovakia, comparing their fabric with similar ones in other Danube countries. The paper is a partial output of research from the project DANUrB +, DANube Urban Brand + Building Regional and Local Resilience through the Valorization of Danube's Cultural Heritage (within the Interreg - Danube Transnational programme).

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AIR CONTENT IN FRESH AIR-ENTRAINING CEMENT MORTARS

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ABSTRACT

The durability of a cement composite is the most important criterion for assessing this material. However, due to the durability of the cement composite, its frost resistance is an important property. In order to ensure concrete frost resistance, the European standard PN-EN 206-1: 2013 requires its aeration at the level of 4 - 7%. The Committee 201 of the American Concrete Institute (ACI) also requires the use of an air-entraining admixture in concretes exposed to frost damage. The amount of air entraining admixture is significantly influenced by the composition of the cement used. In order to minimize the problems with obtaining frost-resistant concrete, an attempt was made to create air-entraining cements. This article presents the effect of the amount and type of dosing of air-entraining admixtures (natural and synthetic) on the air content in fresh air-entraining cement mortars. The test cements used also differed in the production method: joint mixing of components and joint grinding of components. Based on the research, a lot of valuable information was obtained related to the influence of the preparation of air-entraining cements on the air content in the mortar, e.g. mortars with mixed cement with natural air-entraining admixture have a higher air content. The air content is higher in the cement co-ground with natural air-entraining admixture. A synthetic air entraining admixture added separately to mixed cements with silica fly ash and ground granulated blast furnace slag increases air entrainment in mortars. The synthetic air-entraining admixture added separately to co-milled cements causes an increase in air entrainment in the mortars, except for those containing cement with ground granular blast furnace slag.

THE RESOURCE ASSESMENT DURING PROJECT IMPLEMENTATON INFLUENCED BY LOW QUALITY OF PERFORMED ACTIVITIES

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ABSTRACT

The project manager has to solve during implementation of the project very often the problem of the time delay. The time is one of the key project parameter a therefore it is necessary to pay attention to this problem. The reason for the delay is, in many projects, the low quality of the finished activities and consequently the necessity the rework of same activities. If the project has to be finished on time, the solution is add the resources, e.g. workers and machines, with the aim to increase the capacity used for activity performing. Consequently, the financial resources are increased. The described problem can be investigated by means of dynamic model where it is possible to observe the changes in the finished activities and reworked activities. The processing rate depends on the capacity of the resources. In the developed model there are workers. The number of workers can be influenced by hiring new workers. At the same time the workers can leave the company. The costs are derived from amount of the human resources. It is possible to see in the model the dependency between quality of the performed activities and number of needed workers to stabilize the situation. The example of the project with the calculation of the human and financial resources is presented.

APPLICATION OF THE LANDSCAPE CHANGE INDEX FOR THE EVALUATION OF THE LEVEL OF SPATIAL STRUCTURE TRANSFORMATION - A CASE STUDY OF THE SOBÓTKA COMMUNE IN POLAND

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ABSTRACT

Landscape planning should be based on knowledge of the past landscape transformations and the driving forces that have determined the current shape of the landscape. A tool to assess the degree of landscape transformation is the Landscape Change Index (LCI). It is the resultant of the changes that have taken place in the studied time period within all land cover types. With data from different time periods, the Landscape Change Index can be calculated to indicate the time period in which the main driving forces should be looked for. The study of landscape change over the period 1938-2018 in the case study of the municipality of Sobótka in south-western Poland demonstrated the usefulness of the index to identify the time interval when changes were greatest. The main objective of the study was to determine the level of landscape transformation in different parts of the municipality and to identify the time period when changes were most intense, in order to look for the most significant driving forces of change in this period. The analyses clearly showed that the districts where the greatest landscape transformations occurred were the areas within the Sobótka city limits, especially the Górka district, where the obtained landscape change index was almost three times higher than in the other areas. Intensive landscape changes took place also in the areas where summer houses were built and the original function of the village was changed from agriculture to recreation, e.g. in the Sulistrowice and Sulistrowiczki districts. The most important landscape transfromations were identified in period 1977-2018.

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PROPERTIES OF SEALED JOINTS AFTER EXPOSURE TO WATER

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ABSTRACT

In practice, sealed joints in the construction industry are very often exposed to adverse climatic influences. One of these climatic influences is the effect of water, for example in the form of rain or humidity. This article is therefore devoted to the sealing of joints of problematic base materials, which are then exposed to the effects of water and subsequently tested according to the recommended test standards. For this research, a problematic substrate based on cement is selected, and glass cement is specifically chosen for its shortcomings. The main disadvantage of this material is the existence of small particles on its surface, which due to their insufficient wettability disrupt the adhesion of both the primer and subsequently the sealant to this substrate and thus significantly reduce the quality of the sealed joint. Furthermore, representatives of several types of sealants and primers recommended for them available on the Czech market are selected for this experiment. Test specimens are made using glass cement plates treated with the appropriate primer and the sealant. These test specimens are then the goal of a test procedure to verify the properties of the sealed joint of the problematic material and the selected primer and sealant that is exposed to the water element. The results of these tests are then presented in the article.

ENSURING THE SAFETY OF INDUSTRIAL PREMISES BY REDUCING THE NOISE IMPACT THROUGH THE USE OF GREEN WALLS

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ABSTRACT

Urban environmental problems caused by buildings such as increased energy consumption and greenhouse gas emissions, urban runoff, and the urban heat island effect are the main problem of a modern world. There is also another urgent issue - noise pollution, which negatively affects human health, both physical and psychological. Therefore, the so-called green construction is gaining momentum, which can solve most of these problems. In this research we provide the analysis of the modern green wall technologies. We took a detailed look at the different vertical greening systems, we analyzed their benefits and disadvantages, and how each of these systems reduce noise. According to the results of the study, it was revealed that there is no universal gardening system, it should be selected individually, taking into account the conditions. In terms of noise reduction, hydroponic systems with green wall panels are the most noise-reducing systems.

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CERTIFICATION OF GREEN BUILDING AND ENVIRONMENTAL SAFETY FACILITIES BASED ON A RISK-BASED APPROACH

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ABSTRACT

In connection with the deterioration of the environmental situation in the world, specialists in the field of green and environmentally friendly construction are developing new technologies and materials that can increase the environmental safety during the operation of the building. Materials and products used in green building are subject to stringent certification systems. According to the results of the study, it was revealed that there are problems of developing green building technologies and standards for the Russian construction industry using green roof technologies. Buildings increasingly incorporate new sustainable construction materials and technologies for improving efficiency and safety generally, thereby providing a comfortable built environment for the future generations.

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TEST METHODOLOGY FOR DETERMINING THE FIRE RESISTANCE LIMIT OF FACADE TRANSLUCENT STRUCTURES FOR HIGH-RISE BUILDINGS

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ABSTRACT

Based on the analysis of modern construction of high-rise buildings with facade translucent structures (FTS), it has been established that it is necessary to assess the actual fire resistance of FTS for high-rise buildings. The spread of fire hazards due to temperature deformations of translucent structures occurs at a high speed along the vertical of the facade. The required minimum limit of fire resistance for various types of walls (including with filling with fire-resistant glass) in the Russian Federation in accordance with table. 21 of the annex to the Federal Law No. 123-FZ of 22.07.2008 is for buildings, structures and fire compartments the degree of fire resistance I - E30, degree of fire resistance II, III, IV - E15. Methods for increasing the fire resistance of translucent facades of buildings can be developed only on the basis of the results of scientific research on modeling the likely scenario of fire development in high-rise buildings with FTS, which should be carried out taking into account the fragment and characteristics of the sample, the fire load, which affects the development of a fire along the facade. It is also necessary to take into account the FTS design, - glass (ordinary and fire-resistant) and structural elements, since the spread of dangerous fire factors due to thermal deformations of structures occurs through horizontal and / or vertical connection elements into nearby rooms.

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THE REDUCTION THE FIRE HAZARD OF CABLE LINES THROUGH THE USE OF FIRE RETARDANT COATINGS

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ABSTRACT

The main objective of specialists in fire protection, cable lines in recent decades has become the development of new effective fire retardant coatings which reduce the spread of fire, the release of gaseous toxic products during combustion. The formation of new fire retardant coatings requires the solution of a number of complex scientific problems of the physicochemistry of binders and fillers at ordinary temperatures and ambient humidity, at high temperatures under fire conditions, thermodynamics, reactions in solid phases, heat and mass transfer in capillary-porous bodies, solid mechanics body. The aim of this study is to create new highly efficient intumescent and other coatings based on non-scarce materials and to experimentally substantiate the mechanism of swelling under high-intensity thermal exposure when the necessary technological parameters are achieved, associated with the manufacture, application and durability of coatings. Their practical application makes it possible to increase the level of fire safety of construction objects, safety of people, reduce material losses, and increase the time between preventive repairs of coatings.

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LEGIBILITY ASPECTS OF OMANI TRADITIONAL RESIDENTIAL SETTLEMENTS

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ABSTRACT

The interest for studying the Omani built heritage is not recent. However, the published researches about the subject since the early 1970's, were limited in number and sporadic in topics and territories they investigated. Moreover, there was no or little interest in examining this built heritage from the point of view of its urban design typologies. This paper is examining the urban form of these settlements and linking it with legibility aspects. Legibility and its influence on users of urban spaces have been significant for many theorists in urbanization area. In their point of view, behavior patterns of pedestrians are strongly influenced by legibility perception of the urban patterns in urban spaces. The current research aims at studying the legibility aspects of traditional Omani residential settlements in an objective evaluation represented by numerical approach. Through a descriptive and analytical methods, the results will link the influence of urban forms with legibility and behavior patterns of pedestrians which are harshly affected by the perception of body and mind. The paper explored paths' forms influence on legibility perception of pedestrian in some of traditional settlements in Oman that have a strong urban identification. Five case studies representing traditional Omani settlements were chosen and analyzed with an innovative quantitative approach capable of evaluating, discovering deficiencies, and suggesting solutions to develop local concepts for paths in any of urban residential settlements. The findings disclose that the contest to adopt international approaches to solve local urban spaces has created pointless, despicable, and unused spaces, while adopting local patterns, features and solutions will enhance the legible image of local urban settlements.

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ENHANCING ECOLOGICAL, FUNCTIONAL, SOCIAL AND AESTHETIC QUALITY OF STREET GREEN SPACE BY PLANNING GREEN POCKETS

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ABSTRACT

City residents do not always have an opportunity to visit larger parks or nature areas on a daily basis as the rhythm of their daily life does not allow them to spend enough time in a natural environment. More and more time is spent on the way to the working pace or home. As well as tourists visiting the city use main streets as touristic routes. On the one hand major central streets affects ecological balance of the city due to the heavy traffic and contamination from it, but on other hand they area most visited public areas as public transport and various public buildings and touristic objects are concentrated here. Thus, street green space plays an important role in the city landscape pattern and often requires much more diversity of plantings, humane and safer environment than other areas of the city. Street green space can be very limited especially in the centre of the city with dense building areas or places where historic pattern of buildings does not allow to expand green areas. But it is possible to find small green spaces or green pockets in several places along the street. Green pockets developed as multifunctional, ecological and aesthetical green spaces can compensate insufficiency of street greenery. The socio-economically active, medium-size city of Rezekne in Latvia has been chosen as a pilot area for assessment of potential to develop green pockets along main streets of the city. The central street of Rezekne city is main axis of the urban landscape which provides access to the city from other regions, although it is historic heritage area with active public life. Unfortunately, within the development of the city there were needs to increase the flow of the main street by reducing the green space. Therefore, it was not possible to develop classic street greenery from alleys of trees. Due to the random spatial structure of buildings along the main street, there are open spaces of different size and shape between or in front of buildings. Those are appropriate for development of green spaces. The approach of green pockets was adapted for the main street of the Rezekne city as a tool for enhancing ecological, functional, social and aesthetic quality of street green space. As well as, this makes it possible to give the street landscape a diverse and multifunctional image and provide necessary functions and environment for inhabitants and tourists. The aim of the article is to analyse problematic issues of greenery of major central streets of the Rezekne city and present approach of green pockets as tool for their solving.

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RELATION OF THE GREEN STRUCTURE AND THE APPROPRIATION OF PUBLIC SPACES IN LARGE-SCALE RESIDENTIAL AREAS

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ABSTRACT

More than a half of residents in some capital cities of the former Socialist block live in large-scale residential areas that had been built from the 1950s to the 1980s. The public space satisfaction in the areas is low, the residents rarely appropriate the yards and streets of the housing complexes. The aim of the paper is to provide a framework for the understanding of residents' assessment of public space and its relation to the appropriation; the framework can be used for the development of building or landscape architecture projects focused at reconstruction of the public space. Public Space Quality Model is generated in the paper. The model includes three spatial categories that are defined by metrical values, configuration components and dominant spatial elements – elements that determine size, category, and the structure of a space. Using the observation method in the residential areas of the former East Berlin, the research concludes that the model demonstrates the highest precision of predictability of the appropriation intensity of the public space when the green structure is used as the dominant spatial element. A method accompanying the model is presented in the paper that permits to use specific types of trees or shrubs in particular distancing and concrete arrangements to create spaces of high, medium, or low appropriation level in large-scale residential areas.

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EVALUATION OF FINITE ELEMENT SOFTWARE FOR SHEAR BEHAVIOUR OF CONCRETE WALL PANEL CONNECTIONS

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ABSTRACT

Shear connections between large concrete panels are being studied since 1960s. Several design models are formulated and presented in the national and international design codes including Eurocode 2. The International Federation of Concrete (fib) published two documents: fib Bulletin 43 (2008) and fib Bulletin 74 (2014), where the previous research, the design assumptions and approaches used for the wall connections are summarised. During the decades different techniques and many improvements are introduced to increase the shear capacity of the connections. Due to the variety of the possible connection types, uncertainties arise among engineers about the correct application of the various design models. Use of finite element software can help both engineers to estimate the load bearing capacity of structures and manufacturers to optimise the pre-cast element production. Nevertheless, the parameters for interfaces between concrete wall panels can be difficult to define. The representation of the connection in software models usually is not evident and the techniques to do it can differ from software to software. It would be useful to evaluate the results of the finite element analysis with experimental test results. Fortunately, there are dozens of experimental studies reported in the literature. The results from the available reports are used in the current study to replicate several of the available shear tests using today's finite element software and evaluate the software. In this paper a non-linear finite element software ATENA GiD is used. In ATENA GiD the connection between separate panels can be defined in different ways: 1) simplified, 2) complicated by defining interfaces, and 3) a combination of the two. All of them were used in this research. Depending on how the surfaces of the connection are defined, the simplified approach can result in highly overestimated shear capacity. However, if the concrete used in the joint is considerably weaker than the concrete of the panels, the results of the simplified method complied with the experimental results very well. In the case of intended concrete surfaces, the complicated method by setting the interfaces resulted in convergence problems. On the other hand, the combined approach showed the most realistic results for the interaction between intended concrete surfaces of the same strength. During the study, the authors came across with some issues related with the replication of the available reports. Many of the previously performed experimental studies lack information that could influence the results. In older studies concrete/mortar of very low strength (compressive strength of 3.0 to 10 MPa) is used, which is not the practice used in structures nowadays. In authors' opinion, the use of today's non-linear finite element software for replication of previously reported test results is very useful tool. By means of relatively small effort, it helps to evaluate the quality of a particular study and reveals some shortcomings that shouldn't be repeated.

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EFFECT OF ASSUMED BOUNDARY CONDITIONS IN NUMERICAL MODEL OF ROAD PAVEMENT-MINING SUBSOIL SYSTEM ON CRITERIAL VALUES USED IN DESIGN USING MECHANISTIC METHODS

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ABSTRACT

Underground mining brings benefits in the form of the extracted mineral. The negative effects of mining exploration are deformations of the rock mass, which also cause deformations on the ground surface. There are continuous deformations, discontinuous deformations and mining shocks. Recommendations regarding the protection of the structure of cubature building against the negative effect of mining operations are discussed in detail, for example, in the recommendation published by the Building Research Institute (ITB) in Warsaw. In the case of road structures, the situation is different. Firstly, there are no general rules that would provide clear guidelines for the procedure for designing road pavement in mining areas, similarly to cubature buildings. Secondly, in the computer programs used for the individual design of road pavement, it is not possible to assign additional actions, including mining impact. Therefore, in order to analyze the behavior of the pavement-mining subsoil system, an advanced numerical analyze should be carried out. In this case, the subsoil thickness, the boundary conditions and the constitutive relationships of the materials of the road pavement layers and subsoil should be determined. This paper presents an attempt to select kinematic boundary conditions for the FEM model of the road pavement-mining subsoil system, analogically to the model of the building-mining subsoil system. The paper is aimed at assessment of the influence of kinematic boundary conditions selection on the criterial values that are taken into account during the design process of road pavement using mechanistic methods. For this purpose, three cases were considered: (i) horizontal mining strain (ε_{design}), (ii) curvature of surface (K_{design}), (iii) combined impact of these actions. In these cases, each time vehicle wheel load was assumed. Based on the analyzes, the computational horizontal strain of the mining area ε_{comp} is decisive when assessing the criterial values taken into account in the design process of road pavement structures.

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MODERNIZATION AND INTEGRATION OF SPATIAL DATA OBTAINED FROM VARIOUS SOURCES FOR 3D VISUALIZATION

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ABSTRACT

At the Faculty of Geoengineering of the University of Warmia and Mazury in Olsztyn, every year students in the field of the study of Geodesy and Cartography perform land measurements of the Campus. The created measurement database is used for further thematic studies. Based on it, a 1:500 large-scale map was created. All survey points are measured with three coordinates, which allowed to obtain map objects also recorded in three dimensions. Since 2019, the Head Office of Geodesy and Cartography in Poland has made available for free LAS laser scanning collections in the form of: point cloud, developed digital terrain model (DTM) and 3D building models at LOAD2 level. All these data sets have been integrated and allowed for the modernization of the existing resource related to the improvement of quality and visualization. This was the main goal of the conducted works. The result is a digital 3D Campus map. The purpose of detailed research was to establish a methodology for the modernization of 3D measurement objects based on DTM. This involved creates new features by replacing input feature's segments with densified approximations of geodesic segments. The obtained official 3D building models (LOAD2) also needed to be transformed, as the building reference level did not refer to the ground line, but only to one lowest vertex. In addition, autonomous transformations of LAS sets into 3D objects were performed and the quality of the results was compared based on reference data. 3D building sets obtained from different collections were compared with each other. They were based on tables of coordinates. Detailed analyses made it possible to assess the accuracy and define the final conclusions. It was found, that in order to prepare a large-scale vector 3D map and its visualization, geodetic measurement sets and data from aerial scanning (LAS) are necessary. The LAS sets themselves do not guarantee the accuracy of mapping the buildings in the detail of the basic map on a scale of 1:500. It is necessary to obtain the outlines of buildings and other objects from detailed measurements. Comparison of the campus 3D visualization based on the output and integrated data shows the scope of the research carried out. The results indicate, that it is essential to transform of the geodesic resources into a 3D form.

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APPLICATION OF CERAMSITE DUST AS AN ACTIVE POZZOLAN ADDITIVE IN THE CEMENT-BASED COMPOSITIONS

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ABSTRACT

Ceramsite (expanded clay) dust is a waste material, obtained in large volumes all over the world as a by-product of ceramsite gravel production. With the development of the construction industry and the ever-growing amount of ceramsite dust disposed in the landfills, the recycling and rational use of this material is becoming a relevant issue. The currently available technologies for the ceramsite waste recycling are very limited, this is why it is necessary to develop a new effective way to involve this waste into the new production. The present research is based on the assumption that ceramsite dust can be applied effectively as an active pozzolanic mineral additive in the cement-based materials. In order to study the composition, structure and properties of the original clay used for the production of ceramsite, as well as the dehydrated clay dust, captured in the dust removing systems of kilns at ceramsite gravel plants, physical and chemical analysis methods were used. Based on the experimental data, the influence of ceramsite dust on the structure and properties of cement compositions was evaluated. Mechanical tests of the samples showed that the introduction of ceramsite dust as an additive in the amount of 3% by the cement weight leads to an increase in compressive strength by 23% in comparison with the reference composition. The paper also presents the results of microstructural analysis, IR spectral analysis and differential thermal analysis of samples modified with the optimal amount of this microadditive. The study of the microstructure of the modified samples shows that the introduction of ceramsite dust into the composition of the cement stone does not only change the morphology of new formations, thus increasing the density of the structure, but also varies the mineralogical composition of the cement matrix with the formation of stronger and more water-resistant minerals in the form of calcium silicate hydrates and calcium aluminosilicate hydrates. This technology allows the recycling of waste from the production of ceramsite stone, thus improving the environmental situation and contributing to the creation of a circular economy.

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A STUDY ON THE ADHESION IN THE INTERFACIAL TRANSITION ZONE BETWEEN GLASS FIBRE REINFORCED REBAR AND THE CEMENT MATRIX

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ABSTRACT

This study is aimed at increasing the adhesion of the fibre-reinforced polymer rods to the binder in the cement-based composites in order to eliminate the problem of rod slippage under loading and broaden the application of composite reinforcement in the construction industry. It is assumed that the better adhesion of reinforcement rod to the cement matrix can be provided by increasing the cement stone structural density, and, in particular, by compacting the structure of the hydration products formed on the surface the fibre-reinforced polymer reinforcement rod. Such increase in strength and density can be achieved by adding nanodispersed additives such as metakaolin, the dispersion of carbon black and Peneco Nano Stachema primer into the composition of the cement matrix. Additional adhesion of the cement matrix to the reinforcement is ensured by coating it with the primer, which seals the structure of the cement matrix located in the interfacial transition zone between the reinforcing bar and the cement stone. Experimental study proved that the proposed approach allows the formation of a strong and dense structure in the interfacial transition zone between the cement matrix and the fibre-reinforced polymer reinforcement rod surface. The introduction of metakaolin and a dispersion of technical soot led to an increase in the adhesion strength of fibre-reinforced polymer rod with a cement matrix by 27% and 29%, respectively. The IR spectral analysis and DTA analysis results showed that the mineralogy and morphology of the hydration products was changed due to the addition of the modifying additives, thus improving the adhesion characteristics and corrosion resistance of fibre-reinforced polymer in the cement-based composites.

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SUSTAINABLE WAYS AND METHODS OF RECYCLING EPOXY FIBERGLASS WASTE

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ABSTRACT

This article presents two technological ways of recycling the wastes of the production and application of products made of highly oriented fiberglass bound by the epoxy matrix. The first technology is aimed at shredding the epoxy-based products obtained by pultrusion to create fine and ultrafine powders (up to 2-10 microns) used as fillers in various composites. The second technology offers a way to obtain coarse powders with a particle size of up to 100 microns, used in the composition of heat-insulating materials and fire-retardant intumescent coatings. Proposed is the mechanical grinding of fiberglass to a finely dispersed state with subsequent heating to a temperature of 400 ℃ in the presence of a foaming coke and liquid glass. This technology allows the full utilization of waste from the production and application of epoxy fiberglass, such as windmill blades and parts of molded products, leading to the creation of an environmentally friendly fire-resistant and heat-insulating material in the form of plates, blocks and other products with operation temperature up to 400℃, as well as fire retardant coatings for building materials and structures. By varying the content of the foaming agent and soluble glass in the composition of the intumescent mixture, one can regulate the average density, thermal conductivity and strength of the material within significant limits, achieving characteristics that exceed those of traditional heat-insulating materials. The proposed material based on recycled epoxy fiberglass is inflammable and resistant to unfavorable environmental impacts; it has high biostability and provides heat and mass transfer during the operation in buildings and structures.

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STRUCTURAL DESIGN AND TOPOLOGY OPTIMIZATION IN ARCHITECTURE

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ABSTRACT

This paper presents the application of structural design and topology optimization to architectural design. Choosing a structural strategy in accordance with the intended spatial organization and function of a building is a crucial aspect of building architecture. The relationship between structural and architectural design is continuously evolving, and their forms are dynamically driven by their design objectives and constraints associated with reliable and sustainable performance, such as structural integrity, thermal comforts, and daylighting. Given its profound and direct impact on public safety and quality of life, integration and incorporation of structural and architectural planning and design are necessary to achieve reliable operation of building structures. Structural performance is intrinsically influenced by various design factors such as shape, configuration of members, composition of materials, and systematic orientations. Building design becomes interconnected and interdependent with structural and architectural objectives and design ideas. Therefore, integration of theoretical and computational mechanics, architectural design principles with structural engineering into design processes is crucial and this can provide architects and architectural students with new insight into the identification of optimal building form through collaboration between engineers and designers for multidisciplinary design. The paper will show various architecture projects augmented through structural optimization such as grid-shell designs using force density and minimization of potential energy methods, and long-span structures using discrete/continuum-based topology optimization. Finally, the balance between architecture and engineering; aesthetics and functions; redundancy and efficiency; form and stability through mathematical, technical, and computational approaches will be presented.

DESIGN AND IMPLEMENTATION OF NZEB BUILDINGS IN POLAND

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ABSTRACT

The article will discuss the design and construction aspects of nearly zero-energy buildings (nZEB) in Poland. It is the newest building standard introduced by the Directive on the energy performance of buildings 2010/31 / EU. The directive made the implementation of nZEB buildings compulsory in European countries. The article will present analyzes of the energy performance of nZEB buildings, in accordance with Polish legal requirements, and discuss the possibility of achieving this standard in terms of economic efficiency.

Corresponding Author: Małgorzata Fedorczak-Cisak

MATERIALS AND TECHNOLOGIES TO ACHIEVE BETTER ENERGY EFFICIENCY OF BUILDINGS

Małgorzata Fedorczak-Cisak, Henryk Łoziczonek, Beata Różańska, Michał Ciuła

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ABSTRACT

The article will discuss the aspects of the possibilities of improving the energy efficiency of buildings. In particular, the authors will analyze innovative technologies for the improvement of thermal insulation of external partitions. The authors will present paints and coatings available on the market of building materials that may improve the thermal resistance of external partitions, and present preliminary research on innovative thermal insulation materials containing vacuum nanoparticles. It is a topic of research and reflection by scientists looking for opportunities to improve energy standards in buildings.

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CLASSIFICATION OF NEW AND HISTORICAL BUILDINGS FOR COMFORT

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ABSTRACT

The article presents a proposal for the classification of new and historic buildings in terms of ensuring the comfort of users. For historic buildings, the adopted classification depends on the selection of the use function of these buildings. The article also presents an algorithm for selecting the future function of using monuments. In the case of newly designed buildings, the building classification is based on simulations.

GREEN AREAS IN THE CITY AS AN ELEMENT OF NOISE PROTECTION

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ABSTRACT

From the dawn of history, humanity created communication routes in order to move efficiently. Trees were planted along the roads connecting towns and villages so that travelers could rest in their shade. The line of trees also played an informative, strategic and sometimes aesthetic role. Currently, a line of tall vegetation along the street provides shade and relief in cities during hot weather. It is also worth emphasizing that greenery reduces stress factors in large cities. One of the stressors in cities is noise. In an urbanized environment, noise is perceived as unpleasant and bothersome. Appropriate planting of greenery in the city can reduce this phenomenon. The article not only analyzes the possibilities of reducing noise through appropriate planting of greenery, but also provides guidelines for the correct design of greenery along streets and at crossroads. It is worth emphasizing here that the correct design of greenery in the vicinity of communication arteries is not only a matter of ethics or landscape legibility, but also a matter of safe use of infrastructure. The article also deals with the issue of legal acts relating to the design of urban greenery. The former and current legal acts contain provisions related to the classification of green areas, their protection and shaping. These regulations apply to various fields (construction, spatial planning, environmental protection) and therefore there are discrepancies in the legal interpretation of this term. All these doubts will be clarified.

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THE ANNOYANCE OF SIMULTANEOUS OCCURRENCE OF NOISE AND VIBRATION ON PEOPLE IN BUILDINGS

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ABSTRACT

Vibration and noise are factors that have a significant impact on the perception of comfort of people in buildings. The issue of feeling vibrations in a passive way in buildings intended for permanent residence, just like the perception of noise, is still a developed branch of ergonomics. As part of their development, it is worth noting that for some time there has been a trend to study the mutual interaction of annoying stimuli. It is important because the vibrating partition of the room can become a source of structure-borne sound. The vibrations of the partition to which the person in the room is exposed will not be the only stimulus to which person is exposed. To this must be added structure-borne noise. Another case is the combined occurrence of vibrations and noise from transport traffic, where vibrations in the room not only generate structure-borne noise, but are also associated with noise penetrating the building facade. In this work, a review of the literature related to the subject of noise and vibrations was carried out, taking into account their combined occurrence and the total annoyance associated with them for people in buildings. The works unanimously indicate an increase in the overall annoyance associated with exposure to simultaneous stimuli, compared to the assessment of annoyance caused by individual stimuli. However, there is a considerable discrepancy in the quantification of simultaneous annoyance due to different research methods used by researchers to assess the discussed phenomenon of simultaneity of stimuli. This paper shows the discrepancies and common features of the research. The discrepancy should be understood as the research methodology and the parameters used to assess the annoyance. The common features indicated the aim of the research and the general trend of the results.

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ENVIRONMENTAL PROTECTION AGAINST NOISE AND VIBRATION

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ABSTRACT

Noise in large cities reaching the interior of buildings by air or in the form of material noise and vibrations propagating through the ground to the building not only cause discomfort but also pollution according to legal regulations in the field of environmental protection. The main legal acts in Poland relating to environmental protection are the Environmental Protection Law of 2001, as amended. Under the concept of emissions in this act, the introduction of substances or energy into the environment, such as heat, noise, vibrations or magnetic fields. Pollution, in turn, is understood as an emission that may be harmful to human health or the state of the environment, may cause damage to material goods, may deteriorate the aesthetic value of the environment or may conflict with other, justified ways of using the environment. According to a 2008 Directive of the European Parliament and Council, pollution is direct or indirect introduction of substances as a result of human activity, vibration, heat or noise to air, environment water or soil that may endanger human health or environmental quality, or manifest itself in the form of damage to tangible property, diminution of value or collision with other legitimate uses of the environment. The above two legal acts already show that both noise and vibrations should always be taken into account in the environmental impact assessment. The paper also analyzes other acts of law relating to environmental protection, taking into account noise and vibrations. Moreover, possible solutions that can reduce pollution such as noise and vibrations are clearly described.

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DETERMINANTS OF INVESTMENT PROJECT LOCATION 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, analyzing 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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CAUSE AND TYPES OF DELAYS IN CONSTRUCTION WORKS IN POLISH CONSTRUCTION INDUSTRY – INVESTIGATION OF SELECTED RESULTS

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ABSTRACT

Implementation of a construction investment involves the fulfillment of numerous assumptions resulting from the nature and scale of the project and the complexity of construction processes. Despite the professional preparation of the project and its professional management, the occurrence of disturbances generating a delay at various stages of the construction process is impossible to eliminate. Delays are a problem that, despite advanced modern technology and many management support tools, is quite common. It is a result of the random nature of events that have a significant impact on the course of the construction process, and are often difficult to predict at the planning stage. The authors of the article identified and classified the delaying factors on the basis of a literature study. A comprehensive assessment of the frequency of occurrence and their impact on delays in construction works was carried out on the basis of a survey conducted among Polish contractors in 2020.

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SHOPPING CENTRE ARCHITECTURE - MORPHOLOGY AND SPACE ORGANIZATION OF CENTRO COLOMBO, LISBON

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ABSTRACT

This article presents the morphological analysis (organizational and programmatic) of the Centro Colombo shopping centre, located in a contemporary urban space in Lisbon. There is a strong relationship between the organization of space and the logic of consumption in the shopping centre. The social dynamics of consumption stems from a basic natural anthropological propensity: the search for happiness. Through the satisfaction of needs, the Being has a concrete perception of well-being translated by the possession and accumulation of objects. This work aims to identify, at Centro Colombo, which are the elements that shape spaces and to elucidate their implicit or explicit meanings, assimilated in their architectural spatial organization. This aim will verify through the relationship established in this shopping centre, based on the essential elements that structure and organize the architectural space, namely the 'order', the 'measures', the 'balance', the 'objects', 'space' and 'place'. The method used is based on an analysis grid structured from concepts that support the theoretical basis for the analysis, namely, architecture, composition, and formal expression - interior and exterior image and functional structuring. This analysis investigates how to identify the qualities of the shopping centre's morphology, the measures and dimensions established, the logic of its purpose in the context of postmodernity, where culture and mass media are present, through its morphology/geometry. In this way, describe the function and purpose of the architectural space, the geometry, and the concepts of mass, surface, breadth and the paths that define its purpose.

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THE SUSTAINABILITY OF HISTORICAL ENVIRONMENTS AND ITS EFFECTS ON FUNCTIONAL CHANGES: CYPRUS KYRENIA ANTIQUE HARBOUR

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ABSTRACT

Historical cities have been formed with cultural values, life cultures and artistic aspects of various civilizations throughout the centuries and gained identity and reached to today's forms. Cities have existed with architectural works and their past cultures. Historical textures are the open-air that come from the past, convey the traces of the past, and link the past to the future. The transfer of historical and cultural heritage to future generations will be possible through "protection" and "conservation" will ensure the sustainability of historic cities. In general, repairs or amendments aimed at economic development in historic cities provide only economic sustainability in structures with historical characteristics. Sustainability in historic cities should provide protection in accordance with the most important structural characteristic and function properly in the structural form. Thus, the historical city sustainability will be ensured. In historical cities, it is the main target for sustainability and it should be to protect the texture. With this target; It is determined that Kyrenia Antique Harbour, which has a historical value, its location and its past culture is rich and its tourism effects are analysed. In the study, usage analyses were made, the reasons for the changes were made, and suggestions for the sustainability of the historical city were introduced.

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ARCHITECTURE AND SITE LAYOUTS OF PRUSSIAN ASYLUMS IN POLAND IN THE 19TH AND EARLY 20TH CENTURIES AS A REFLECTION OF THE DEVELOPMENT OF GERMAN PSYCHIATRY AND HEALTH POLICY

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ABSTRACT

The aim of the article is to present a short overview of site layout and architectural solutions of Prussian institutions for the mentally and nervously ill in the 19th and early 20th centuries, on the example of the complexes created in the Polish territory (Prussian Poland) ranging from hospitals located in adapted buildings to modern, extensive facilities, which according to the views of the time were supposed to be a tool of therapy. Prussian asylums in Poland were built according to the high standards set for this type of building in the Kingdom of Prussia and later in united Germany. They reflect the trends in the rapidly developing 19th century German psychiatry, supported by the social and health policies of the state. The psychiatric institutions discussed in the article include all architectural and site layout solutions applied in Prussia, including model institutions such as the hospital in Lubiąż or those awarded at exhibitions such as the facility in Owińska. This proved the high level of architecture of the hospitals erected in Poland. The phenomenon of this architecture, bathed in greenery, designed as a part of therapy, has never ended. Both small pavilions for patients, social facilities, gardens and parks are still great for treatment. Complex of hospitals for the mentally ill are a testimony of cooperation between architects and doctors in order to build the best therapeutic spaces that are still valid. Thanks to the cosy architectural and urban interiors, the interaction of architecture with nature and greenery, the introduction of a climate of peace and harmony, which is often lacking in contemporary, huge hospital complexes, they still successfully fulfil their function.

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CONTRIBUTION OF BRICK RECYCLED PLASTICS TO THE REDUCTION OF ENERGY USE AND GREEN HOUSE GASES EMISSIONS

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ABSTRACT

Buildings consume a large amount of energy to maintain the internal comfort temperature, contributing to the exacerbated consumption of fossil fuels, with the consequent increase in temperature, due to the associated greenhouse gas (GHG) emissions. On the other hand, plastic is one of the materials that causes the greatest impact due to pollution, from its production from fossil fuels to the end of its life cycle. These discarded materials end up in landfills or exposed to the open air, with little or no degradation, and the management of this waste is one of the major problems of our society. Reuse represents an economic saving (associated to the costs of the municipalities that must give adequate destination to the waste) and an opportunity to generate employment among wide sectors of the population, from the scientific and technological research sector to the most vulnerable social sectors. We present an alternative to mitigate environmental pollution and global warming through the construction of the lateral envelope of a house in the city of Rosario (Argentina). In this city and its surroundings, the climate is temperate-humid (according to the Köppen-Geiger classification). Temperatures are highest from November to March and there is a cold season between May and August. Summer is hot at midday and in the early afternoon, temperate in the mornings and afternoons and cool during the evenings. Winter is temperate/cold during the day and cold at night. The city of Rosario is located in the southern area of the province of Santa Fe, Republic of Argentina (32.55° S, 60.44° W, 24 m asl). This alternative considers the building with recycled plastic and will be compared with a house built in a traditional way. The objective is to quantify the annual energy savings, as well as the avoided GHG emissions, providing an scalable option for different types of construction. The study was developed using the Clean Energy Project Analysis Program (RetScreen), developed by the Government of Canada. It allows the calculation of energy demands for air conditioning and avoided GHG emissions. In conclusion, buildings constructed with recycled plastic material contribute to energy savings -with the corresponding reduction in electricity and gas consumption-, reducing GHG emissions into the atmosphere and providing healthier indoor environments by requiring less external energy for climatization. In addition, it contributes decisively to avoiding the use of landfills to bury the plastic at its final destination, making it possible to reuse it in the construction of recycled plastic bricks.

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A PRELIMINARY STUDY OF VISUAL CONSTRUCTION DOCUMENTATION

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ABSTRACT

Photography has been around for almost 200 years and for about 150 years it has been used to document the progress and as-built condition of construction projects. In the late 1980s digital photography advanced to the point where commercially available digital cameras dramatically increased the ease of capturing photographs and lead to thousands of digital photographs being taken during construction projects. Eventually this resulted in an overwhelming amount of photographs and data, instigating the development of specialty software products designed specifically for the capture, storing, organizing and easy retrieval of visual construction documentation. Through qualitative methods, this research study explored the history of visual construction documentation and identified its integrated applications that are currently available to construction industry. From the results of this study, it appears that there are several good products available for construction professionals to capture, store and manage photographic visual construction documentation. The self-service and full-service options provide several options depending on the construction project size, budget, and documentation needs.

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BUILDING INFORMATION MODELING USAGE IN FEDERAL HYDROPOWER DESIGN AND CONSTRUCTION MANAGEMENT

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ABSTRACT

The use of Building Information Modeling (BIM) is widespread within the engineering and construction industry, with huge strides in both usage and technological advances in the past two decades. The benefits of design collaboration, communication, visualization, and risk mitigation are untold. The U.S. Army Corps of Engineers foresaw the benefits of BIM and began to write policy for its mandatory use across the enterprise in the early 2000s. As BIM technology evolved, the U.S. Army Corps of Engineers has struggled to keep pace with the speed of industry but continue to make improvements to policy and more widespread usage across the enterprise. The MILCON program sees widespread use in the planning and design phases using BIM for visualization, communication, creation of 2D construction drawings, and rough estimating. BIM usage stops short in two major areas of the U.S. Army Corps of Engineers work: hydropower rehabilitation and construction management. Professionals from the U.S. Army Corps of Engineers in design management, hydropower engineering, and construction management all agreed that BIM, utilized and implemented properly, can have a very strong impact in each major field that would improve efficiencies, aid stakeholders in better understanding of complicated design concepts, and realize a more streamlined construction management process for complicated hydropower work. Through literature review and interviews with construction professionals, this research studied how BIM is being used within the U.S. Army Corps of Engineers, specifically within hydropower rehabilitation programs, for design and construction management. This research also focused on how private industry has been and is currently using BIM in construction management, and to correlate how processes used in private industry may be used on hydropower generation unit rehabilitation projects at USACE-owned facilities.

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REEXAMINING THE OLD DEPOT MUSEUM IN SELMA, ALABAMA, USA

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ABSTRACT

Housed within the distinctive architectural fabric of the former L&N Railroad Depot and listed on the Water Avenue Historic District National Register of Historic Places, the Old Depot Museum depicts life in Alabama and the histories that made Selma the "Queen City of the Black Belt." Formally known as the Selma/Dallas County Museum of History and Archives, Collections range from the times of pre-historic Native Americans to the Civil War, continuing through the Depression and the historic path of the Civil Rights Movement, illustrating how a site that was once home to a Confederate foundry became a critical repository for the preservation and interpretation of key documents, artifacts, and photographs related to "Bloody Sunday", as one of the most significant incidents of American Civil Rights Movement, and its aftermath. Through enlightening and enriching displays, Selma's Old Depot Museum provides unparalleled educational opportunities for the general public and area schools, with particular respect to the path from slavery to voting rights for African Americans. This paper will present a research project that brought the architectural fabric and archives of the Old Depot Museum in Selma to life for visitors, both on-site and remotely through Historic Building Information Modeling (HBIM) and other technology, including LiDAR, 360-degree photography, photogrammetry, and UAVs. The findings of this project can also be implemented to help digitally document and showcase other historic American Civil Rights structures.

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USE OF WOOD WASTE AS AGGREGATE FOR THE DEVELOPMENT OF GYPSUM PLASTER AND CEMENT MORTAR

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ABSTRACT

The present work shows the results of an experimental plan using wood waste from demolition as additives in gypsum and mortar mixtures. The wood waste used is extracted from domestic buildings in the historical centers of Spanish cities. These buildings have wooden slabs and roofs structures. The additives are used in the form of wood shavings and sawdust mixed in various proportions. The gypsum mixtures were tested adding 2.5, 5, 10, 20 and 40 percent of waste as additives in the two forms specified. The samples were characterized by their physical and mechanical properties. The results showed that increasing the amount of wood waste reduced density. It was also observed that a rise in the percentage of wood waste slightly lowered thermal conductivity. In addition, the mechanical properties of the composite material were lower than in the reference samples. A 40% addition yielded a decrease in flexural strength of 61% for samples with sawdust and 65% for samples with wood shavings. Regarding mechanical resistance to compression, the compound with sawdust waste at 40% saw a reduction of 71% and 78% for the compound with wood shavings at 40%. On the other hand, mortar mixtures were studied by replacing natural aggregate in the proportions of 2.5, 5, 10 and 20 percent by weight of sand. Mortars were characterized by their physical and mechanical tests. In the case of mortars they were characterized in fresh and hardened state. The results showed that increasing the amount of waste obstructs the workability of the sample and prolongs setting times. Furthermore, compounds with larger-sized particles, those based on wood shavings, showed a more pronounced decrease in density and produce the best thermal results. Finally, contrary to what one might expect, the wood shavings compounds also have presented better mechanical properties, resistance to bending and compression.

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INDUSTRIAL SPACE IN BYDGOSZCZ

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ABSTRACT

Because of its specific, industrial space constitutes a challenge from the planning stage to the design stage. Proper zoning of this space has positive effects on industrial function, spatial exposure and environmental impact. Proper creation of industrial areas means the impact of these processes on a macro scale. Local government authorities have the most important influence on the formation of industrial areas, which are necessary for the functioning and economic development of a region. The right regional development policy is what places the industrial space in symbiosis with areas of a different purpose. The most important is the selection of an appropriate space - an enclave, where this specific function can exist and develop without affecting the surroundings, which may be the adjacent urban space. Due to its specifics, locating of industrial areas has a fundamental role in these multifaceted processes. Bydgoszcz Industrial and Technological Park (BPPT) is the biggest industrial area in the district and one of the biggest industrial and technological parks in Poland. As city authorities say “According to the independent report of the World Bank “Doing Business in Poland 2015” Bydgoszcz is the best city for investment. The potential of the Park and his rapid development are finding disregarding only amongst investors, but also other operators receiving the BPPT infrastructure.” Referring to the above, there are several important questions. How do these assumptions relate to the industrial zone if an urban areas is in close neighborhood? How should the development of industrial spaces look like, so that it does not adversely affect urban living space? How do the above assumptions refer to the Bydgoszcz Industrial and Technological Park (BPPT)? The matrix presented in the article compares the general assumptions of the interactions of industrial processes and their application for the Bydgoszcz Industrial and Technological Park.

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REGIONAL ARCHITECTURAL TRADITION AS A DIRECTION OF CONTEMPORARY CHANGES

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ABSTRACT

The aim of the research was to find common threads linking the regional, local tradition of construction with contemporary trends in architecture. In some of them, traditional patterns are explored clearly and in different ranges, while in others they can be found to a small extent. Regionalism in architecture refers to the structure, the way of shaping the solids and elevations, their colour, the shape of the space in which the buildings are located, but above all, to the living conditions of people. After the period of modernism, subsequent trends in architecture were shaped based on the achievements of technology, but also on the growing knowledge of social sciences. Postmodernists restored the freedom of shaping the layouts, and treated the style of all previous epochs with a grain of salt. Deconstructivists created works that were apparently against the laws of gravity. At the same time, an ecological trend emerged in architecture, the effect of understanding local and subsequently global problems. At the same time architectural critics noticed vernacular architecture, existing in a hidden way, on the periphery of the European-American cultural centre. The regional tradition began to influence the creativity of the younger generation, which could also refer to the achievements of the few older artists who operated in the times of modernism. For the last two hundred years achievements in the field of economy, as well as the culture of individual countries and regions were presented on the world exhibitions. Currently, the most important event is World Expo, continuing the tradition of the Great Exhibitions of the 19th and early 20th centuries and held every few years in various cities throughout the world. Exhibition pavilions were always an important element of the exhibition presentation. Evaluated by both architecture critics, architects themselves and a wide audience they showed what the country or region was most proud of at the moment. The pavilions of exhibitions organized after World War II were a demonstration of technical and technological achievements and the enormous possibilities of a man-creator and inventor. Their interiors were focused on the same issues. In the second half of the 20th century, buildings that interpreted the regional architecture, landscape and local values began to appear. As the decades passed, this trend began to dominate. The situation was similar in crowded cities, where, under the influence of growing economic and social problems, the new quality of buildings and spaces became important. In this field, attention was also paid to traditional solutions and the possibility of their technically and formally modern interpretations. Several projects and buildings that were created at the turn of the century and became "icons" due to their attractive form and the opportunities they gave users, caused a gradual change in the paradigm of modern architecture. It is likely that the pandemic we are currently in will accelerate this way of thinking and expand the scope of changes taking place in architecture.

SPACESTOURISM PLANNING: A RIVER BEACH AS AN EXAMPLE OF AN INTEGRATED SUSTAINABLE TOURISM PLAN - THE CASE OF AMEIXIOSA IN SÃO PEDRO DO SUL - PORTUGAL

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ABSTRACT

In the inland areas of Portugal there has been a series of interventions, mostly of municipal initiative, that seek to promote economic activity through the promotion and construction of tourist facilities. However, these facilities are repeated in the territory, and sometimes their degree of success is not as expected, particularly in the temporal continuity of the use of these spaces, since many are not subject to a balanced and original integration into a sustainable policy for the sector, which has at its core a real assumption of sustainability of projects, territories, environment. Taking as an example the project of creating a River Beach, within an integrated tourism planning, we seek to give an example of a sustainable project, in its broadest sense: so we seek a true integrated planning, with the presentation of studies and analysis that cover not only the site itself, but also frame the region and tourism as a way to achieve a solution that enhances the advantages of the site and the region where it belongs, while seeking to turn into positive points, some of the less positive aspects that the site and the region have.
Thus framed, in obtaining the proposal for the River Beach that is presented for the locality of Ameixiosa, municipality of São Pedro do Sul, in the central region of Portugal, sustainability principles were always present in its different components, such as the use of local materials, landscape maintenance, the use of alternative energies, or the study of the architecture of the region. The sustainability of the proposal also comes from its integration into a tourism planning that seeks to take into consideration the territory and tourism in a conscious and uncomplicated way. In this sense, an analysis of the advantages of the region, the municipality (especially its cede), and the proposals of tourism plans for the central region were taken into account, to position the site studied in the territory, seeking to provide the beach with a series of equipment that complement and bring innovation to the tourism offer of the and the Region, thus enhancing its economic sustainability by, namely, giving itself the possibility of boosting the site throughout the year with elements that make it distinctive and thus able to attract visitors.

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REFLECTION OF THE OLD CITY - ARCHITECTURE, HERITAGE AND TOURISM: CIDADE VELHA IN CAPE VERDE

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ABSTRACT

Since the last decades of the 20th century, tourism in Cape Verde has been one of the fastest growing sectors, attracting greater foreign direct investment. However, this growth can create greater pressure on existing resources, with negative impacts at various levels. There is a clear reflection on the valorisation, preservation, and conservation of patrimony heritage, in which the historical center of Ribeira Grande, Cidade Velha, the bearer of a of a unique history, being the cradle of the Creole nation and the place where the slave trade where the slave trade was born. It had an existence of golden times, almost ephemeral, but knew how to take It had an almost ephemeral golden age but was able to take advantage of it and be efficient at the time. The theme of this work is a think proactively study that relates history to urban design, the image of the city design, the image of the city from various points in it, economics, sociology, and architecture with heritage and tourism. architecture with heritage and tourism. A demonstration of how to revitalize the historic, almost rural place of the Cidade Velha de Ribeira Grande, is suggested, valuing the environment, conserving the cultural, natural, built natural, built, and underwater heritage. In this way we combine a research study on history, landscape, urban endowments, and equipment, to thus give way to a "recycling" of space and World Heritage, without disturbing the environment, making it attractive, and developing its economy in the sector of Sustainable Tourism.

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THE COMUNICATION OF HERITAGE, ARCHITECTURE AND ENVIRONMENT: REFLECTIONS ON THIS POST-COVIDE PANDEMIC

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ABSTRACT

This is a contemporary subject, since tourism and the number of visitors to a city have practically disappeared or been suspended due to the current situation in the world. The crisis that has arisen with the emergence of the COVID-19 virus. What the pandemic seems to have highlighted is the way different agents deal with communication issues, namely musicological institutions, is the object of this reflection. Alongside the usual forms of communication, new ones seem to be emerging, combining a series of new technologies and the growing use of social networks. How will be the future of these spaces, what will make the visitor go to these places, or continue the virtual visits will be something important to discuss. In this context, environmental quality, integrated planning, the use of local materials, the enhancement of place, innovation and creativity may be a way forward, and will be an opportunity for new forces of communication, for rethinking tourism in cities and the role of architecture in this communication that is sustainable and environmentally friendly. The use of new materials, of new digital tools can be a tool that, always bearing in mind that the city is ultimately a human creation, of the zeitgeist and human knowledge, can and must contribute to a greater sustainability in time and space of the agglomerations, resuming good practices and sustaining itself in the reflective practice and the uniqueness of the people. A look at this problem from different points of view, against the backdrop of the Belém area in Lisbon is proposed as a starting point for this theme.

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A NUMERICAL STUDY ON SETTLEMENT DUE TO LIQUEFACTION BY USING PM4SAND MODEL

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ABSTRACT

The destructive effects of earthquakes negatively affect the lives of many people and cause a large number of lives and property losses. One of the most crucial factors that increase the destructive effects and structural damages of earthquakes is the deformations that occur in the soil layers during strong ground motion. Especially liquefaction due to sudden increase in pore water pressure during strong ground motion in saturated sandy soils causes large deformations in the soil layers; hence leads to serious damage to the structures. Therefore, it is necessary to determine the liquefaction induced deformations and settlements in the soil layers with high liquefaction potential. In accordance with this purpose three different two-dimensional fully saturated soil profiles with 35, 55, 75 % relative densities were created and carried out by using seven different strong ground motions for estimation of liquefaction-induced free field settlements. The finite element code “Plaxis 2D” and constitutive model “PM4Sand” were used in the analysis. The results of finite element (FE) analyses were compared with semi empirical methods in the literature. FE analyses have showed that the evaluation of free-field, liquefaction-induced settlements obtained from PM4Sand-Model have considerably lower settlement values than the semi empirical methods. But the semi-empirical method suggested by Cetin et al. (2009) and numerical analyses gave quite similar settlement results to each other. On the other hand, the maximum acceleration on the surface increases with the relative density of sand layer while liquefaction potential and liquefaction induced settlements decrease in the FE analyses. Moreover, the maximum acceleration of strong ground motion is more dominant parameter than magnitude of earthquake.

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PERCEPTION OF SPACE AND ARCHITECTURAL FORM OF CHILDREN WITH ASPERGER'S SYNDROME AS A UNIVERSAL GUIDELINE FOR EDUCATION SPACE DESIGN

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ABSTRACT

A child's perception is significantly different from that of an adult. His attention is directed to other areas of architecture and space, not only due to physical conditions, but also due to the level of mental and emotional development. In connection with the development of science, more and more diseases and developmental disorders are also recognizable in high-functioning children. One of them is Asperger's Syndrome, which allows the child to function in a typical primary school, but is an obstacle for him and his environment. Children with Asperger Syndrome are distinguished by their behavior in the architectural space. Their motor coordination can be impaired or simply different from most children. Sensory disturbances can hinder learning, concentration and even affect their perception in the peer group. Designing architecture should be tailored to its users, hence the knowledge of the perception of the recipient should be particularly important for the designer. Designing an education space, or in areas of an education space, is particularly important because the child has specific goals to achieve there, a significant time of his childhood spends there, and the future adult is shaped to a large extent there. Due to the dynamically developing teaching methods, the development of science in this area, the changing expectations of parents and legal conditions, architecture should also evolve so that it can be one of the factors supporting the development and education of a young person. The article will analyze the perception of space and form of a child with Asperger's syndrome, determine its spatial needs and compare it with the needs of children without developmental disorders. The presented results of the analyzes will allow to define the field of common and different spatial conditions. The research is aimed at determining whether it is justified to apply the idea of Universal Architecture in the design of educational space, that is, answer the question "is designing for the most demanding user in the educational space also beneficial for others".

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DAM SAFETY EMERGENCY ACTION PLAN: A CURRENT PRACTICE FOR A HYDROPOWER DAM IN MALAYSIA

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ABSTRACT

There are currently 104 dams constructed in Malaysia. The dams built for many purposes, 16 of them were built for hydropower. TNB is the major owner of hydropower dams in Malaysia. The dam's reservoir often presents significant risks to downstream areas if a massive downfall release occurs. The massive release could be due to a dam break event, overtopping, and emergency operational release. An incident may occur due to water that usually flows over a spillway with high-speed discharge or unexpected peak discharge. The obvious impact of dam failure is on the community in the downstream area. Although there is no dam failure recorded case in Malaysia since the 1900s, the possibility of dam failure is still there. Hence, the dams must have an emergency action plan (EAP) to prepare the likelihood of the emergency occurrences. The main objective of preparing EAP is to provide procedure to execute dam emergency action plan. The benefit of establishing a dam safety emergency action plan is to create better communication and effective responses system among agencies during dam emergency occurrences. Implementing EAP in the emergency response system would minimise the impact on the public and environment due to dam failures. This paper revolves the EAP practices by dam owners in mitigating the risk of dam failure occurrences.

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BASIC REFLECTIONS ON THE IMPLEMENTATION OF DIFFERENT 3D TECHNOLOGIES CO-OPERITING IN THE ARCHITECTURAL DESIGN PROCESS

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ABSTRACT

The constant progress of technique is inevitable nowadays and seems to be the same in a predictable future. The observation of this phenomenon leads us to formulate a few reflections on it. The use of advanced techniques causes a clearer detachment of production processes from human work. Robotics and automation were initially supposed to facilitate the production of elements, but over time they began to replace humans more and more. Will there be a place for human work in the future? It is already being pushed out of many bastions in which it was supposed to be indispensable. Autonomous cars and buses are the best example of this. Can similar phenomena be noticed in design? Will the machine replace the creator? The development of artificial intelligence (AI) shows that it is possible. Complicated algorithms are already able to compose a piece of classical music. In the case of architecture, architects are still in the lead, however, one has to take into account the conquest of this field by AI. At the moment, designers have various advanced techniques at their disposal to facilitate and accelerate their work. The most important among them are: digital 3D modelling CAD (Computer Aided Design), Building Information Modelling (BIM), visualisations, and computer animations mainly used to present ready-made ideas, but also useful at the concept stage. Apart from them, three-dimensional printing is also important, as well as three-dimensional design of structures. The above technologies are increasingly used in the design process. They are more compatible with each other than before. They allow you to save labour, accelerate the implementation of tasks, as well as to optimise the designed buildings in many respects related to construction, prefabrication or energy efficiency, to name just a few. An important, although not very common, advantage of technological innovations is their use not only during design and construction, but also during the maintenance of ready-made buildings. The best example of this is BIM, which facilitates the management of previously in this technology designed objects. In the future, it will be much easier to design the adaptations of such buildings and to store information of changes which were made. This approach fits in with the idea of Management of Change, which can be included in an even broader aspect among the paradigm of sustainable development.

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APPLICATION OF WASTE ROCK DUST IN CEMENT BINDING MIXTURES USED IN ROADWAY

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ABSTRACT

The article contains the results of research on the effect of waste rock dust on the properties of cement-bound mixtures. Gabbro-limestone dust with a significant proportion of active silica and calcium carbonate was used for the tests. The results of strength tests after 28 days of maturation with a variable proportion of cement (3%, 5%, 7%) and rock dust (0%, 10%, 20%) are presented. The stabilized aggregate was fine sand. The obtained results did not show the expected strength and frost resistance of the tested samples. The analysis of the results shows that the addition of rock dust is not applicable in dusty soils.

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PROBABLISTIC MODELING OF DEMOGRAPHIC CHANGES IN SINGAPORE'S NEIGHBOURHOODS

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ABSTRACT

Predicting the temporal evolution of the demography and the residents' spatial movements would immensely aid the estate development and urban planning. The evolution of population in three townships of Singapore is simulated at neighbourhood scale using a novel agent-based probabilistic approach with inputs from large-scale survey and statistical data. The demographic changes due to age-dependent rates of death and fertility are studied by considering the inter-ethnic marriages that has a varying probability depending on the ethnicities of the male and female partners. The predicted changes in the age and household compositions and family types have been found to reflect the population trends in Singapore over the past years. The decline in family types that contain children and the structure of age composition over years underline the issue of prevailing low fertility rates. The strategies for incorporating the population relocation to consider the long-term spatial movement are also discussed. In Singapore's context, we consider in the relocation model an added complexity of ethnic quota for the residential units developed by public housing board. The ethnicity dependent parameter coupled with other parameters that represent the number of children in a household besides their size, the household income, the proximity of children's schools, and the places of employment could play a strong role in predicting the spatial evolution of the residents. These predictions can be used by the urban planners and policy makers to improve the quality of life in Singapore.

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ARCHITECTURE FOR TRANSITION: ANALYSIS OF TWO PROJECTS IN THE PEACE-BUILDING PROCESS IN COLOMBIA

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ABSTRACT

In a scenario of global transition characterized by social and ecological crises, architecture plays an important role in the generation of projects whose design responds to the habitat conditions and the needs of the populations. In this sense, architectural design for transition is proposed as a possibility to rethink both modern and contemporary paradigms that understand architecture as a spatial, functional, and technical problem and to think about territorial transformations from a wide and holistic understanding of concrete spatial realities in constant change and interaction through daily practices that contribute effectively to the habitability of the place and the "buen vivir" -good living- of its inhabitants. This implies considering the interrelation of all the systems of the territory to produce localized designs in the pluriverse. For the Colombian case, such an epistemological and methodological approach is relevant given the peace-building process marked by the signing in 2016 of the Final Agreement between the national government and an illegal armed group that was active for more than 60 years. While the transition to peace in the post-agreement framework requires investment in infrastructure works and projects in the territories that were the scene of the conflict. This paper starts from the analysis of two small-scale architectural projects built in the rural area of San José del Guaviare, from the perspective of architectural design for transition that takes up different contemporary theories and practices emerging in the Global South. This approach places architectural design as a highly transdisciplinary, collaborative practice based on the understanding of complex systems. The findings show that the conception, design, management and construction of the architectural projects analysed respond to a standardized and prototypical solution that ignores the reality of the specific territorial context, the conditions of habitability of the region and the ways of living of the local population. They are delocalized projects that have not been appropriated by the communities. Thus, it is corroborated that architecture in the post-agreement context should have as a basic and fundamental purpose to generate spaces to live, work and socialise of the inhabitants in those rural territories in transition to peace, characterized by their historical marginality and state abandonment. A project should be understood and thought as a device for local action and transformation through transitional architectural design, in order to strengthen communality and promote autonomy in community processes, the appropriation of the territory and its re-existence in it.

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HISTORICAL ENERGY SUPPLY BUILDINGS IN CONTEMPORARY URBAN CITY CENTRES IN POLAND

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ABSTRACT

The drastic development of technology during the industrialization era, and transformations occurred in that time has led to the development new methods of energy supply both for production facilities and entire urban structures. The dynamic changes taking place in cities in the 19th century led to the creation of new type of energy generating facilities in inner city centers. That kind of development was created due to the lack of technical infrastructure that would allow to transmission new types of energy which supplied the factories. Such solutions had a huge impact on the space planning development in industrial cities. In many examples the historical city centers have changed their way of functioning. Many urban centers were forced to rebuild their entire layout. The growing industry has also changed the way public spaces are used in cities. The centers have become huge production machines, the ubiquitous production plants have changed their panorama to the present day. By examining the impact on contemporary urban structures and the problems of the facilities themselves related to gas, electricity and heat production, I will try to present the issues related to the re-use of factory facilities related to energy supply on the basis of examples of large urban centers in Poland in Warsaw, Szczecin, Wroclaw and Lodz. The analytical part of the research consists both in the study of the architectural building adaptabilities and facility's surroundings, the way it functions as a factory complex. Main case of study is also role these complexes in the modern city, focusing on the issue of isolation and uneven development of contemporary city structures.

EXPLORING OF ENERGY EFFICIENCY IN BUILDINGS CONSIDERING HOT CLIMATE WITH A PARTICULAR REFERENCE TO CITY OF RIYADH

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ABSTRACT

Energy conservation has been becoming more decisive to concern people globally. Buildings are responsible for considerable amount of heat loss and gain for most of energy consumption such as heating and cooling. Vision of Saudi Arabia has launched in 2016, and one of the most crucial elements of the vision is to minimize reliance on energy. This is might be accomplished by enhancing energy efficient buildings that require less energy. Fast majority of published research carried out aims to promote new buildings. However, there is numerous of energy consumption linked to existing buildings. The aim of this study is to provide solutions for existing buildings, trying to reduce the total of amount of energy consumption in buildings. EDSL TAS computer modelling has been used to analysis energy consumption. The study focused on buildings in hot region for the case study of the city of Riyadh. The study has reported that the size of glazing system is a prime variable that could be applied to exciting buildings during as part of retrofitting.

THE ANALYSIS OF MORPHOMETRIC PARAMETERS IN HYDROLOGICAL MODELING USING GIS TECHNOLOGY

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ABSTRACT

The analysis of the physical-geographical conditions determines and influences the formation and the regime of the water resources from a hydrographic basin. This paper aims to analyse spatial data based on raster models, more precisely the terrain analysis, later used in hydrological modelling. For the elaboration of the digital model of the terrain, methods of interpolation of certain data are used - the level curves - after which, by running the ArcGIS program will result the structure of the irregular triangulation network (TIN). Next, based on the TIN model, a set of analyses is obtained regarding the morphology of the terrain: the slope map; slope exposure map, etc. The slope is one of the most important factors for controlling surface and intermediate water runoff. The exposure of the slopes depends very much on the direction of the slope of the land. With the help of the analysis of the slope and slope exposure it is possible to: calculate the solar lighting for each location in a region; find all slopes in the southern part of a mountainous region to identify locations where the snowmelt process will start earlier than in other areas, thus avoiding the danger of flooding due to runoff from the slopes and the danger of soil erosion; the value and speed of surface runoff; identify the spread and abundance of flora and fauna, precipitation; identify the productivity classes of the land; find all the north-facing slopes on a mountain as part for the search of the best ski slopes.

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ANTHROPOGENIC IMPACT ASSESSMENT IN THE ARANCA DRAINAGE 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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HISTORY AND PRESENT USE OF THE UPPER AND MIDDLE VLTAVA RIVER

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ABSTRACT

The paper present research results of the historical development of anthropogenic activities along the upper and middle Vltava watercourse from the water management perspective. The Vltava river has been considered since ancient times as a natural waterway used to transport goods, especially wood, salt, and construction materials. The cargo was transported down the river from its source in the Upper Vltava region to the place of consumption, for example to Prague and other cities along Vltava and Elbe rivers. According to chronicle records, this worked as early as 920, when Prince Wenceslas declared the Vltava River a free road on the water. Vltava river has always offered a source of available water energy, which was exploited by mills, hammer mills, sawmills, which, due to the construction of necessary weirs, created obstacles in navigation. The development of navigation conditions took place during the reign of Charles IV, who ordered that the weir stages must be complemented with so-called raft culverts. From the 16th century, at the instigation of King Ferdinand I, not only tow paths began to be established along the course of the river, but river training works and other related infrastructure was built. For example, in the 18th century all weirs around the Orlík castle were removed to improve navigability of the river. With the development of technology that time, in addition to the usual river training works, the first lock chamber Županovice on the Vltava river was built in 1729. The volume of river transport on the Vltava began to rapidly reduce due to the fast development of the railway in the 19th century and completely ceased with the beginning of the Slapy dam construction in 1949, when the Vltava river as source of hydropower completely prevailed. Anyway the construction of dams cascade on the Vltava began to be considered as early as the beginning of the 20th century. When designing the Slapy and Orlík dams, class I navigation equipment (ship lifts) for pleasure boats, was also considered but it was never built. In the 2020s, a waterway from the Orlík reservoir to České Budějovice was put into operation in this class I. The connection to the European waterway network is expected with the completion of the above-mentioned ship elevators on the Slapy and Orlík dams. A partial result of the research in the project "Vltava—transformation of historical landscape as a result of floods, dams' creation and land-use changes along with cultural and social activities in the river neighborhood" is a database of historical, planned, and current water management structures on the upper and middle Vltava. The database describes weirs, dams, and other water management structures on the Vltava river. The aim of the database is to be a source of information as a technical description of structures, geographical information, photo documentation, historical documents for the developed web application, the exhibition under recent preparation and for watercourse and waterway administrators and other entities, including organizations operating in the field of cultural heritage protection.

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STABILIZATION OF EXPANSIVE CLAYS USING RECYCLED GLASS

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ABSTRACT

Millions of tons of glass end up in landfills every year. The glass in landfills can cause puncturing of the geomembrane and/or clay liner, which protects other chemicals from leaking into the soil and ultimately the groundwater supply. In the state of Mississippi, there is no glass recycling facility. Accordingly, all the household and industrial glass waste end up in landfills, and it can create a potential problem during the landfill's lifespan. Glass is nearly 100% recyclable and can be substituted for up to 95% of raw materials in new glassware. However, this reuse of glass is often limited by the color of the glass containers. Also, collection, transportation, and processing of glass waste for recycling can be very costly and time-consuming. Repurposing waste glass by integrating it into roadbeds for stabilization would be an efficient, cost-effective, and sustainable solution. However, proving this concept requires a set of laboratory experiments. Utilizing recycled glass can be an alternative method to using lime or fly ash to stabilize the roadbed. In this study, Atterberg limits and the standard proctor tests were performed with bentonite clay and varying crushed glass sizes. The proper mix of recycled glass and bentonite showed promising results in minimizing the liquid limit, plastic limit, and optimum moisture content. The results indicated that the recycled-glass has a great potential for the stabilization of expansive clays in transportation applications.

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INTERNATIONAL ROUGHNESS INDEX MODELING FOR JOINTED PLAIN CONCRETE PAVEMENT USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

Climate attributes such as precipitation, extreme temperature, and freeze-thaw cycles along with traffic loads cause pavement distresses. The maintenance need for pavements is decided based on the pavement condition rating such as International Roughness Index (IRI). Generally, an IRI rating less than 2.68 m/km is acceptable, and a rating greater than 2.68 m/km is considered unacceptable and classified as “very poor” condition of the pavement. It is imperative to be able to accurately predict pavement conditions to prepare proper Maintenance and Rehabilitation (M&R) programs for the pavements. This study aims to develop IRI models that can successfully estimate the IRI values for Jointed Plain Concrete Pavement (JPCP) considering the M&R history of the pavements using Artificial Neural Networks (ANNs) approach. The study was carried out with the database collected from Long Term Pavement Performance (LTPP) program. The variables used for the ANN model development are initial IRI, pavement age, concrete pavement thickness, equivalent single axle load (ESAL), climatic region (wet-freeze, wet non-freeze, dry-freeze, dry non-freeze), construction number (CN), and several climatological data. After utilizing various ANN model structures, the best performing ANN model resulted in promising statistical measures (i.e. R^2 = 0..87). The IRI prediction model can successfully estimate the increase of IRI values with the increase of ESAL value over time. The IRI prediction model can also estimate the decrease of IRI value after maintenance and rehabilitation. The predicted IRI values with good accuracy will help the local and state agencies to prepare for M&R programs for JPCP pavements and allocate a projected budget accordingly.

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ROUGHNESS MODELING FOR COMPOSITE PAVEMENTS USING MACHINE LEARNING

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ABSTRACT

A large number of paved highway surfaces comprises composite pavements as a result of concrete pavement rehabilitation that uses an asphalt overlay on top of the concrete surface. Annually, billions of dollars are spent on the maintenance and rehabilitation of road networks. Roughness is one of the several indicators of road conditions used to make objective decisions related to road network management. The irregularities in the pavement surface affecting the ride quality of road users can be described by a standard roughness index defined as the International Roughness Index (IRI). Roughness prediction models can identify rehabilitation needs, analyze rehabilitation effects, and estimate future pavement conditions to implement different Maintenance and Rehabilitation (M&R) activities to extend the pavement life cycle and provide a smooth surface for road users. This study intended to develop pavement performance models to predict roughness for asphalt overlay on concrete pavement sections using the Long-Term Performance Pavement (LTPP) program database. Artificial Neural Networks (ANNs) approach was used to develop the roughness prediction models. A total of 52 pavement sections with 592 data points were analyzed. Five models were developed, and the best performing model, Model 5 was found with an average square error (ASE) of 0.0023, mean absolute relative error (MARE) of 12.936, and coefficient of determination (R^2) of 0.88. Model 5 utilized one output variable (IRI_{Mean}) and 14 input variables (i.e., Initial IRI_{Mean}, Age, Wet-Freeze, Wet Non-Freeze, Dry-Freeze, Dry Non-Freeze, Asphalt Thickness, Concrete Thickness, CN Code, ESAL, Annual Air Temperature, Freeze Index, Freeze-Thaw, and Precipitation). The ANN model structure utilized for Model 5 was 14-9-1 (14 inputs, 9 hidden nodes, and 1 output). Environmental impacts and traffic repetitions can cause severe damage to the pavement if timely maintenance and rehabilitation are not performed. By considering the effects of M&R history of the pavement, it is possible to obtain realistic prediction models for the future planning. Therefore, the developed ANN roughness performance models in this paper can be used as a prediction tool for IRI values and guide decision-makers to develop a better M&R plan. Local and state agencies can use available historical traffic and climatological data in the developed models to estimate the change in IRI values. Utilizing these prediction models eliminates time-consuming data collection and post-processing, and consequently, a cost reduction. This low-cost tool will improve the condition assessment and effective M&R scheduling.

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EFFECT OF NON-METALLIC COMPOSITE REINFORCEMENT ON LOAD-BEARING CAPACITY

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ABSTRACT

It is known that non-metallic composite reinforcement was invented in the 60's of the last century, and already then, a large number of scientists began to investigate its physical and mechanical characteristics. Despite its rather old age, this reinforcement has not been sufficiently studied for its work in building structures. To date, non-metallic composite reinforcement is used to reinforce monolithic foundations where there are low loads (low-rise buildings) and industrial floors, brick and aerated concrete masonry, to strengthen the roadways, to reinforce structures that are used in corrosive environments and high vibration conditions, etc. Fiberglass composite reinforcement (Arvit) is a high-quality construction material with many advantages: 4-5 times less weight compared to metal of the same diameter; it does not rust or oxidize; tensile strength is 2 times higher than metal reinforcement; it does not conduct electricity; high resistance to temperature changes from -70 to +200° C; easy to transport. However, such reinforcement has several disadvantages: the modulus of elasticity is 4 times smaller than that of metal reinforcement; it practically does not bend, when trying to bend it will just break; it is not weldable, which slows down the production process; low heat resistance with high heat and fire. The concrete structure reinforced with composite cores collapses with extreme heat and fire. Fiberglass is not afraid of high temperature, but its binder plastic loses strength when heated above +200 ° C; aging. The distinctive features of work of fiberglass composite reinforcement in bending spacer elements are still insufficiently studied, which in design and production practices leads to the non-use of such reinforcement in the construction of elements of buildings and structures. The purpose of this study is to investigate the load-bearing capacity and deformability of a spacer element reinforced with non-metallic composite reinforcement. The obtained results are compared with the results of studies of a spacer element reinforced with metal rod reinforcement.

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METHOD OF EXPERIMENTAL RESEARCH OF NEW CONSTRUCTION OF BEAMS FROM GLUED WOOD WITH COMBINED REINFORCEMENT

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ABSTRACT

Structures of glued wood have significant advantages in comparison with structures made of metal or reinforced concrete (less mass, better resistance to the action of chemically aggressive environments, high fire resistance, aesthetic attractiveness, eco-friendliness). Glued wood in comparison to solid has greater durability and does not change geometric dimensions with time or change in moisture, does not have significant shrinkage and swelling. However, at the same time, scientists are looking for new ways to improve the characteristics of such wood and improve the elements and structures based on it. Various methods of reinforcing glued wooden structures were proposed and investigated for the improvement of the elements of wood, enhancement of bearing capacity, stiffness. This has given a certain effect, such as the ability to reduce the overall dimensions of the cross section of the reinforced element of laminated wood and increase the spans that can be overlapped. We also proposed a new construction of combined reinforcement of glued beams in which the steel bar reinforcement of the periodic profile was arranged in the grooves of the compressed zone, and in the stretched zone reinforcement was carried out with the external composite tape made of carbon fiber Sika CarboDur S-512. This combination increases both rigidity and bearing capacity of the elements that we are testing from glued wood for work on transverse bending. The aim of the work is to consider the research methodology of the new design of glued wooden beams with combined reinforcement, and in the future to receive and process new results of experimental tests of this type of structures.

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A STUDY OF SANDWICH REINFORCED CONCRETE – FOAMED CONCRETE FLOOR SLABS

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ABSTRACT

The development of housing construction demands an application of building materials which ensure necessary functional performance of structures, have high heat-insulating properties, are environmentally friendly and their use is economically appropriate. Simultaneous ensuring of mentioned indices is possible because of complex combined joining of building materials with different physical-mechanical properties. The building materials of this kind are traditional materials such as normal concrete and reinforcement rod, and also modern materials as cellular concretes, especially foamed concrete. The scientific attention to the foamed concrete is caused by the fact that this building material is characterized the low self-mass, well heat-insulating and soundproofing properties, fire resistance. It worth be noted that the scientists carried out the researches of physical and mechanical properties of foamed concrete, the fire resistance of foamed concrete, the investigations of foamed concrete as a material for the road construction, the study of foamed concrete bricks and etc. However, the researches of non-autoclave foamed concrete floor slabs were carried out sufficiently small, because the non-autoclave foamed concrete has low compression strength. In our opinion, this scientific problem can solve by means of a joining up the normal concrete, the non-autoclave foamed concrete with basic and additional reinforcement by reinforcement rod and propylene fiber. This action will permit to ensure the receiving the appropriate functional characteristics of floor slabs with the simultaneous considerable decrease of its construction mass. The practical use of building structures made of different structural materials is only possible due to the availability of reliable information about loading which can be perceived by this structure. The simulation of the stress-strain state of complex structural elements that occurs during exploitation of structures is one of the urgent tasks of scientific investigations. This article presents experimental determination of useful load for sandwich reinforced concrete – foamed concrete floor slabs. Sandwich reinforced concrete – foamed concrete floor slabs are the floor slabs which are composed of normal concrete, non-autoclaved foamed concrete and spatial reinforcement frame.Experimental test of sandwich reinforced concrete – foamed concrete floor slabs was carried out under condition of pure bending that was achieved by applying to floor slab in one third of its span two concentrated forces equal in magnitude. Useful load for sandwich reinforced concrete – foamed concrete floor slabs was 33.23÷77.87 kN/m^2. Sandwich reinforced concrete – foamed concrete floor slabs are proposed to be used in construction of housing and social structures.

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RESEARCH ON VITALITY IMPROVEMENT STRATEGY FOR THE HISTORIC DISTRICT OF TAIYANGGOU IN LUSHUN

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ABSTRACT

Located in the Lushunkou District of Dalian, Liaoning Province, the Taiyanggou Historic District is one of the most well-preserved modern historic districts in China, with the most surviving historic heritages. The area is home to a large number of cultural heritages, ranging from national to district level, as well as a large number of modern historic buildings that are not on the conservation list, which have immeasurable historical and cultural value. This District is reputed as an “open-air architectural exposition”. However, as Lushun is a military port city, most of the area is under the jurisdiction of the army, and the government and the army have multiple administrations that do not form a unified combination, making it difficult to implement conservation and development in the Taiyanggou Historic District. Eventually, this leads to problems of stagnant development, environmental degradation, population loss, population aging and a gradual decline in the vitality of the district. Therefore, how to reshape the vitality of the district and promote its long-term development while preserving its original historical appearance to the greatest extent has become an urgent problem to be solved. The paper began with an in-depth interpretation of the connotation of “vitality” and “vitality improvement” in historic districts through previous studies. The five major components of the vitality of historic districts were summarized as physical space vitality, social vitality, cultural vitality, economic vitality and political vitality. Subsequently, from these five aspects, the elements of vitality of the Taiyanggou Historic District were extracted and summarized, and the problems of its current decline in vitality were analyzed. Finally, using the problem-oriented and goal-oriented research ideas, a targeted approach was adopted to explore strategies to improve the vitality and get out of its current development dilemma, with a view to shedding light on the conservation and renewal of Taiyanggou Historic District.

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THE SPECIFICS OF THE INDUSTRIAL ARCHITECTURE OF SARATOV REGION IN THE SECOND HALF OF THE 19 TH – EARLY 20 TH CENTURY

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ABSTRACT

The architecture of industrial buildings that appeared in Saratov region at the turn of the 19th and 20th centuries is a significant part of the historical and cultural heritage. It carries a trace of history, as technological and constructive,stylistic and architectural. At the same time, industrial architecture has been explored much less than the civil architecture of that period. The typological range of the architecture under study is quite wide: mills, tobacco factories, iron foundries and machine factories, manufactories and printing houses, buildings of leather and soap production. Monopolization and centralization of industry in the provincial center of Saratov-Pokrovsk (Engels) is actively traced. Peripheral medium and small towns were limited of one leading city-forming enterprise. The periphery did not draw off a large amount of industry from the center, since it was not able to economically support the development of industry in several directions. At the same time, it is important to note that the architectural heritage of medium and small cities has undergone to change and distortion over time less than in large cities of the province.

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ASSESSMENT OF INFLUENCE OF RESIDENTIAL AREA PLANNING STRUCTURE ON AIR QUALITY USING NUMERICAL MODELING

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ABSTRACT

Modern cities are characterized by a complex architectural and city planning structure that changes dynamically over time. Under the influence of urbanization processes in large cities, the city planning structure is gradually changing. For instance, construction of new micro-districts of high-rise buildings in already existing low-rise and densely-built areas lead to change in urban landscape and in some cases it can lead to dramatic consequences in terms of area ventilation and accumulation of harmful gases and dust particles in residential areas. The location of residential areas in the vicinity of highways can also lead to deterioration in air quality due to the presence of local sources of aerosols emitted by car traffic on the roads. We have an urgent task to develop and validate methods that would allow to assess the impact of city planning structure of buildings on air quality at the stage of residential areas design. Today, computational fluid dynamics methods (CFD) allow to perform virtual experiments to assess wind loads on buildings and structures, analyze the area pedestrian comfort as well as evaluate the aeration of building complexes. Numerical models of fluid mechanics make it possible to study complex processes of air heat- and mass transfer, to detect zones of high aerosol concentrations, to evaluate the effectiveness of various protective measures, such as vegetation zones, protective screens, etc. Using CAD models of buildings in conjunction with Computer-aided engineering software (CAE), we can research various aeration scenarios and optimize architectural and planning solutions for buildings. In this paper, we performed a numerical study of the aeration of a new urban microdistrict located on the banks of a river and along a busy highway in Novosibirsk, Russia. This case presents an interest for researchers because on the one hand, the considered territory is characterized by strong winds, and on the other hand, the territory is located in a zone of heavy traffic. The main goal of the paper was to assess whether the architectural and planning structure of the new microdistrict is optimal in terms of aeration and air quality. Numerical modeling is performed for the prevailing wind direction, as well as for frequently repeated wind directions for winter and summer seasons. Modeling was carried out in 3D approximation using the Revit software to build the CAD model of the residential area and the ANSYS software was employed to perform a series of computational experiments. Based on the results of the study, numerical data were obtained on the wind speed fields in the residential area and on the aerosol concentrations in the vicinity of the buildings. On the basis of the calculated data, various wind regimes of the territory were analyzed and the territory plan was assessed regarding air quality in residential areas.

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ASPHALT CONCRETE FOR BINDER COURSE WITH DIFFERENT JUTE FIBRE CONTENT

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ABSTRACT

Since the beginning of modern road construction, there have been effort to make durable, long life pavements. But no one pavement can fulfil designed purpose forever. On the other hand, some natural resources are limited, so it is important to maximize use of renewable resources. In recent years, there is a visible pursuit of this trend, in road construction represented mostly by use of waste materials, such as industrial by-products or recycled asphalt pavement itself. Within the effort, fibrous additives were established on the market to prolong life of pavement layers. Some commercial ones are synthetic polymer based, so it does not go well with the renewable part of pavement life cycle if we want to secure sustainable future. This paper describes use of fibres from natural renewable resource, specifically jute plant (Corchorus). Three asphalt mix variants with jute fibres were designed and further compared. Fibre content was 0.1 %, 0.2 % and 0.3 % by weight. Several tests were conducted to examine the effect of fibres on mixture properties, with aim on stiffness modulus (IT-CY) and crack propagation (SCB). Furthermore, indirect tensile strength ratio was calculated as a parameter showing performance of the mixture under the wet conditions. Control mixtures with paving grade and polymer modified bitumen were tested for better comparison and evaluation of the results.

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BRICK OF THE HISTORICAL HERITAGE. COMPARATIVE ANALYSIS OF THE THERMAL CONDUCTIVITY, DENSITY AND MOISTURE

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ABSTRACT

In the renovation of historic buildings, the facades deserve special attention because, in general, it is where the property's value and heritage lies. Additionally, they have a fundamental impact in the energetic efficiency of buildings. When you want to achieve an efficient building, the facades must comply with certain construction standards, generally difficult to achieve in renovations, especially in facades built with exposed brick, not altering their external appearance is a sine qua non condition. Against this background, in order to carry out optimal interventions in the thermal behavior of a brick wall, it is essential to have an exhaustive knowledge of the characteristics and values that influence thermal conductivity. To do so, calculations and simulations are carried out using the density and porosity parameters that are published in the different documents and regulations. However, these values are not reliable because they refer to the materials currently manufactured, and therefore, they are not valid when working with centenary materials that have been produced without quality control or precise technical specifications. On the other hand, the values provided by the regulations refer to the material in the dry state. It has not been considered that bricks, and especially those manufactured manually, due to their intrinsic conditions, are capable of absorbing large amounts of water, and therefore, of significantly varying its thermal conductivity. This feature is extrapolated to brickwork facades, where water can rise from the ground and penetrate from the rain. Thus, it is necessary that in the thermal conductivity study its hygrothermal behavior is taken into consideration. Against this background, this article presents the results of the tests carried out on specimens of various bricks from different traditional bricks factories and manufacturing processes and with an approximate age of about 100 years, to show that the old bricks have very different density, porosity and thermal conductivity values from the current ones. In addition, these values vary greatly depending on the moisture they contain, and also, the manufacturing system they had. Likewise, it is clear that the bricks of the facades of historic buildings, even if they are contemporaries, have different characteristics among them, showing different thermal behavior.

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FAR-REACHING DECISIONS ON URBAN LAYOUT MODIFICATION OF HISTORIC CENTRES IN THE XIX CENTURY AND ITS LEGACY IN THE XXI CENTURY: THE EXAMPLE OF ZAMORA (SPAIN)

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ABSTRACT

Public spaces of historic centres of contemporary cities, their use and enjoyment, as well as the architectural complex that make them up, are, in many cases, the results of far-reaching actions that political leaders took since the end of the 19th century, when industrialization made its appearance in Spain. We must look back to place value on the far-sighted urban design of public administrations because its configuration lasts over time and a bad decision becomes a burden that the city has to carry forever. Nowadays, local residents and visitors enjoy the places that our ancestors have bequeathed us without making a deep reflection of the difficulty, that long ago, involved making decisions about their formation and carrying out their materialization. These actions transformed radically the physiognomy of certain areas, both in large cities as in small towns, more than a century ago. This is the case that we put in evidence in this article about the city of Zamora, located in the northwest of Spain in the territory of Castilla & León. Through this research, it is claimed the important work of the municipal administration in the urban renewal that begun in this provincial capital at the end of the 19th century, after the lethargy in which it had been immersed since the Middle Ages. In this regard, the alignment of the main roads of the medieval city was essential to achieve the functional adaptation of space to modern circulatory requirements, using the new urbanistic mechanisms granted by state legislation. The early intervention on one of the neuralgic street of the historic centre, marked a turning point in the capital revitalization process. Its strategic location, at the confluence of the Plaza Mayor and the main streets of the second precinct, allowed the connection of the urban centre with the new communication and transport infrastructures located outside the walls, favoring the recovery of the citizen activity and giving rise to new interventions in the area that endure today and constitute some of the most enjoyed urban spaces in the city.

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FORMULATION OF PERFORMANCE LEVELS AND RELEVANT LIMITATIONS FOR CLAY BRICK MASONRY INFILLS IN SEISMIC ANALYSIS OF R/C FRAME STRUCTURES

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ABSTRACT

Observation of damage caused by recent earthquakes highlights, once again, that the presence of infills significantly affects the seismic response of reinforced concrete (R.C.) frame buildings. Therefore, in spite of the fact that infills are non-structural elements, and thus they are normally not considered in structural analyses, in many cases their contribution should not be neglected. Indeed, if on one hand the presence of infills is beneficial due to the increase of the structural system resistance and their ability to dissipate energy, at the least in the initial phase of seismic response, on the other hand the induced reduction of the fundamental vibration period of the structure inevitably increases its spectral response. Based on these observations, the study proposed in this paper consists in the evaluation of the seismic response of infills in time-history finite element analyses of R.C. frame structures by means of a two-element model, constituted by two diagonal nonlinear beams. A “concrete”-type hysteretic model predicts the in-plane state of infills, through a force-displacement backbone curve expressly created for, described in detail here. This model is demonstratively applied to a real case study, represented by a school building damaged by the 30 October 2016 Central Italy earthquake. The building consists of a R.C. frame and various types of masonry perimeter infills and internal partitions. The time-histories analyses carried out allowed carefully checking the influence of the presence of infills on the seismic response of the structure, as well the effectiveness of the proposed model in reproducing the observed real damage.

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ANALYSIS OF THE REPORTED REVIEWED RESPONSES AND MEASURED VALUES FROM DRIVERS/USERS ON ROUTE SELECTION BASED ON RESPONSES TO DISTURBANCES IN THE URBAN TRANSPORT NETWORK

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ABSTRACT

For successful planning of traffic flows and road networks in an urban environment are very important information's about prior, current and planned information on traffic flows for an urban transport planner or traffic engineer. In the field of traffic engineering is one of most common approaches to research traffic flow distribution on base of travel behaviour covering connections, patterns and nodes. In the case of a disruption on the urban road network, different equilibriums are used for predict future behavior on in the area of influence of the road network in planning process. In order to plan the future induction and reduction of traffic flows in the area of the anticipated disruption of the road network, the planners rely on the declared data of the users of the disrupted network. The article deals with the aspect of comparing the measured values that occurred as a disturbance in the urban road network and the data obtained from drivers who used the same area of disturbance in the urban road network. Measured values where optained with automatic pressurize traffic counters in year 2015 when the first disruption on the observed network in urban area occurred meanwhile so called reported reviewed responses from user who used the same observed network was made via personal interviews in year 2018. Reported reviewed responses are also equipped with the emotional response of drivers/users and separated by common characteristics such as gender, age, status, origin and purpose. In this way, the engineering approach of obtaining data at counting points and the sociological approach are connected with the obtained statements on the traffic behavior of drivers in the past, present and future. It is also possible to compare the common characteristics of drivers who make similar decisions in response to a disruption in the transport network. Additionally, the results of the statements are accompanied by the emotional aspect of drivers getting used to changes in traffic behavior as a result of disruption of the urban road network. The responses of the observed drivers showed that they roughly mimic the form of a graph of the general description of reactions to changes, where the satisfaction rating begins to rise over a certain period of time, but it cannot yet be fully claimed that emotional reactions directly influence the decision to use specific alternative road a disruption in the transport network. It was detected clear connections between the decisions made on alternative routes based on the common characteristics of the drivers and as well with measured values obtained with automatic pressurize traffic counters which used as validation.

NEW GENERATION OF CLAY PLASTERS STABILIZED BY POLYMERS

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ABSTRACT

Research is dedicated to the use of unburnt clay, first as a material to produce clay plaster, and second stabilization via polymers. The main goal is to enhance the attributes of a clay plaster through the stabilization of various polymers, alternatively by combining the polymer with hydrophobization in different ratios. Stabilization is particularly important for exterior plasters, as they are the most exposed to water. To compare the characteristics, the mixtures were tested for water resistance, water vapor permeability, flexural tensile strength, and compressive strength. Unburnt clay has been widely used as a building material in the past around the world. In the last century, this material was rather despised. Nowadays, however, this trend is reversing and the unburnt clay is experiencing a renaissance. Increasingly people emphasize ecology, a healthy and balanced indoor climate, and demand buildings with low operational and energy intensity. All this can be offered by unburnt clay, because it is energy-efficient in production, easily accessible in almost all parts of the world, harmless, and beneficial to human health, as clay can contribute to the improvement of the internal microclimate to a much greater extent than other building materials, as confirmed by many scientific findings. Unfired clay has many advantages and only a few disadvantages, but they are all more essential. However, these disadvantages can be reduced or perhaps eliminated in some ways, and this is the main topic of this article. The biggest obstacle for clay is the action of water and our effort is to improve its resistance to this natural element. At the moment, we can deal relatively well with the large shrinkage of clay, which is another disadvantage, but the topic of improving water resistance seems to be insufficiently researched. This is solved by the already known solution of the secondary binder and hydrophobization through hydrophobic polymers. The aim is to improve this solution by dividing and better setting the functions of hydrophobization and binder. This objective appears to be true, but the research would like to explore more.

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A STRUCTURED METHOD TO DEFINE GOALS WHEN DEVELOPING A BUILDING ENERGY PERFORMANCE ASSESSMENT METHOD IN A LEGISLATIVE FRAMEWORK

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ABSTRACT

To boost the energy performance of buildings, the EU has established a legislative framework including the Energy Performance of Buildings Directive (EPBD). Through this document EU state members are incentivized to set up a Building Energy performance Assessment Method (BEAM), tailored to the specific needs of the country. There is no standard definition for *the energy performance of a building*. Because the options are numerous it is important for the policy maker to first define the goals of their specific BEAM, before developing the BEAM itself. The definition of these goals is a subjective matter and can differ when asked to different organizations in the building sector. To comprehend the desires from these different groups and perspectives a structured overview of the goals that are important for the specific region is needed. In this paper, a method was developed to provide this structured overview and was tested on the legislative energy performance of buildings (EPB) framework of Flanders, Belgium. The Flemish framework was initiated in 2006 and has been in action until this day. The method contains two steps. In the first step, a multi-level tree structure for the mapping of the goals, based on the Goal Breakdown Structure (GBS), was developed with on top de main goal, *reducing global warming,* which then subdivides into many sub-goal on different levels. A goal on the lowest level could be the insulation level of the walls, for example. In the second step prominent stakeholders in the Flemish building industry, including policy makers, researchers, manufacturers, contractors and building owners were surveyed to capture their expectations from a BEAM and to query whether current BEAM corresponds to their expectations? The goal of this survey was to receive qualitative, not quantitative input from the stakeholders. In total, 33 respondents completed the survey. The survey results showed that, in general, the desired goals have not changed substantially compared to the preset goals in 2006. Trias Energetica is still the preferred guideline in the decision tree, although its absolute power has decreased slightly and seems to be more prone to the conditions. The current indicator for the overall energy needs (E level) is still strongly preferred while the recently introduced S level attracts mixed feelings in terms of usefulness to the whole EPB framework. The overheating indicator receives the most critique for not being accurate enough due to the simplified, single zone BEAM.

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A COMPARISON OF SHELL AND SOLID FINITE ELEMENT MODELS OF AUSTENITIC STAINLESS STEEL COLUMNS IN COMPRESSION

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ABSTRACT

Although stainless steel is increasingly being applied in load-bearing structures, there is little discussion about computational models of these structures in terms of input material characteristics, geometric imperfections, boundary conditions and other model uncertainties. Compared to carbon steel, test data on stainless steel is less available and a number of new material types are not statistically documented, partly due to manufacturers' concerns about the misuse of this data by competition. The subject of this article is the implementation of new knowledge about material and geometric characteristics obtained from an experimental research program in advanced numerical models of compressed columns made of austenitic stainless steel using the ANSYS Classic software. Nonlinear stress – strain curves of stainless steel were obtained using our own experimental program in two implementations and studied in terms of identifying the most suitable material model capable of accurately modelling material nonlinearity. Other material and geometric characteristics were obtained from literature and other independent experimental and theoretical research. Numerical models differing in mesh density localization, formulation of element integration, non-linear material model, and initial geometric imperfection were created and compared. The aim of the models was the ultimate limit state of a strut of circular hollow cross-section stressed by compression and analysed using the geometrically and materially nonlinear solution with consideration to the influence of initial imperfections. Static resistance and limit state deformations are compared for each model and the differences are described and discussed. The paper presents the analysis of model uncertainty by comparing SHELL and SOLID FE models, which must be characterized before the start of the analysis of the random influence of imperfections on limit states. The mean values and the coefficients of variation are practically the same for both approaches. In summary, the presented models can be considered sufficiently validated and eligible for integration in tandem with simulation sampling methods.

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THE IMPACT OF PUBLIC HEALTH CRISES ON LISBON PUBLIC SPACE POLICIES: FROM THE 19TH CENTURY TO THE PRESENT DAYS

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ABSTRACT

Cities have been affected, across History, by earthquakes, big fires, epidemics, and pandemics that sparked moments of reflection and change in the city form and public space quantity and quality. For example, this happened after the Great Fire of London (1666) or the Great Earthquake of Lisbon (1755). After episodes of destruction or disruption, debates and projects forge the urban answer to diminish future losses and risks. Being this the starting point, we aim to discuss the impact of two distinct moments of public health crisis - the epidemics of the 19th century and the current COVID-19 pandemic - on Lisbon public spaces. For both periods, we will analyze primary sources - strategies, plans, projects, and papers - designed by Lisbon City Council and that depict the ideas and tactics to tackle the urban challenges imposed by the public health crises. During the epidemics of the 19th century - yellow fever, cholera, and bubonic plague -, the sociopolitical context in Lisbon favored the arguments for street widening, the expansion to the north plateau, the construction of the city embankment, for example. The need to create broader and cleaner public spaces led to the construction of avenues and public parks. Also, Frederico Ressano Garcia presented the “Plano Geral de Melhoramentos de Lisboa” which followed Haussmann’s ideas, reproduced the wide boulevards and avenues being experimented in Paris, and used public space to define the new city blocks. At the moment, we are experiencing a global public health crisis related to the COVID-19 pandemic. In this context, public spaces open and ventilated are essential for livable cities. And many activities are demanding extra space: waiting lines, outdoor workout classes, outdoor cafés, or meeting friends and family. In 2014, the Lisbon City Council presented the program “Uma praça em Cada Bairro” to benefit more than 150 public spaces in Lisbon, being in 2021, 16 concluded (and 6 on-going). This program followed the “city for people” approach and dedicated more public space for pedestrians against the prior car-centric model. Additionally, in June 2020, the Lisbon City Council announced a plan to transform public space to avoid the potential increase of individual transport (car) and pollution split into two main goals: transform public spaces and build pop-up cycle lanes. With this research, we discuss the impact of public health crises on public spaces policies design through two particular examples in Lisbon, from the 19th century and the current days. Furthermore, we aim to question if these crises served, to some extent, the prior intentions to qualify public places and introduce a new form and image on Lisbon public spaces.

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COMPARISON OF THE PERFORMANCE OF PRESTRESSED RIBBED PANELS AND HOLLOW CORE PANELS SUPPORTED ON FOUR-EDGES

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ABSTRACT

Tests of full-scale models of the precast slab with dimensions of 6.30 x 6.30 m, built of two different precast panels, were carried out under short-term load. The models were made of autoclaved aerated concrete (700 type) brick with a thickness of 240 mm and a height of 2.24 m. The slabs were supported at four edges. The first slab was precast prestressed ribbed panels with concrete overtopping. The second slab was made of prestressed hollow-core panels. The panels had the same modular width of 600 mm. Tests were carried out under load placed on the top of the slab. The short-term load was applied sequentially, and displacement measurements were measurement by the electronic method. The load was initially applied evenly distributed. In the last step, part of the load was transferred to one-half of the slabs. The obtained load was different for each half of the slab. The first part of the slab were panels 1 to 5, loaded with the value of 1.7 kN/m^2, and the second part were panels 6 to 10 loaded with the value of 7.7 kN/m^2. The tests allow determining the difference in slabs' performance depending on shearkey construction. The panels maintained the possibility of load redistribution based on their interaction despite the longitudinal joints' work only through the concrete cross-section. The slabs had a different character of transverse displacements depending on the presence of concrete topping. The models revealed a different response to transferring part of the load to one-half of the slabs. There were no cracks in the line of longitudinal joints on the upper surface of the slabs. Also, there were no cracks on the bottom of the panels. At the panels' connection with the wall, rotation and lifting corners of the slabs were noticed. The measured displacements were significantly smaller than for the corresponding models of single-span slabs with a parallel load.

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TEACHING SITE EVALUATION SKILLS FOR LEED CERTIFIED BUILDINGS ONLINE USING BROOKFIELD'S CRITICAL INCIDENT QUESTIONNAIRE

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ABSTRACT

Preparing construction management and architecture students to conduct site evaluations can be challenging for instructors who are teaching sustainability courses online. Teaching online limits contact hours thereby making it difficult for students to learn soft skills needed to make informed observations. This poster shares successful use of Brookfield's Critical Incident Questionnaire (CIQ) to gather students' reflections when they feel especially engaged, distanced, puzzled, or surprised. This Scholarship of Teaching and Learning research highlights ways to enhance students' observational skills and build confidence when they are asked to go to a site and conduct a site evaluation. The purpose of this research was to test the efficacy of the CIQ when students were asked, following site visits, to describe what issues stood in the way of them making in-depth observations. Two site visits were involved. CIQs were administered after each site visit. Data was gathered for two separate semesters, summer 2012 and 2020. Variations due to Covid-19 were reported. Principle results indicate students learnt better when they had the opportunity to reflect on their observational skills. The teacher was able to elicit authentic comments from her students, thereby allowing her to gage her students' level of understanding regarding course content and delivery methods. Results from the CIQs allowed the teacher to provide additional instruction as needed to smoothly coach her students through self-directed site visits to a Leadership in Energy and Environmental Design (LEED) Certified Building. Site evaluations require mastery of soft skills. The CIQ was found to be especially useful for students conducting their second site visit. Data and results will be described in the poster.

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ARCHITECTURAL INTEGRATION OF PHOTOVOLTAIC MODULES IN UNIVERSITY BUILDINGS

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ABSTRACT

Nearly zero-energy buildings will become a mandatory European standard after 2020. They are characterized by extremely high energy efficiency and use of renewable energy. Solar energy, along with that of the wind, rain, tides and geothermal, is clean and is considered practically inexhaustible. Photovoltaics are one of the most promising renewable energy technologies. Nowadays their use has considerably grown up. The problems concerning the architectural integration of photovoltaic modules have become more important and have been a question of present interest. Their design is strongly influenced by building's function. In order to reduce the volume of the current research, the application of photovoltaic modules was set for university buildings. Selected examples of this type of public buildings with integrated photovoltaics were shown and analyzed in the paper. The main types of architectural integration of photovoltaic modules were systematized according to the constructional principle of their attachment to the bearing base. The advantages and disadvantages of the defined systems were studied. A wide variety of applications are available today. The architectural integration of photovoltaic modules in university buildings can be classified into three main categories: roofs, skylights and canopies; facades and parapet units; and solar shading systems. The photovoltaic solar shading systems fulfil at least two functions: to provide shading when it is needed and to allow a maximum electricity production. Each of these three main types has enormous potential for development. Their efficiency depends on the weather conditions and solar irradiation, the type of the cell, tilt and orientation, overheating and over shadowing. The PVs have to be considered as part of the overall environmental design of the building.

ARTIFICIAL SNOW MAKING RESERVOIRS IN ROMANIA, NOTES ON THEIR CONSTRUCTION, MAINTENANCE AND OPERATION

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ABSTRACT

As there is a tight link between infrastructure and recreational activities, one of the many linked aspects is between skiing and artificial snow installations. Such infrastructure is a new and innovative approach and include hydrotechnical infrastructure that is atypical and with a different approach to the traditional one. The artificial snow water reservoirs are important features in the climate change resilience and operation of the ski and winter sports. The intakes and reservoirs needed to store water for the artificial snow are usually located at hard to reach altitudes and require intense manoeuvring of the features in order to operate. As we factor the extreme temperatures of operation, high altitudes, climate change, hydrologic changes with the extra loads that snow and ice impose things get really difficult. In this article we present a brief description of the challenges that are encounter in the construction, maintenance and operation of such infrastructure. In Romania a sum of such reservoirs has been developed in the recent years and are now just passing the first years of testing and operation. With close to ten years since most of them have been built we are close to issuing good practice notes for them

CRIVINA DAM EMERGENCY INTERVENTION WORKS

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ABSTRACT

Bucharesti city, capital of Romania, with a population of about 2 million inhabitants, is supplied with water from Arges Rivet that runs just west of the city. The water is supplied by a large intake with a movable weir that was initially built in the 1940's at Crivina. Arges river has the tendency to lower it's thalweg with an accelerated rate due to multiple factors both anthropic and natural. In the past, thalweg drops of 2-3 meters have been reported and dealt with at intervals of about 15 to 20 years. This poses important risks to the safety of both dam and water supply networks as the thalweg drop can lead to instability for the weir and possibly even failure. Such events can generate important floods for the downstream localities and even loose of life on top of the inherent damage. Another important aspect is that the water supply for the capital of Romania can be endangered by the weir's problems rendering an important part of the population to drinking water privation. Recently such a drop of 2-3 meters was reported for Crivina weir, with the urgent need to intervene in order to prevent such catastrophic events from happening. In this article we will present the main features of the structural rehabilitation process that is needed in such situations.

DAM REHABILITATION IN THE CONTEXT OF CURRENT EU FINANCE PROGRAMMES

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ABSTRACT

Some of Romania's Large dams, built in the period between 1960 and 1980 are now experiencing ageing related issues. The context of their refurbishment is now overlapped on the European programs that can supply the necessary finances. Environment standards are currently growing ever so strict and habitat protection is one of the key aspects. As engineering problems seem to be left on the side for environment protection prioritisation, we will present in fact how the two can be synchronised. The dams purpose and philosophy when the dams were initially commissioned was different and was oriented towards functional aspects and a multi-purpose approach. The main functions for these dams were flood protection, water supply, hydropower…etc. In the context of the European guides to financing these dams have to be inscribed into a hydrographic basin risk based approach. One other very important aspect links the European founding to the greed infrastructure approach. In this context we aim to present how such an approach can include also dam rehabilitation and risk based approach. Multicriterial analyses and additional structural implications can be linked and provide the key to both structural safety and environment protection. We present in this article the case of two dams in need of rehabilitation in Romania enrolled for European financing assessment.

2D SITE RESPONSE IN ALLUVIAL BASINS BY FINITE DIFFERENCE-BASED NUMERICAL METHOD

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ABSTRACT

The lateral irregularity of the soil media is typically formed by fault ruptures or topographic depressions filled with sediments and this highly present geological formation is identified as a basin. On this type of project site, the estimation of the surface ground motion of an earthquake is a complex problem in geotechnical earthquake engineering. Contrary to the soil column assumption of the semi-infinite 1D soil model, the soil layers have both horizontal and vertical discontinuities and change topographically and stratigraphically. Therefore, the question of how the soil response would be shaped as a result of combinations of the effects of principal wave phenomena in the sedimentary basins, surrounded by roughly circular or elliptical harder layers or the bedrock outcrops, is still a leak in the seismic code provisions. In this study, basin conditions considering soil classes as soft clay (E) which defined by NEHRP 2020 provisions was investigated with different levels of bedrock inclination. Fully nonlinear time-domain analyses were carried out on both 1D and 2D models of created basins by the Finite Difference-based numerical method. The results of the nonlinear time-domain analyses were compared to clarify the effects of the basin edge inclination on the resultant ground motions on the points located with equal intervals on the model surface. The acceleration response spectra of 2D and 1D models were illustrated across the basin, and it is aimed to explain the dependence on the motion frequency and the effect of the inclination angle of the basin edges to site response.

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PHOTOVOLTAIC FAÇADE PERFORMANCE EVALUATION

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ABSTRACT

A post-occupancy evaluation of a high-rise building has been focused on monitoring of an energy generating PV integrated façade. A part of the building south facade is covered with PV panels. The total area of the PV panel installation is 685 m^2 with the total amount of 392 poly-crystalic PV panels. The PV panels consist of the EVA encapsulation system with triple-layer back sheets in an anodized aluminium frame. The photovoltaic façade has been monitored for three years for electric energy generation. The PV façade was also simulated for specified conditions in annual evaluation at the region with temperate climate conditions. Minimal generation of electric energy was monitored in winter seasons from November to February. Maximal production depends on intensity of solar radiation and also on solar altitude. It was found that from May to July the façade is not so efficient compared to periods from March to April and August to September. The vertical PV façade absorbs maximum of solar energy during the months of transitional periods in the given climatic locality. The evaluations of the PV system energy generation show that the façade has important impact on the high-rise building energy efficiency.

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THE URBAN RESILIENCE OF MONASTIC ARCHITECTURE AND THE HERITAGE MANAGEMENT: THE CASE OF SEVILLE'S SAINT AUGUSTIN CONVENT

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ABSTRACT

The aim of this communication is to develop how to preserve the permanencies and losses of old convents and monasteries after urban transformations, as well as to review the instruments of heritage protection that have failed. It is a common process that has been experimented in many European cities and whose protagonist are the cloistered convents. Pieces that have served to make city and help to build its periphery. But, with the passage of time they were submerged in abandonment, fragmentation, forgetfulness and even loss their memory. This situation remains until a fresh impulse transforms it into a new object of patrimonial value, resource for tourist use, and rejoins the city. The methodology followed is based on the simultaneous use of different 2D and 3D assisted drawing tools, always supported by historical cartography and written documentary sources. In Spain, the city of Seville stands out as one of the settings for the development of religious orders, more than one hundred. As a result of historical events and developments, many of Seville's convents and monasteries have disappeared completely. The number of monasteries that have remained intact, preserving their use value as a religious institution are very small, only 15. However, it is common to find remnants in the present-day city where their remains are still visible. Saint Augustin monastery was founded in the 13th century outside the city walls, 15,016 m2 next to the Carmona Gate. Its location was bounded by the city and the city walls to the west, the aqueduct to the south and the Tagarete River to the east. Both the aqueduct and the river allowed for the location of the building as well as the extensive development of its orchards. The importance of water in the conventual space is due to the need for irrigation and cultivation of the green area. In 1835, the convent was disentailed, and the building was divided up. New dwellings were also built on the site of the former convent, which was in a privileged location. New streets appeared, the site was completely divided and cloisters, parts of the old convent and its church disappeared. The remains of the building have not been adequately protected for decades. The convent of Saint Augustin is an outstanding example of urban resilience, how a building of great importance and size has managed to survive. Some valuable spaces of the original building are still preserved, such as the refectory, the staircase, and the main cloister. The understanding and protection of Seville's convent heritage requires specific planning tools to address the urban condition of the convents. In addition, their determining role in the morphological construction of the city and the configuration of the historic urban landscape will be stablished. Unpublished material of the urban and architectural research process will be provided under a methodological approach of renewed heritage management, clearly useful for European historic cities.

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A CASA PORTUGUESA: BETWEEN TRADITION AND AVANT-GARDE. THE FIRST SOCIAL HOUSING NEIGHBOURHOODS IN SETUBAL (PORTUGAL)

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ABSTRACT

In Portugal, the first public housing policies were developed in a high state-control context: the Salazar dictatorship (1933-1968). Until the 1950s, the Estado Novo actions had an evident paternalistic character by constructing small-scale housing focused on the most urgent cases or aimed at controlling specific sectors of the population. The public effort focused on promoting housing in the country's central districts and cities, given that the population was abandoning rural areas to seek better living conditions in the large cities with a higher level of industrialization. In this context, the official architectural discourse defended the ideal of the *Casa Portuguesa* [Portuguese House] as an affirmation of the ideological discourse of the regime. This model advocated a ruralizing architecture style by integrating architectural and decorative elements of the region's traditional architecture, including an outdoor garden to grow vegetables, store agricultural, farming or fishing tackle. The single-family dwelling was presented as the only residential type capable of assuming the Nation's principles, with low-rise and low-density urban designs typical of the garden city. It would become an excellent instrument for defending the family institution and preserving the existing social order. In this regard, the paper proposes to study the first social housing neighbourhoods built in the medium-sized city of Setubal: *Alfonso Costa, Nossa Senhora da Conceiçao, Pescadores* and *Familias Pobres*. Setubal has historically played a significant role in the region due to its strategic location within its territorial structure around the Sado Estuary. Linked to the fishing tradition, the city overgrew in the first decades of the 20th century thanks to the canning industry, making it a recipient of the migratory processes that gave rise to social housing construction. The research has identified that these four neighbourhoods respond to a simple-line architecture close to the Modern Movement, especially in their spatial organization. However, their external image and their urban planning link them to the Portuguese House idea. Most of them consist of one- or two-storey houses, detached or semi-detached with gardens, and their façades incorporate elements typical of the popular architecture. At present, these developments are located in continuity with the existing urban fabric and have acquired a hinge position between the historic city and the new peripheral growths. It is worth highlighting their potential as a new centrality, insofar as they are seen as strategic pieces for urban models that defend the recycling of the consolidated city in the face of those who continue to bet on the unlimited growth of cities.

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IMPACT OF BIOPHILIC INDOOR ENVIRONMENT ON HEALTH IN THE CONTEXT OF COVID-19

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ABSTRACT

In the context of the coronavirus (COVID-19) pandemic, when our homes become places of treatment or convalescence it is crucial to use the therapeutic potential of designed spaces. The theory of biophilia hypothesis indicates that humans possess an innate tendency to seek connections with nature. On the other hand, we see a world where cities grow and societies become more urban. We spend most of our lifetime indoors. Therefore, there is an urgent need to rethink how indoor spaces are organized. Biophilic design is a response to the global challenge of confinement and a perspective in spatial and social distancing. It is a way to embrace occupant connectivity to nature through the use of design patterns, that can expedite healing, reduce stress and anxiety. According to researches, there is a strong relationship between human health and the natural environment. We can observe some specific strategies and considerations, that define our satisfaction with the indoors connected to nature. There are identified experiences, which are characteristic for biophilic spaces. The present study aims to shed light on common ground between the design and health. The article is a systematic review of current knowledge about the relationship between natural design and human health in the context of home quarantine and the post-pandemic society convalescence. Understanding the subliminal influence of the built environment on our brain is important for creating a human-centered design. Furthermore building consciousness of the impact of physical environmental factors on human well-being is important for reducing the risk of society's mental issues caused by fear and uncertainty.

SYSTEMS FOR INTELLIGENT TRUCK PARKING IN HIGHWAY RESTS AS PART OF THE INTERNET OF THINGS WITHIN THE CONSTRUCTION 4.0 CONCEPT

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ABSTRACT

The Road and Motorway Directorate of the Czech Republic is introducing a system of smart truck parking at motorway rest areas. They are preparing to install these systems or has recently implemented them, for example, at motorway rest areas on the D1 Střechov and Mikulášov, or on the D35 motorway at the Dolní Roveň rest area. Thanks to the use of detection technologies in the place of rest and connection with NDIC, where traffic information is collected and processed, it is possible to include this technology in the Internet of Things as a part of Construction 4.0 concept. The subject of this article is a brief description of these systems, including examples of use. With the help of SWOT analysis, the strengths and weaknesses, respectively opportunities and threats of these systems will be identified with the help of experts. The capacities of parking spaces also play an important role in the use of these systems. At present, due to the lack of parking spaces for trucks, the system is still difficult to use to the full extent intended. However, the planned expansion of rests also includes the installation of these systems, which should lead to the fulfillment of the primary function of this system. Even so, this system will play an important role in Internet of Things as a part of Construction 4.0 concept in terms of obtaining data on the real current load of highway rests.

DEFINING FOCUS AREAS FOR DIGITIZATION TO REDUCE CONSTRUCTION INDUSTRY GENERATED CO2 EMISSIONS

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ABSTRACT

The amount of greenhouse gas emissions generated by the construction industry is significant, therefore it should be addressed to protect our environment in the 21st century. The present research is the starting point for a more complex analysis in bioengineering science. It examines the possibilities of implementing digital technologies and the gains that their application can achieve. The research provides an overview of CO2 emissions from construction processes and identifies areas that may focus on future detailed analysis. The study consists of two main parts: a literature review and an interview with digitization experts focused on the issues identified. The present research guides future development focus areas comparing interviews by market and scientific studies. It is essential to determine how significant results can be achieved by using modern digital tools and methodologies. In this way, the extent to which they affect global emissions can be examined, and their impact can be quantified. In the research, the full spectrum of the construction industry was explored, hence we comprehensively analyzed the impact and problems of the processes belonging to each phase of the lifecycle. Although the environmental impact of raw material extraction and processing is significant, its techniques can be improved primarily through innovative solutions that require organizational or governmental intervention. By examining the building phase and post-building phases of the lifecycle, significant reductions in emissions can be achieved through more detailed design, optimized construction, and well-thought-out operation and demolition processes. As a result, immediate interventions are needed in existing methods and procedures. Sustainable construction can be supported by applying new, more accurate, innovative, and higher quality design, construction, operation, and demolition methods. These changes will facilitate the implementation of digitization processes in the construction industry at a higher level and prepare proposals for the solution of environmental problems in the construction industry.

The research project is conducted at the University of Pécs, Hungary, within the framework of the Biomedical Engineering Project of the Thematic Excellence Programme 2020 (2020-4.1.1-TKP2020)

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INVESTIGATION OF BEARING CAPACITY OF THE DRILL - IMPACT MICROPILES WITH ENLARGED TOE IN THE SOILS OF DIFFERENT TYPE

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ABSTRACT

The reinforced concrete micropiles with enlarged toe is the effective construction for the arranging of new and reinforcing of existing foundations which a drill-impact method are made as a circular bar with a diameter to 250 mm from the flow consistency concrete with prefabricated reinforcement cage and enlarged to two diameters toe cone-shaped form. For research of them real work by the authors of the article and engineers of PP BKF “Osnova” were conducted them field tests on the objects of building in the different soil conditions and the analysis of them calculation and experimental bearing capacity is given. The new effective construction of drill-impact micropiles from the reinforced concrete with enlarged toe developed on the department of build constructions Lviv national agrarian university and introduced in the real building. The experimental studies of them bearing capacity is given. The actual values of drill-impact micropiles bearing capacity, what certain experimentally a method them the field tests the static pressing, mainly exceeds them theoretical values, got a calculation after norms. The analysis of quantitative correlation of experimental and theoretical bearing capacity for the different types of soils is the task of researches.

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A COMPUTER SIMULATION OF NOISE OF CONSTRUCTION MACHINERY OPERATING IN PARALLEL

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ABSTRACT

Prolonged, repeated or very intense noise exposure can damage human health. To reduce any dangerous effects of noise on human health, policies and restrictions are enshrined in national law and legislative regulations. In the Czech Republic, this issue is subject to the Ministry of Health. In other states it can be the Ministry of Health or more often the Ministry of the Environment. The protection of human health against noise and vibration is enshrined in Act No. 258/2000 Coll., on Protection of Public Health, specifically in §§ 30-34 of this Act. Other restrictions are described in Act No. 309/2006 Coll., which regulates other requirements for safety and health protection at work in labour relations and on ensuring safety and health protection in activities or the provision of services outside of labour relations. Furthermore, hygienic limits for workplaces, protected indoor areas of buildings and protected outdoor areas are set in the new Regulation of the Government of the Czech Republic, No. 272/2011 Coll. as amended. This Regulation also sets limits for construction noise. They set limitations in so-called outdoor protected areas and the so-called outdoor protected areas of buildings. The hygienic limit of the equivalent sound pressure level A for noise from construction activities is set here by adding a correction of 5dB or 15dB according to the type of protected space to the basic value of the equivalent sound pressure level A 50dB. This limit must be adhered to. For buildings nearby, the term „protected façades“ is used, i.e. „protected façades“ include the nearest buildings that are inhabited and their occupants could be exposed to noise for a long period of time. We can measure the intensity of noise in these places if we have a "sound level meter". Predicting the intensity of noise and its longevity for future construction is more challenging. The computational evaluation of the noise load of the outdoor area of the monitored territory is based on the recommended theoretical acoustic relations for the transmission of sound from stationary noise sources according to ČSN ISO 9613/1-2. One of the possibilities of calculating the intensity of noise is the application of software programmes used for determining traffic noise, which, in contrast to construction noise, is handled very carefully and predicted in detail during the construction of transport infrastructure. Because here are the values and methodologies for the calculation of noise indicators set correctly and in detail, it is possible to use them also, provided that we work well with the background and input data. The calculation indicators are the values of the equivalent sound pressure level falling in front of the façade, on which we determine various measuring points. If the noise sources and acoustically significant elements are entered correctly, we obtain both correct values and also the possibility of displaying a map of the area with colour isophone bands, which expresses the level of noise in the construction site and its surroundings.

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EFFECT OF COURTYARD ON CORRIDOR TEMPERATURE AND CLASSROOMS POSITIONED INSIDE AN INSTITUIONAL BUILDING LOCATED IN WARM-HUMID CLIMATIC CONDITION: A FIELD EXPERIMENT AND SIMULATION PERSPECTIVE

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ABSTRACT

The role of corridor space on the classrooms located in warm-humid climatic conditions of Tiruchirappalli is examined using field experiments and the same is validated using computational fluid dynamics simulations. It has been explained how the corridor temperature affects the classroom temperature, with increasing floor levels. The effect of positioning of the corridor and classrooms on the rate of heating of Corridor Temperature and Room Temperature as a function of time and floor levels also has been analyzed. Based on the field experiments and computational fluid dynamics simulations one can hypothesize a differential heating phenomenon among the rooms and corridor positioned in eastern and western orientation of the building.

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RURAL HOUSING IN TRANSITION. FROM LOCAL TRADITIONALISM TO GLOBAL `MODERNISM`

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ABSTRACT

Although there are many surveys conducted by the real estate market and the sociology of housing is known by a marketing perspective, we do not have enough information regarding the people relation with the built environment and their options on housing architecture, that is what the present study seeks to highlight. It is necessary a holistic approach regarding urban aesthetics, but also on a human scale. Almost 1000 people of the peri urban an on the main road villages around Timisoara answered to the online questionnaire „The present rural housing, Banat, Western Plain" between 15 October-15 December. The purpose of the study is to investigate the preferences of the communities regarding the present housing in rural environment and their attitudes on traditional housing and their perception on future urban evolutions of the Banat villages. The questionnaire collects information on age, occupation, place and time of residence/ property, and identify the population attitude on the future of present agricultural land, on the territorial planning and the urban control, on the opportunities of developments and on the level of acceptance on the density growing of housing or the agricultural land occupation with buildings. In conclusion, we can formulate that the vernacular housing evaluation is low, the houses are relevant only from the point of view of the rural cultural landscape. Their social acceptance will be produced in time, only when they will become enough old to acquire an historic documentary value, until then we can only seek to protect the built heritage through technics of preservation.

ANALYZING THE PERFORMANCE OF CFRP RETROFITTED HOLLOW-CORE SLABS

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ABSTRACT

External bonding with CFRP (Carbon Fibre Reinforced Polymers) has been investigated over the last decade, as it represents a viable technique of strengthening existing prestressed concrete structures, including hollow-core slabs with non-circular voids. The high performance of these carbon fibres has been validated through a large volume of experimental and numerical research and yet there are a few issues which remain controversial in simulating their behaviour with the finite element modelling. Although the CFRP mechanical properties are provided by the manufacturers, they are not satisfactory for a complete understanding of the analysis and design approach of retrofitted CFRP hollow core slabs. The objective of this study is to emphasize the effect of damage and interface behaviour on the constitutive modelling of CFRP strips. Damage is predicted using Hashin's initiation criteria and the cohesive behaviour in the interface for the epoxy resin which bonds the CFRP sheets to the hollow-core units. A plastic damage model was used for modelling the concrete, after a parametric study regarding the dilatancy angle and viscosity parameter was conducted for the most accurate choice of concrete damage plasticity parameters. The overall procedure is made up of computations using finite element models in Abaqus 6.13 program for an analysis of CFRP strengthened hollow-core slabs. Two different modelling possibilities of CFRP-to-concrete interface were studied: a tie constraint connection was first used and secondly the contact bonding was defined with the cohesive behaviour option of the contact interaction property. The present research is conducted on prestressed hollow core slabs with CFRP strengthened non-circular voids. The strengthening method consisted in the application of the composite material on the internal surface of the precast slab's voids, on two different zone lengths: 300mm and 500mm. The results are provided in terms of load-displacement response, equivalent plastic strain and distribution of Von Misses stresses in the CFRP strips.

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THE PROXIMAL SURROGATE INDICATORS FOR AN ANT COLLISION INFORMATION AND ACCIDENT PREVENTION

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ABSTRACT

The proximal surrogate indicators associated to traffic conflicts techniques and technologies for ant collision information are very important to accidents prevention and can also reduce the time response of road rescue vehicles. This paper presents the study of proximal surrogate safety indicators such as: Time-To-Collision with Disturbance (TTCD), Deceleration Rate to Avoid the Crash (DRAC), Modified Time-to-Collision (MTTC) and Crash Index (CI) for assist the development of a collision warning system and after accident studies. These indicators can be used to generate alerts about eminent rear-end collision using parameters such as: speed, acceleration, location, and timestamp collected by vehicles that interact in a vehicle-to-vehicle (V2V) communication. It can be useful for innovations in new emergency breaking systems and futures studies by precisely accident occurrence time identification. Thus, these indicators can also be associated to an alert and accident location sent to a rescue unit closest to the accident site. This study has used scenarios and models in R language for generation of graphs that demonstrate the viability and relation of these indicators with eminent collision information that will help the improvements in technologies and new public policies for road safety.

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ENERGY PERFORMANCE QUALITY OF BUILDINGS' ENVELOPE ON THE ISLES OF USEDOM AND WOLLIN, BASED ON THE INFRARED EXAMINATION

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ABSTRACT

The Isles of Usedom and Wollin are located in the southern shore of the Baltic Sea, on the Polish-German border. Their area has long been used as a recreation area and resort due to its location on the seashore and numerous natural and spa values. In the direction set out by the EU Commission and sanctioned by the European Green Deal Directive, steps have been taken in the area to prepare the foundations for the energy transition in order to face the ambitious goal of achieving climate neutrality by 2050 or earlier. The process requires a number of actions in the planning field on a cross-border basis, taking into account awareness-raising activities and requiring the cooperation of all stakeholders, both internal and those related to the islands. One of the fundamental step is the description of the existing energy state in a broad sense so as to define the energy base line of the Usedom and Wollin Isles. In the Polish-German project MoRE INT 190 "A Model Region of Renewable Energies of The Isles of Usedom and Wollin", an analysis of the thermal quality of the building stock's envelope on the islands was performed. Infrared technique investigations covered building's stock in a total of 15 pilot sites, 7 on the German side and 8 on the Polish side. The sites were selected "mirroring" on both sides of the border, taking into account their characteristics, including: function, building stock, infrastructure, development, as well as the characteristics of adjacent areas. As a result of the conducted research, the most common differences and weaknesses in the buildings' envelope, which contribute to excessive energy losses, were described. Their character was systematized and probable reasons for their creation were indicated. The obtained results and their analysis allowed for the formulation of conclusions about the energy-related condition of building's stock in the pilot sites and the reasons for the weak points created in terms of energy. Guidelines have also been developed to implement corrective actions to reduce the energy demand of the islands' existing building stock. Reducing energy demand is a very important step in the process of energy transition and, in the future, full introduction of renewable energy to the energy mix of the isless of Usedom and Wollin, and thus counteracting the effects of climate change. The MoRE INT 190 project is co-financed by the Interreg VA PL/MV/BB Program.

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RENAISSANCE VILLAS - ARCHITECTURAL SPACE, ARTS AND LANDSCAPE: MORPHO-TYPOLOGICAL COMPARISON OF THE *PALÁCIO FRONTEIRA* AND ITS GARDENS WITH ITALIAN AND PORTUGUESE REFERENTS

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ABSTRACT

This text aims to demonstrate the existence of invariants recognized in *Quintas de Recreio* in the Lisbon region, built in the 16th and 17th centuries, which strictly respect the principles of design and construction of the most important and revolutionary suburban villas of the Italian Renaissance - Rome and Florence - such as: a. rational / purist design of buildings; b. implantation on the ground, appropriation of the natural site, creating new highly qualified spatial realities, which interrelate architectural spaces, gardens and the surrounding landscape; c. use of artistic expression as a way of aggregating architecture and landscape in a spatial whole with meaning and character - definition of environments, creation of narratives, interaction with the senses in a decisive way depending on the possible appropriations of interior and exterior spaces. We intend to compare the architectural composition of *Quinta dos Marqueses de Fronteira* with other erudite villas that are close to it - geographically, temporally and culturally -, focusing on the following parameters: a. conception and definition of the architectural space; b. decorative, iconographic and symbolic function of the arts with a more or less determinant link in the spatial composition of architecture and gardens; c. modes of relationship and interaction with the landscape, understood as an integral part of the place / Quinta de Recreio. Regardless of the composition of the architectural whole that constitutes this *Quinta de Recreio* [Villa], or parts of its constituents that are clearly Mannerist or Baroque, due to their composition or expression, not least because they were built at different times, it is the conceptual humanist referent coming from the Renaissance villas model (which originally typified their spatial program, becoming constant in time and in different cultures) that we identify in the most erudite cases of non-urban civil architecture built between the 16th and 17th centuries in Portugal. The *Quinta dos Marqueses de Fronteira* shows, in this context, the most complex, rich and qualified cultural and artistic expression resulting from the interrelation of its architectural spaces (interiors and gardens) with the landscape and the arts, originating contexts, environments and narratives that determine the inhabitance and character of the Place.

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A STRAIGHTFORWARD PROCEDURE FOR DERIVING BIAXIAL INTERACTION DIAGRAMS OF RC SECTIONS IN FIRE

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ABSTRACT

The biaxial interaction diagrams represent a widely used practical tool for the design of reinforced concrete (RC) sections under axial load and bending moments about their two axes. At ambient temperature, these biaxial interactions diagrams can be classically established in the framework of ultimate limit state design (ULSD) where the strain limitations of concrete and reinforcing steel are prescribed. However, the implementation of such a calculation procedure becomes much more complex in the case of RC sections subjected to fire loading, since the strain limitations of concrete and reinforcing steel are now temperature dependent. In addition, elevated temperature leads to a degradation of constituent material properties. Based on the lower bound static approach of the yield design (or limit analysis) theory, this contribution presents a straightforward computational procedure for deriving the biaxial interaction diagrams of RC sections in fire conditions, taking into account the experimentally-based relationships linking the degradation of material strength properties to the temperature increase. Indeed, while the classical methods are usually based on conventional limitations of strains of constituent materials, the yield design approach only requires that their stress (and not strain) limitations be prescribed, with no reference to other mechanical characteristics. More specifically, material characteristics are introduced in two steps: (i) a preliminary heat transfer analysis for evaluating the temperature distribution on the RC section and (ii) the introduction of reduced factors as functions of temperature on both the concrete and steel strength properties. As a result, a semi-analytical solution of axial load-biaxial bending moments failure surfaces will be proposed for any prescribed temperature distribution. Due to its simplicity, the proposed method allows performing parametric studies in a rather quick way. For illustrative purpose, calculations will be conducted on typical RC sections subjected to different fire exposure conditions. Finally, the theoretical predictions will be compared to those obtained from numerical simulations of the same problem using a finite element software.

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PROTOTYPE DESIGN METHODOLOGY OF SOCIAL HOUSING OF THE ENERGETICA 2030 PROJECT

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ABSTRACT

For the Energy project 2030 within the P02 called Sustainable Construction, the general objective is the design and construction of an energetically sustainable Living Lab in different thermal floors of the national territory (Colombia), through the integration of technologies of generation, storage, monitoring, and energy manipulation to evaluate the technical and socioeconomic viability of energy solutions and their scalability in different environments in Colombia. There was methodology developed that allowed a preliminary development by the students of the vertical sustainable housing workshop of the faculty of architecture and design of the Universidad Pontificia Bolivariana, this methodology allowed to identify different perspectives of housing, looking for a module that would improve the habitability of users and allow it to be built by a final user. In addition to identifying different scenarios that allow housing standardization so that it can accommodate the different characteristics of the Colombian territory. Subsequently, for the year 2020, a team oversaw the final architectural design of the module, in addition to developing a methodology that allowed the interaction of a multidisciplinary group, made up of professionals from the EAFIT university, the National University of Colombia, UPB, among others, that would offer, not only the hydraulic, electrical, and home automation design of the house, but a component of innovation in each of these aspects. This methodology allowed, in addition to different work fronts, a preliminary design that had already contemplated different problems in the environment and some benefits that each of the searches developed by each student could have.

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NON-DESTRUCTIVE TESTS PERFORMED ON WOODEN ELEMENTS

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ABSTRACT

Over the years, the wooden structure elements undergo destructive processes. Their development and progress depend on various factors amongst which an important role is played by the historical events that took place while the structure existed. Mechanical wear and long-term mechanical stress together with its consequences are the elements resulting in the destruction of wooden elements. Wood is subject to degradation also under the influence of stresses from the humidity changes and insect effect. The fungi decay emerging when the humidity is above 20%, is an important issue in case of wooden objects in civil engineering. Examining the condition of wooden elements is crucial from the perspective of the correct structure performance. Detecting the internal wood condition deterioration without any symptoms visible from the outside allows preventing the further spread of the decay. Research conclusions frequently result in the necessity to conduct repairs, renovations, replacement of the wooden beams structure, or even the substitution of a significant part of the structure. To achieve acceptable results, test methods should take into account the anisotropic nature of the wood, which includes the shape of annual rings, as well as the location of the core in cross-section. To adopt methods based on physical effects, profound knowledge of wood physics is needed, particularly knowledge of interdependence. Apart from simple tests, such as a visual inspection or tapping to determine the near-surface defects, non-destructive testing (NDT) play an important role in the process. In this article methods of non-destructive testing performed on wooden elements are presented. These methods include tests conducted with ground penetrating radar (GPR), thermal techniques, microwaves, acoustic emission, ultrasonic tomography and X-ray tomography. The use of the ground penetrating radar may be problematic in case of elements of small size. This is when the acoustic test methods are more advantageous, as they allow identifying the heterogeneous or damaged areas based on the time-of-flight value. A map presenting the distribution of a specific parameter, for example, the wave propagation velocity, is created on the basis of the aforesaid values, which facilitates the interpretation of the information on the examined area. The article summarizes the use of non-destructive methods, indicates their disadvantages, advantages and some limitations.

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ANALYSIS OF INFORMATION TECHNOLOGY USED IN CONSTRUCTION ENTERPRISES

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ABSTRACT

Information technology represents an increase in use in every sector. The construction industry is a sector that produces large volumes of data. Their processing requires automation and systematization. Information technology is an essential tool for data processing. Relevant information is an important advantage in the digital economy. However, working with data and information is time-consuming, economically demanding. Based on this, the use of information technology is critical to implement in construction. This paper addresses the issue of using information technology in smelting companies. The research aims to analyse the use of information technology in construction companies. Information technology can save information processing time. They also have a positive impact on reducing costs in the long run. They also have a positive effect on productivity. The research seeks to quantify the use of information technology and to look for dependencies between research groups. The research works on the assumption that the use of information technology will be different between research groups. The size of the construction company, the use of foreign know-how and capital, and the construction activity, or the definition of the participant in the construction project, can be important in the results and determine differences in use. Differences and identify potential differences between individual research samples are based on the use of statistical tests. The Kruskal-Wallis test verifies the significance of the findings. The research sample includes 55 construction companies operating in Slovakia. These are mostly contractors, developers, designers and sub-constructors. The research involved large construction companies, as well as SMEs and micro-enterprises.

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DETERMINATION OF COST-EFFECTIVE SAND MIXING RATIO FOR IMPROVEMENT OF HIGH LIQUID LIMIT SOIL BASED ON FUZZY COMPREHENSIVE EVALUATION

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ABSTRACT

High liquid limit soil is a kind of weak soil with high natural water content, high liquid limit and high fine particle content. High liquid limit soil cannot be used as embankment filling for its low performance in engineering. In order to save soil resources and increase the utilization range of high liquid limit soil, the high liquid limit soil was improved by mixing sand in this paper. Geotechnical tests were carried out on high liquid limit soil mixed with different amounts of sand. It is shown that the sand-mixing improvement method can significantly decrease the liquid limit and plasticity index of high liquid limit soil, and increase its value of California bearing ratio to meet the property requirements for embankment filling. After mixing with sand, the unconfined compressive strength of the high liquid limit soil is significantly improved, while the free expansion rate and compressibility coefficient are decreased. Sand mixing ratio is the ratio of the mass of dry sand to the mass of dry soil, and the cost-effective sand mixing ratio was determined with the help of fuzzy comprehensive evaluation method. The improvement cost and improvement effect including liquid limit, free expansion rate, California bearing ratio value, unconfined compressive strength and compression coefficient of sand-mixed high liquid limit soil are taken as the evaluation factors in the fuzzy comprehensive evaluation. The fuzzy comprehensive evaluation results show that the improvement effect and cost of sand-mixed high liquid limit soil reach a comprehensive optimal state when the sand mixing ratio is 20%.

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CRITICAL SUCCESS FACTORS FOR IMPLEMENTATION OF GREEN BUILDING IN INDIA

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ABSTRACT

For the sustainable built environment, Green Building technology is the most widely adopted trend worldwide, however, it is in a nascent stage in India. Even though the use of green building technology is advantageous over the lifecycle of the project, people are hesitant to adopt. Therefore, this study aims at identifying the critical factors affecting the implementation of green buildings in India. For this purpose, an extensive literature review was done to identify factors affecting the implementation of green buildings. In total 27 factors were identified which may be critical for the adoption of green building technology widely in an Indian context. The questionnaire was prepared using the five-point Likert scale. The questionnaire was sent through emails to 150 consultants in India and 52 valid responses received in return. The primary data is analyzed using factor analysis. The critical factors found are time and knowledge constraints; technical constraints; authenticity of research and awareness about Green Building. Though the findings of this study are based on the small sample size, it will be beneficial to the policymakers to draft necessary strategies to promote green buildings in India.

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ADVANCED ARCHITECTURE BUILDING TECHNOLOGIES

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ABSTRACT

In this paper I want to clear why we should have a green house and the most important company in the word who works in this domain and the importance of owning a (BUILT GREEN) home, there will be many benefits that you can enjoy, including improved home value and preservation; Increase home durability and lower utility costs, plus you live in a healthier home with better ventilation and fewer air allergens than low or no VOCs, low or formaldehyde-free building materials, and certified floor coverings. They all contribute to a healthy indoor environment for you and your family — you can expect to breathe easily, and the severity of asthma and allergies in these homes is much lower. That is why you also contribute to a healthier outdoor environment because (BUILT GREEN) homes produce less gas emissions than a greenhouse by requiring less energy to operate and less waste. Thus, the owner of a greenhouse (BUILT GREEN) is more comfortable. The rooms are airtight, the windows are triple-glazed, and the ventilation is better. And greatly reduce the sound from an external source.

MODELLING AND EVALUATION OF THE SEISMIC CAPACITY OF TYPICAL BRICK URM BUILDINGS OF THE HISTORICAL CENTER OF CUENCA-ECUADOR

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ABSTRACT

The Historic Center of Cuenca (HCC) is located in the southern region of Ecuador. It is well known that our country is located on the so-called belt of fire of the Pacific Ocean, this area is characterized by having generated the most important seismic events in the history of mankind. More specifically, there are records that show that in the last 200 years the city of Cuenca has been exposed to earthquakes that have produced moderate to severe damage. These reasons make it possible to establish that the city of Cuenca and specifically its historic center could present important problems in the face of significant seismic events. Most of the buildings in the HCC date back to the middle of the 20th century and have used unreinforced brick masonry (brick-URM) to build their walls. This work is part of the Seismic Vulnerability Project: Seismic Damage Scenarios of the Built Heritage of the Historic Center of Cuenca. In the context of this vulnerability project, the objective of this work was to establish a family of pushover curves for three unreinforced brick masonry buildings typical of the HCC, based on a parametric pushover analysis. The definition of the typical buildings was based on an extensive work of architectural and geometric characterization of the traditional built heritage of HCC. On the basis of focusing the study on two-story buildings (the most common), the size of the floor area of the buildings (small, medium and large area) was assumed as a base parameter. Based on an analysis of the variability of different geometric and mechanical characteristics, and in order to study their influence on the pushover curves of the three typical brick URM buildings, the following study parameters were defined: 1) compressive strength of brick masonry y 2) wall thickness. The pushover analysis was carried out with the Ruaumoko program. The model of the buildings responds to an equivalent portal frame macro-model scheme that has been formulated and validated by the authors of this paper. The results will be discussed in terms of the incidence of the variability of the study parameters on the basic characteristics of the pushover curves. These results will be an essential input for the next stage of the project consisting of damage estimation for different levels of seismic action expected in the city.

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A THERMOPHYSICAL ANALYSIS OF HIGH-PERFORMANCE CONCRETE FOR AN INNOVATIVE SWIMMING POOL SOLUTION

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ABSTRACT

Concrete is the material most often used when it comes to the construction of swimming pools. The efficient use of energy in swimming pools can bring benefits such the reduction of energy consumption and the increase of the comfort of users, Therefore, it is important to develop and implement more energy efficient swimming pool construction materials and solutions. In the present work, the thermophysical properties of different concrete mixtures to be used in an innovative swimming pool construction system are experimentally determined. The swimming pool solution, which is the focus of the research project MC-Pool - Modular Concrete Pool, is composed of two prefabricated walls (pre-walls), made of a highly compact and durable pre-cast concrete, and a central core filled with a lightweight concrete cast in situ. Different thermophysical properties, such as thermal conductivity, volumetric heat capacity and thermal diffusivity, are experimentally determined for several concrete compositions. The influence of density and moisture content on thermophysical properties is assessed. It was observed that an increase in material density and moisture content has negative implications on the thermal performance of materials. The introduction of lightweight aggregates with the corresponding reduction in density allowed a thermal conductivity decrease of up to 45% with respect to a normal weight aggregate reference concrete with a high potential to be used in the core of the developed swimming pool system.

This research work is co-financed by the European Regional Development Fund (ERDF), through the partnership agreement Portugal2020 - Operational Programme for Competitiveness and Internationalisation (COMPETE2020), under the project POCI-01-0247-FEDER-033534 MC-Pool: Modular Concrete Pool.

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THERMAL AND ENERGY SIMULATION STUDY OF AN INNOVATIVE SWIMMING POOL CONSTRUCTION SOLUTION

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ABSTRACT

The construction of in-ground swimming pools placed outdoors, for both private and public use, is quite common in South European countries, with warm and dry summers. In general, swimming pools are either entirely prefabricated with light materials, such as plastic or fiberglass, which are directly installed on site, or they are entirely built on site, with reinforced concrete being the material commonly used in these cases. The present work is part of the MC-Pool - Modular Concrete Pool project, which intends to build a swimming pool system with different characteristics from those available in the market. This project proposes to develop an in-ground swimming pool installed outdoors partly prefabricated and partly executed on site. The proposed system consists of prefabricated modules composed of two concrete layers – pre-walls - that are assembled together and connected to the bottom slab with a central core of concrete cast on site. Different concrete compositions were considered for both pre-walls and core solution. The present paper aims to assess the thermal and energy performance of the developed MC-Pool system. A numerical simulation study was carried out using THERM software. It was possible to predict the temperature distribution and heat fluxes and to assess the thermal and energy performance for the developed system for different concrete compositions and thicknesses. Moreover, the performance was evaluated during both winter and summer conditions. This study revealed that the incorporation of lightweight aggregates in the swimming pool concrete walls benefits the thermal and energy performance. Maximum reductions in heat flux through the walls of 40% and in water heating energy of about 5.8% in the winter condition and 3.8% in the summer condition, have been obtained compared with ordinary concrete.

This work is co-financed by the European Regional Development Fund (ERDF), through the partnership agreement Portugal2020 - Operational Programme for Competitiveness and Internationalisation (COMPETE2020), under the project POCI-01-0247-FEDER-033534 MC-Pool: Modular Concrete Pool.

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ASSESSING PUBLIC PERCEPTIONS AND PREFERENCES FOR RURAL MICRO-REGENERATION STRATEGIES IN TRADITIONAL VILLAGES DEVELOPMENT: A CASE IN SOUTH CHINA

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ABSTRACT

Traditional village and rural cultural landscapes are continually threatened by cultural and societal losses due to the increasing presence of industrialization and urbanization. For the majority of China's remaining traditional villages, limited investments and other budgetary barriers prevent adequate rural renewal. Micro-regeneration is a gradual renewal strategy that uses small-scale intervention to improve the quality of the living environment, and local community and industry development. It became a potential economic rural renewal approach for traditional village conservation and development because of the small-scale interventions. We explored the potential of promoting micro-regeneration strategies based on assessing public perception and preferences in an "unlisted" traditional village in China (with limited investment for conservation comparing "listed" famous traditional villages). Our study explored the rural micro-regeneration strategies that result in both the industrial and transformational development of rural traditional villages, based on an assessment of local resident perceptions and preferences. We used a quantitative analysis and multiple regressions derived from research in Huangshan traditional village, Yiwu, Zhengjiang Province, China. Our quantitative analysis identified that a spatial, pattern-based map that outlines resident perceptions and preferences could ultimately contribute to the selection intervention pathways that result in the restoration of historical buildings, specifically during the development of rural micro-regeneration strategies. Our assessment results further indicate that income significantly affects residents' perceptions of, and preferences for, village transformation including their restoration plan, method, demands for functional improvement and enhancing public infrastructures, And the majority of residents expressed stronger perceptions on traffic conditions improvement and restore old buildings on their own, with the village committee simply investing funds toward the improvement of public spaces. We conclude our study by offering researched recommendations for positive rural micro-regeneration practices.

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BUILDING CLIAMTE-ADAPTION CITY THROUGH MUTIPLE SCALE COOPERATION: EXPERINCES FROM COPENHAGEN

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ABSTRACT

Climate change has become an important factor affecting global sustainable development. Therefore, the disaster risk brought by climate change also poses new challenges to urban planning. The establishment of a climate-adapted city that effectively responds to climate change will become an important topic of urban planning. The climate change adapted city is one that is prepared for existing and future climate impacts through improving resilience of city, thereby limiting their magnitude and severity.However, in many cities, the organizational capacity of multiple stakeholders in various level required to combineclimate adaption with further sustainability targets may not be available.As European green capitals, Copenhagen has implemented a series of climate change adaptation policies and initiatives for ten years.Under the background, we overviewed climate adaption stragties of Copenhagen based on documents analysis and key stakeholder interviews. The paper accounts for the building of climate adapted city in Copenhagen, and explores how the city strategically meta-govern the boundaries between the expert governed large-scale water management scheme against small-scale place-based bottom-up projects in collaboration with citizens and other place-based stakeholders. Our study reveals that climate adaptation plans in new urban planning for storm water management open up new possibilities for cooperation with multiple stakeholders and climate adaptation projects are developed in a multilevel governance. Further more, we summarizes the experiences of building climate adaptation city in Copenhagen, which refers to adequate data preparation in the early stage and rigorous planning, well- integration of storm water management design & landscape design of urban space coordination of various stakeholder's interest and public participation.

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HYPOTHESES OF URBAN REGENERATION. SMALL TOWNS IN THE VENETO REGION, ITALY

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ABSTRACT

This work considers the small towns of the Veneto region, Italy, as a case study, concentrating analysis and proposals for a new urban design on areas that has been affected by a rapid post 2nd world war reconstruction and by following building speculation, thus losing their organic unity with the surrounding parts. The violence that often characterizes the insertion in the twentieth century of disproportionate volumes into the urban fabric inherited from the medieval culture and enriched by Renaissance masterpieces is easily recognizable. This is the reason why a lower standard of living is now perceived, if we accept the idea that standard of living is proportionated to the level of culture expressed by the context. The methodology looks at the town as a result of its spatial structure. More than political, social, and economic systems, reasons for its special nature can be found because of its constancy. Planning new buildings starts from understanding the context, that is, its physical structure. The method adopted is based on studying the history of the place to understand the urban morphology of it. The physical specificity of the urban form is explored with the aim of elaborating a design process to reinforce the public space as a reference point for the community. The spatial aspects and formal image of the transformations have been studied as a premise for the design of the new architecture that has developed because of necessity and the events that have occurred in the territory. Intervening through a process of urban redevelopment inside the city involves measuring according to the values that have become rooted in the areas with the passage of time. Good regeneration practice must not leave recovering the old together with its values out of consideration. This point of view leads us to consider that urbanism as a group of skills and bureaucratic apparatuses must occupy itself with the city and above all with its formal structure rather than be occupied so much with the contents of the legal, financial-economic, and administrative order.

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FORM THE PANDEMIC AGORAPHOBIA TO NEW ECOLOGIES OF LIVING

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ABSTRACT

As we are approaching the post-pandemic reality for our communities, the anxiety of the urban cannot be disregarded. The unsettling qualities of urban centers have become more fragmented, distrustful, divided, and uncanny. The city epicenter is transformed to areas of epidemic and defensive territories that have turned existing divisions into large voids. Public space is not as free as we would have anticipated. This is a new form of agoraphobia. If the center is to be feared and physicality is measured in terms of distance there is no other escape than suburbia. The common typology of a public space needs to be re-imagined. There is a desire to create better common spaces. The 'city of chunks', of monumental urbanisms and other modernists fantasies is now moving to the periphery. It is where the new center will be found: the landscape, the park, the mall, and the hospital garden. This allows the satellite city to become a destination for health recovery and isolation. The city may again resemble a factory but for healthy living. There is no diversity. Social space turns into a fetishized abstraction. The cathartic imagery allows for a hygienic lifestyle away from the distractions and filthiness of the modern urban life and congested public spaces but with a new imagery of lazy lifestyles and well-behaved residents. But the escape to suburbia brings a new and emerging material set of codes: from the aging tactility of the traditional center to the pastiche materiality of the periphery. Yet this is where nature and ecosystems offer new experiments, explorations and innovative technologies. Performative materials, architecture that adapts and the environment as an agent is where the new experimentation will take place; architecture thus becomes part of complex systems of ecology, chemistry, and biology. This materiality is made by hybrid objects, both synthetic and natural. This method involves an environmental understanding and sustainability. Only after then reclaiming large and arid areas and weaving the outer periphery of the landscape, the park, the mall and the hospital become new expressions, centers and common spaces. The new dichotomy of the urban/rural may yet offer the best chance and opportunity to reconsider to re-think about our communities. Furthermore, it is time for our gathered knowledge to have an impact on social and climate change, an emerging collectivism and design solutions for enhancing health and well-being.

URBAN PERIMETERS ISSUES IN LOW-DENSITY AREAS: INTERIOR OF PORTUGAL

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ABSTRACT

Since the 1970s, there has been a concern to preserve the territory to ensure the correct and orderly expansion of urban perimeters due to the urban development actions of private initiative that have occurred in Portugal. Urban spaces corresponding to cities, towns or villages should be contained within urban perimeters intended for building and urbanization. Nowadays, the concept of urban perimeter is defined as the closed polygonal line that delimits a continuous portion of territory classified as urban land-use. The territorial plans limit the urban land-use which is totally or partially urbanized or built and which is intended for urbanization or building purposes. The municipal experience with the Municipal Master Plans (MMP), essentially those since the 1990s, known ed as the 1st generation, has been showing ambiguity in the enforcement of criteria in the delimitation of urban perimeters. These were delimited with gaps in terms of the principles of economic or financial sustainability, plus the absence of adequate digital methods. Among the causes for these gaps there is the speculating of the value of the lands, and, consequently, the urban speculation. In this context, this article will exemplify the associated gaps with the delimitation of urban perimeters from the 1st generation of MMP which created sprawled urban spaces. This plan was expected to be an instrument for the consolidation of urban perimeters, thus ensuring urban continuity. Although this goal was not always achieved. Regarding low-density territories which are places of a greater propensity to urban sprawl, the previously mentioned issues are even more serious. In this sense, this study focuses on seven low-density counties in the interior of the country where financial resources are scarce when compared to municipalities on the coastline or metropolitan areas. The cases of Almeida, Belmonte, Celorico da Beira, Figueira de Castelo Rodrigo, Meda, Pinhel and Trancoso, are all classified as low-density territories and still maintain the 1st version of master plan. Therefore, the study presents the referred cases where demographic and economic cycles are recessive. All of them have in common over-dimensioned urban perimeters with fragmented and low levels of urbanization and building execution. Even though they have all followed particular methodologies in order to identify the limits of urban perimeters of their territories, in all of them this process has occurred without principles nor rules, such as the verification of the existent infrastructures, the topographic mapping or ecological sensitive areas inappropriate to build. The conclusions have shown that low density territories reveal greater sensitivity to urban dispersion. Associated with economic and financial factors, demographic, social dynamics, and social values are promoted.

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SUSTAINABLE CITY FORMS

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ABSTRACT

Twenty first century characterises with approach of sustainability in different scales of spatial planning. During the pandemic in 2020 and 2021 more and more attention has been paid on health and well-being of population. Remembering that two thirds of all European population live in cities the theme of sustainability of living environment became even more important following SDG 11 “Sustainable Cities and Communities”. People in the cities more often seek for possibility to spend time outdoors, preferably in nature. It has become the important issue not only for individuals but also for governors of local municipalities and big cities providing such opportunity for their inhabitants. In order to find the best possible solution for development of urban environment it is important to know what are the choices available and best practise realized in spatial planning sustainability context. During the last five decades and even earlier different researchers and city planners have been defining possible city forms to ensure sustainability and well-being of todays and next generations. The purpose of research paper is to show the variety of sustainable city forms outlined in research papers and formed by collaboration of progressive cities. To strengthen the importance of new approaches in city planning, there are examples of the best practise of some European counties following SDGs in spatial planning of their territories showed. The analysis of situation in different countries clarifies that development of green infrastructure, use of local resources and support of local initiatives are the best approaches for any place to reach the sustainability because fulfilling the needs of local inhabitants for qualitative outdoors results in better life not only for locals, it plays also important role for forming good image of municipality and country increasing sense of proud of such place. City municipalities need to put more effort for developing sustainable communities providing healthy and attractive living environment for local and even new inhabitants in place where living, work and recreation are in balance with nature.

RESILIENCE IN FRAGILE CENTRAL ITALY: ENTERPRISE EXPOSURE TO EARTHQUAKE AND LANDSLIDES

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ABSTRACT

The multi-risk condition has challenged the survival of Central Italy's Apennine civilization. The economic crisis in 2008, the seismic events in 2009, 2016, and 2017 and finally, the current pandemic crisis have compromised the urban framework and infrastructure networks, fragmented communities, depowered the already fragile local economies. The case study is the Crater Area (made by 138 municipalities) in severe social and economic distress that, to return to job creation and wealth, must regain the ability to compete in a safe environment. The paper focuses on seismic and landslide hazards to assess the enterprises' exposure in Central Italy through a spatial analysis of companies' location and multi-hazard conditions. The goal is twofold: i) to increase risk awareness by disseminating information about hazardous conditions in which businesses have continuously operated; ii) to arrange a working method to develop 'preventive planning' that reduces disaster risk and increases the resilience of fragile territories. The research combined information from different databases. The AIDA database (by Bureau van Dijk) on businesses in the Crater Area (data 2021); the seismic hazard areas defined by the National Institute of Geophysics and Volcanology (INGV) in 2006; and the landslide hazard areas defined by the Superior Institute for Environmental Protection and Research (ISPRA) in 2017. Working with GIS tools, the spatial analysis had interesting results to identify headquarters and place of business for over 15,000 companies. Moreover, the study is relevant for recognizing which economic sectors are most exposed to landslides and earthquakes. For each economic sector (agriculture, manufacturing, commerce, real estate, etc.), the analysis highlighted the exposure of working capital, human capital, and fixed capital (goods, buildings, and equipment). The information gathered is handy for urban planning. Overcoming the 'tyranny of urgency', i.e., the overwhelming pressure to act quickly, urban planning must support enhancing the resilience of communities and economic activities. The analysis results can help the 'preventive planning' for Disaster Risk Reduction (DRR) defining priority orders of intervention to increase territorial safety in peacetime. Following this approach, information about companies' exposure helps policymakers plan land use and design guidelines. For instance, they should relocate manufacturing properties, de-seal impermeable soils by reducing the vulnerability of production areas, what infrastructures or services improve, where priority action should be taken to consolidate slopes protecting equipment and assets that cannot be relocated elsewhere. The 'preventive planning' that considers the characteristics and needs of companies can better guide the process of ecological transition required both at national and European level. Spatial planning can guide the interventions of infrastructure rehabilitation and consolidation of the natural landscape. Spatial planning should direct the investments made available by the Next Generation EU program, helping to boost economic and social development along with environmental sustainability, digitalization and technological innovation, social inclusion, and territorial cohesion.

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IMPULSE DEVELOPMENT OF CITIES CAUSED BY THE RANGE OF CERTAIN INFRASTRUCTURAL FACTORS. FORMS AND EXPERIENCE

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ABSTRACT

The issue of impulse development of cities caused by different infrastructural factors is considered. It has been determined that rapid development of urban planning structure which occurred over a short period of time can be viewed as an effective urban planning impulse, with the exception of the following conditions, when they: a) did not lead to sustainable results, b) did not solve the basic problems of life support; c) originated from the modernist legacy of total urban planning, which considered the possibility of creating a large urban structure from scratch, based on a one-time master plan). According to the history of their development, urban structures fall into two major categories: evolutionary and impulse-based. Evolutionary category includes the cities which have developed gradually, without any significant spurts from the original core, through the long-term accumulation of complications. While the cities, which fall into the impulse-based category are characterized by a stage of sharp acceleration of development or a kind of a growth spurt, followed by either stabilization or a relative slowdown. Given the task set in this study, this category of the cities was selected as the object of further consideration.
Based on the analysis of the source base, four basic factors of historical urban planning have been outlined, which can be considered as impulse factors in the form of clearly expressed changes - infrastructural, demographic, economic, myth-making. Taking Tenochtitlan, Stockholm and Alexandria as the example, the content and functional structure of infrastructural impulse changes have been outlined. By these we mean rethinking of life support systems, which leads to sharp population growth and employment diversification. To become a 'growth spurt' factor, such changes must contain a number of special qualities: convenience, accessibility and uniqueness. Convenience is the difference in the use of infrastructural benefits between the locality in which the impulse change takes place and other similar cities. Accessibility means the ability to use (access) the infrastructural benefits by as many residents as possible. While uniqueness stands for a feature or set of infrastructure features that are notably absent in the cities of the competing area.

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FIELD PERFORMANCE AND RAPID REPAIR METHOD OF AN AIRFIELD PAVEMENT UNDER THE BLAST LOAD OF CLUSTER BOMB UNIT

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ABSTRACT

This paper discusses a field test of airfield pavement under cluster bomb unit (CBU) blast load and a study of repair method upon the examination of the damage geometry. Cluster bomb unit blast load shows a similar level to that of a typically known air-to-ground munition, and the penetration depth was calculated using empirical formulae with terminal velocity during a free fall following an explosion and dispersion 20km above the ground. Based on the calculations, the field test was executed assuming a cluster bomb unit penetration depth of 33cm for concrete pavement surface. The concrete slab on the test site was casted in a circular shape at the field and then cured. This slab was an unreinforced concrete structure with a similar compressive strength and thickness as that of airfield pavement currently in use. The test reflected the cluster munition penetration depth of 33cm, and the concrete slab was drilled in the center and explosive with a weight resembling that of the cluster munition installed. As results of the blast test show a damage to the pavement expanded the crater to a depth of 78cm, down to the crushed stone layer and with a diameter of 30cm. The concrete fragmentation requiring removal was of about 156cm in radius on average. The 7 tensile cracks across the pavement were not so heavily damaged to require removal. Cutting and removing the crushed concrete slab with dimension of 1.8m × 1.8m, compacting the disturbed crushed stone layer and repairing the concrete slab section using ultra-rapid hardening concrete are reviewed the appropriate repair method based on the above results.

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RIVER AND CULTURAL LANDSCAPES OF WATER: THE ITALIAN TOOLS OF RIVER CONTRACTS TO DEVELOP STRATEGIC LANDSCAPE PLANNING SCENARIOS

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ABSTRACT

Correct planning and management of river basins, combined with effective water protection action, in Italy, has become one of the priority issues in consideration of the now evident and increasingly serious effects of climate change, with consequent economic, environmental and of human lives. The intensive use of water resources has had negative consequences on their environmental quality. Global warming, following the worsening of extreme weather events, is aggravating already critical situations in some areas with an increase in the frequency and intensity of floods, or, on the contrary, drought, with a reduction in the quality and availability of water and of eco-systemic services, which is leading some areas of Italy towards phenomena of desertification. Thus the flood events that have affected Italy, in recent years, have increased the vulnerability of many hydrographic basins that have become fragile ecosystems, a situation aggravated by landscape contexts suffering from excessive overbuilding of the territories, inadequate maintenance, with negative consequences on quality and availability of water and severe impacts on natural habitats. For these river landscapes it is necessary to adopt an integrated approach, going beyond the sectoral, mono-specialist one, with a governance of water and soils based on close coordination between the various policies and on participation, promoting dialogue and collaboration with communities and stakeholders with interest. It is therefore necessary to encourage bottom-up processes to improve knowledge of critical issues and the choice of the best solutions and to promote greater awareness of the value of water resources. In this sense, the River Contracts, voluntary instruments of negotiated and participatory planning, aimed at containing the eco-landscape degradation and the requalification of hydrographic basins and sub-basins, provide a decisive contribution; like any participatory tool that presupposes the collaboration and sharing of intentions between various public and private subjects, and considerable advantages, environmental, economic, knowledge and, from the final results, which, due to the very nature of the strategic planning process on which the River Contracts are based, they will be profitable and lasting over time. The paper intends to describe the instrument of River Contracts and report on the state of adoption and implementation in Italy. From the examination of the experiences in progress, new perspectives are opened for the governance of river landscapes.

GEOSPATIAL TECHNOLOGIES FOR SMART CITIES: PLANNING AND INTER-ETHNIC MANAGEMENT

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ABSTRACT

In Italy, as part of the National Strategy for Sustainable Development (SNSvS), both the Regions and the Metropolitan Cities, as well as cities and local communities are developing strategies and plans to commit to the Sustainable Development Goals (SDGs) established by the UN 2030 Agenda. for sustainable development. In this regard, the impacts that migratory pressure exerts on urban areas deserves to be investigated. Geospatial technologies with satellite images offer a remarkable spectrum of investigation that allows us to take into account the predictive possibilities that these technologies are able to offer. Copernicus, a community program that guarantees the EU constant and independent access to the wide range of information acquired from satellite observation, contributes to increasing awareness (and control) of migratory movements. The paper intends to show the potential of geospatial technologies for the creation of increasingly smart cities. From satellite data to cartographic themes, these technologies are very important for the governance of urban transformations as an aid to decision making, to create more environmentally sustainable and inclusive cities. Some cities located in South of Italy, affected by large migratory flows, are examined where the experimentation was conducted with the use of high-definition images of Copernicus that zoom in on emergency situations allowing to identify the impacts of the presence of migrants on the environment and to define strategies for mitigating the impacts for achieve the Sustainable Development Goals (SDGs).

COMPARISON OF TWO MEMBRANE STRUCTURES WITH DIFFERENT STIFFNESSES

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ABSTRACT

The aim of this paper is to compare and evaluate the results of the natural vibration obtained by numerical analysis. Technical textile, thus membrane is the main element of the researched structure. The membrane stabilized by the shape of a hyperbolic paraboloid and the edge stainless steel ropes were in the first case modelled with general articulated supports and in the other case, it was supplemented by a boundary condition in the form of the steel frame presenting the real device. The reason for completing the model with the steel frame was to obtain real observed characteristics, which are expected to be affected by changes in the stiffness. Modal analysis was performed on both models as the analysis of the mode shapes and natural frequencies. For the purpose to compare the results, the FEM software Dlubal was used with help of an add-on module, focused on the dynamic analysis, called RF-DYNAM Pro. The calculation assumed one mass state of dead-weight, 10 mode shapes, and specific conditions suitable for membrane structures, including the stiffness of the membrane after form-finding (which is an important step related specifically to membrane structures). Modal analysis is one of the first steps in the analysis of dynamic behaviour. In addition to the natural vibration, it is necessary to subsequently solve the forced vibration, which is significant for the global assessment of the structure. In the end, to verify the obtained numerical values, the last important step is to perform a dynamic analysis on the experimental device presenting the model mentioned above.

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AN UPDATED PICTURE OF TARGET 11.1 AND 11.3: PATHWAYS OF IMPLEMENTATION IN THE LIGHT OF COVID-19

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ABSTRACT

What has changed in the concept of resilient/sustainable cities and human settlements with Covid-19? When we talk about "adequate housing and basic services" today, do we have in mind the same housing and services we were thinking about before the pandemic? Nowadays, what indicators do we need to develop and monitor sustainable urban policies? The paper seeks to answer these questions by focusing on some dimensions of Sustainable Development Goal 11 (SDG 11) linked to sustainability in the urban environment: accessibility to adequate housing and basic services (with reference to target 11.1, Affordable housing), land consumption and direct participation in urban planning (both dimensions in reference to target 11.3, Inclusive and Sustainable Urbanization). The objective of this paper is twofold: first, an updated picture of the indicators used to monitor target 11.1 and 11.3 to global, European and national level, in Italy is explored; second, assuming a field of analysis limited to a single European country (Italy), we identify some gaps in the existing monitoring according to sustainable issues emerging during the pandemic and scaling-up issues at urban and suburban level, proposing three potential pathways of innovation and implementation of the existing indicators framework. In this sense, the paper proposes a detailed state of the art of the measurement of the aforementioned targets, punctually investigating the concepts at the basis of the existing indicators, the methodologies used for the quantification of the indicators themselves and the different declinations according to the global, European and Italian national scale of reference, providing a complete synthesis framework useful and necessary to open a review of these issues. In line with the aim, the different pathways for the development and implementation of the new indicators are proposed contextually to the Piedmont region and, in particular, to the city of Turin and its metropolitan area.

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HYBRID RENEWABLE TRIGENERATION SYSTEMS INCLUDING SEASONAL BOREHOLE THERMAL ENERGY STORAGES: DYNAMIC PERFORMANCE ASSESSMENT OF 10 ITALIAN CASE STUDIES UPON VARYING CLIMATIC CONDITIONS AND UNDERGROUND PROPERTIES

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ABSTRACT

Solar energy is considered one of the most competitive choices able to address the increasingly serious impacts of climate change. One of the barriers to solar energy deployment for heating purposes relates to the misalignment of solar energy availability with respect to heating requirements; seasonal or long-term thermal energy storages allow for thermal energy storage over weeks and months, with it being a viable solution to overcome this temporal mismatch. In this paper, hybrid renewable trigeneration systems, integrated with seasonal borehole thermal energy storages, have been modelled, simulated and analysed while satisfying thermal, cooling, electric demands of 10 different existing small districts located into the 5 different provinces of the Campania region (southern Italy). The simulations have been carried out by means of the software TRNSYS over a 5-year period; detailed dynamic models validated versus literature and/or experimental data have been selected. The novel proposed plants mainly consist of solar thermal collectors coupled with a seasonal borehole thermal energy storage; the solar field is also integrated with photovoltaic panels coupled with a lithium-ion battery; a solar-powered water-silica gel adsorption system is used for covering the cooling requirements; a wood pellet auxiliary heater is adopted to supplement the solar source. For each province of the Campania region, two different existing small districts have been considered: the first one consisting of school buildings only, the second one composed of residential buildings only. Specific weather data files have been developed for each location based on 1-year in-situ hourly measurements in order to accurately take into account the influence of meteorological conditions on energy demands and system performance; the effects of thermo-physical properties of underground (affecting the operation of the seasonal storage) have also been taken into consideration depending on the location and according to measured data available in the scientific literature. The novel proposed plants have been compared from energy, environmental and economic points of view with conventional Italian heating and cooling systems assumed as reference in order to assess the potential savings, highlight the effects of both meteorological data and properties of underground, as well as promote the diffusion of solar applications in the south of Italy. The simulation results highlighted that the novel proposed systems are able to achieve a reduction of more than 50% in terms of primary energy consumption, equivalent CO_2 global emissions and operating costs with respect to the reference plants.

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VIRTUAL WORLD - VIRTUAL ARCHITECTURE?

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ABSTRACT

The current difficult situation in connection with the pandemic is forcing us to limit real social contacts and at the same time to turn deeper and deeper into artificial - mediated communication using digital media by escaping into the isolated inner worlds of the mind. This tendency is accentuated by the increased interest in computer games, the essential background of which is their environment - including architecture. It emerges as a new kind - virtual buildings (environment), which from the beginning does not have the ambition to be a material building, but is a purely visual construct, composed on the psychological needs of the subject. Contemporary video games depict very different environments - from prehistoric to historical to cosmic, from rational to existential, from mythical to transcendental - similar to other types of art, but on a large scale commercial products. Are there any common internal constants of human mind that are externally manifested by the constant return of essentially unchanging deep themes in various contemporary updates? Can there be such a thing as a digital simulator to verify the emotional effectiveness of a virtual architecture? The virtual architecture (as an environment) of games is actually a cross-section of the inner worlds of its users, which is thus very different from the real utilitarian architecture of everyday life. To examine these phenomena, we have formed a team of experts, which includes, in addition to architects and visual artists, also an psychologist, neurologist and expert in cognitive sciences and artificial intelligence. Its task is to carry out an experiment with volunteers using the device for neurofeedback - TruScan LT device in combination with Oculus Quest 2 with glasses. Colors, lights, scenes etc. are scanned by the EEG signal of the brain. The basic questions we are trying to answer are the following: 1. virtuality as a simulator for testing the most emotionally effective visual aids - experimental measurement of their effect, 2. virtuality as psychoanalysis - for unreacting of internal stresses of states of mind - reflection of (unresolved) problems of the inner world, pictorial - visual materialization of unconscious existential feelings, 3. virtuality as an expression of the type of inner feeling of experiencing the world - the inner imaginary world projected into the outer visual forms. Unfortunately, the current pandemic situation has made it impossible to carry out the experiment, but similar studies carried out in other artistic fields also show the impetus for reflection in the indicated direction. An attempt to outline that problem is the subject of this paper.

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SOCIAL SPACES OF SHOPPING MALLS: TYPOLOGY

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ABSTRACT

Under the current COVID-19 pandemic circumstances, the quarantine measures have been introduced in most European countries since March 2020. These measures are related to the prohibition of certain activities, including the operation of shopping and entertainment establishments, except for establishments selling essential goods. Under such conditions shopping malls suffered significant economic losses. As a result of the lockdown, no new shopping malls appeared in Ukraine in the first quarter of 2020. However, since the easing of quarantine measures and the invention of the COVID-19 vaccine, interest in malls as commercial real estate has grown again in Europe and particularly in Ukraine. According to the Cushman & Wakefield's April 2020 Report, between 2020 and 2022 it is planned to open six new malls in Kyiv and at least eleven new malls in other regions of Ukraine. Given such a new round of active shopping malls development in Ukraine, in-depth study of this building type is becoming more important than ever, especially the one focusing on malls' structural elements such as social space – a link between all the mall's functional content parts. The article analyzes 16 malls located in different countries in Europe, with different sizes and planning layouts. During the previous studies we divided the mall's social space into two groups of elements: linear and point ones. Linear ones include the main and side malls, while point ones include central and anchor courts: a. central court – court at the crossroads of main malls; b. anchor court – court located in correspondence to the location of the functional element of mall performing the anchor function; c. main mall – mall between two anchors, or between the main mall and an anchor; d. side mall – mall that is not connected to any certain anchor. We used "Archicad" software to determine the conditional area occupied by social space of the mall on the floor schemes to get the proportions of structural elements. The conditional area of each of the structural elements was determined in the same schemes, thus maintaining the proportional relationship between the dimensions. The conditional area of the social space is taken as 100%, hence we determine the percentage occupied by each of the elements. Using the above principle of comparison, we can distinguish three types of social space by the prevailing element: linear type, court type and mixed type. The developed classification reflects the proportional ratio of point and linear elements in malls' social spaces. This classification is intended to improve the analysis of existing malls for future research. It will be useful when designing new shopping malls and making recommendations for their design. Also, the results of the study can be incorporated into regulatory frameworks for the shopping malls design.

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SYSTEMS ANALYSIS OF SOCIAL SPACES OF SHOPPING MALLS FROM CUSTOMERS' POINT OF VIEW

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ABSTRACT

The initial needs of visitors of shopping malls mainly include buying goods, visiting establishments of various kinds, as well as using the offered services. These needs are met through rented premises. However, while sets of brands and establishments in many shopping malls are generally the same, their social spaces (the basis of the planning structure) are different. Consequently, it is the social space that often acts as an indicator of the entire mall quality. To create a quality social space, it is necessary to determine all customers' needs, not only physical but also psychological and social ones. In addition to specific dimensions, planning solutions, and functional content of social spaces, there are several quality criteria that provide usability, psychological comfort and promote socialization and communication in the environment. Design psychology is currently one of the most popular trends in modern design, which is based on communication between people and their connection with their either built or natural space. Like Maslow's pyramid of needs, proponents of this trend developed the Pyramid of Design Psychology. In Maslow's pyramid, self-realization is considered the highest level, the need for which arises after meeting all previous needs: physical, security, social, and the need for respect. The pyramid of design psychology also consists of five levels: space as a shelter, psychological needs, social needs, aesthetic needs, and space as means of self-realization. The paper provides a systems analysis of the shopping mall's social space functioning with the "black box" approach. According to this model, the main purpose of social space is to meet the needs of visitors at all five levels. In addition, external architectural and non-architectural factors are determined, and the means of influence are identified: architectural organization means. Thus, based on previous research, a detailed model of the "black box" of the social space system was built. In which, to meet all the needs of customers, and in accordance with the levels of design psychology needs, we formed five principles of building a shopping mall's social space: 1) the principle of ergonomics; 2) the principle of organicity; 3) the principle of social openness; 4) the principle of harmony; 5) the principle of "flexibility" and polyfunctionality. The research results can be used in the design of new and reconstruction of existing malls, as well as in further research on this topic.

THEORETICAL PROBLEMS OF THE 19th CENTURY ARCHITECTURE: CHOICE OF PROTOTYPE AND DICHOTOMY OF CREATIVITY

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ABSTRACT

New theoretical problems were formed in the architectural development of the 19th century: the problem of choosing a prototype of architectural style and the dichotomy of the design process. The aim of this article is to analyze these problems and identify their internal relationship and interdependence. The choice of prototype of architectural style in the architecture of the 19th century became extremely important, because it was the style that was entrusted with the function of visualizing the meaning of the building – the main representative goal of historicist architecture. The main prerequisite for the shaping of this problem was the need to articulate the representative function of architecture, which put in the forefront the moral, educational and ethical aspects of the architectural process (not utilitarian and not even aesthetic ones). The successful implementation of this function necessitated the development of an arsenal of tools by which the representation could be visualized. The main among them was the architectural style, or rather – the architectural forms of the past. Architectural forms of the past were endowed with certain moral and ethical values, and their reproduction in the actual design process meant the visualization of these values. The antithesis of the historicist approach in architectural activity is represented by the ideas of utilitarianism and pragmatism. It demonstrated the deep internal contradiction of the architecture of the 19th century: the contradiction between the newest construction of the building and its "historic clothing", which masked the innovative engineering solution. It led to an internal split (dichotomy) of the architectural process, which was divided into artistic and rational components. This rational-practical direction reflected the paradigm of determinism of the architectural style through material and technology, which was popular in the 19th century. Unlike the artistic direction, it focused on the transmission of exclusively utilitarian architectural meanings, without claiming ethical and moral values. Although the implementation of a rational approach took place with the involvement of forms of past architecture, programmatically it was anti-historicist tendency, the development of which led to the conceptualization of the paradigm of modernism. To sum up, the uniqueness of the situation in 19th century architecture was precisely that the implementation of artistic and rational directions of architectural development was based on a single methodological approach – on the choice of the architectural prototype in the past.

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NUMERICAL AND EXPERIMENTAL PROTECTIVE PERFORMANCE EVALUATION OF SACRIFICIAL MEMBER EFFECTS ON THE PROTECTIVE STRUCTURES

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ABSTRACT

Principal objectives of the protective design are on protecting life, property, facility, system device and operations by developing protective design measures that reduce threat level and vulnerability while enhancing structural resilience. Protective design procedure against blast hazard would be accomplished with the threat identification, risk-based assessment, and designing the members and structures based on the proper design requirements. Considerable necessity before the protective design is to find out the various measures reducing the blast effect such as security measures, architectural configuration, and mitigation schemes without any structural strengthening the structure itself. This paper addresses the mitigation scheme to reduce the blast overpressure in general, and then a specific barrier type is introduced as sacrificial structures with the performance verification. The general schemes to reduce the blast pressure by installing barriers is mainly using RC type structures which have typical shapes and sizes. This barrier type has advantages both on installing easiness and cost. In the barrier type sacrificial wall structure, instead of using the normal RC structures, enhanced-cement concrete and composites are useful to improve protective performance and scabbing of the back surface of the RC walls. A series of the wall type RC barriers are modeled and fabricated to investigate and verify blast pressure migration and protective performance based on theoretical and numerical analysis.

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SAFETY PERFORMANCE ENHANCEMENT SCHEME FOR MUNITION STORAGES BY APPLYING THE CONCEPT OF SHALLOW UNDERGROUND CONFIGURATIONS

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ABSTRACT

Practical demand for the expansion of military ammunition and explosives storage in both volume and number has been increased, but due to safety-distance regulations that require those facilities to be isolated from a civilian presence there are constant complications that arise. Recent incidents include petitions to either alleviate said regulations or relocate several ammunition storage facilities neighboring civilian areas are further development. Two types of underground ammunition storage facilities wold be considered in practice; the first is the tunnel-type which is applicable to areas that have sufficient depth of the cover and the latter is the sub-surface type that retains a sufficient depth of soli layer which can especially be utilized in areas that do not meet clearance requirements nor have geographical limitations. For the sub-surface type storage, there are two construction schemes for construction to meet safety-distance requirements. The existing popular ECMs (Earth Covered Magazines) have shallow soil cover for just plantation camouflage that is not affect the pressure suppression effect due to the internal explosion. Therefore, the scheme of the increasing soil cover depth to some amount, if applicable, pressure and fragment suppression can be achieved. The open-cut method for new construction is easily applied for this purpose in the field. This study addresses the safety distance reduction effect by increasing the soil cover depth on the ECM type storage facility by applying theoretical and numerical analysis.

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PROPOSAL OF SIMPLIFIED WAY OF APPLYING WIND LOAD ON CIRCULLAR CROSS-SECTION

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ABSTRACT

Wind action on circular cross section was described in many publications. It finds an application for flue gas ducts, pipelines, silo or chimneys. This study concentrates on elements with diameter greater than 1m. There are well recognized analytical solutions of static calculation with uses Fourier-series for wind distribution. Although during last 10years numerical methods of solving problems get more popular, especially among young engineers. For surface structure's ability of finding internal forces disappears, and Finish Element Method substitutes analytical calculation. Modelling of wind load in FEM programs cause several problems. Using wind load distribution proposed in Eurocode 1-4, or from laboratory test, it is usually necessary to divide circular cross-section into 32 up to 72 rectangular elements. Applying load in that way is the most accurate method to imitate wind load in FE model. From the other hand that take much time, and requires preparing data about distribution before modelling. Applying wind on complicated model, with many independent parts of piping, for at least 2 load cases cause faults and slows down work. This paper shows and compares a few proposal wind load models for numerical calculation. Those models were built to obtain accurate internal forces in compare to Eurocode procedure. Proposed models offers simplification of Geometry in numerical model, and saves of time. It also helps to make FE mesh become independent from structural nodes, lines or divisions. This paper concern on one case of one *Reynolds number*, with refers to 2m wide cylinder, wind velocity of 22m/s and surface roughness of steel plate – 0,05mm. This paper compares different wind load distributions, in terms of required number of division of model, time consuming, precision of results. Author selected one proposal load distribution, with give equivalent internal forces as wind load distribution obtained from Wind Flow simulation (for example CFD method). Proposed model is useful for structural engineers and statics in offer stage of project. With some safety factor it can be also used as wind load as case for detailing cylindrical structures.

DETERMINATION OF THE DEFORMED SHAPE OF A NATURAL STONE MASONRY WALL EXPOSED TO FIRE LOADING BY A HOMOGENIZATION METHOD

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ABSTRACT

In engineering practice, the reference text for the design of masonry structures in Europe is Eurocode 6. However, recommendations for the analysis and design of natural stone masonry walls are still missing. In this context, a preliminary experimental campaign has been carried out on two natural stone masonry walls, showing geometry changes of such structures in fire conditions. Indeed, when exposed to fire, a natural stone masonry wall is subjected to high thermal gradients through its thickness. Due to the thermal-induced deformations, such a structure exhibit out-of-plane displacements, which lead to an eccentricity of the vertical load. Consequently, bending moments are generated in the wall in addition to the pre-existing compressive axial force. These bending moments caused by the geometry change, combined with the fire-induced material properties degradation, may lead to the collapse of the structure. Based on a simplified 1D modelling of the problem, a calculation procedure for evaluating the deformed configuration of masonry walls exposed to fire, has recently been proposed. However, the main limitation of the previous approach lies in the fact that the thermo-mechanical characteristics of the mortar joints are assumed to be close to those of the natural stone blocks, so that the wall can be considered as being homogeneous. Consequently, such an approach may not provide reliable predictions for poorer quality mortars where the influence of the joints on the thermal induced change of geometry of the wall may be no longer negligible. The present contribution shows how it is possible to determine the homogenized thermo-elastic characteristics of a natural stone masonry wall, taking into account the material properties of stone and mortar as functions of temperature increase as well as the geometrical characteristics of their assembly. More precisely, joints are incorporated in the analysis through a numerical homogenization procedure. A 1D heat transfer analysis is firstly carried out in order to obtain the temperature distribution across the thickness of the wall. Then, a representative elementary cell of the heterogenous masonry wall is subjected to this temperature distribution, and to periodic in-plane and out-of-plane displacement boundary conditions . As a result, membrane and bending stiffness coefficients, as well as thermal-induced efforts, of an equivalent plate are obtained. Such homogenized thermo-mechanical characteristics make it possible to determine the deformed shape of the wall after a certain time of fire exposure. Thanks to the smaller size of the finite element model of the representative unit cell, the proposed homogenization method allows for performing parametric studies in a much quicker way than when using a fully 3D finite element model for the entire wall. As an example, the calculation procedure is performed on a particular configuration of infinitely wide wall, illustrating the influence of the joints on its thermal deformed shape. To assess the practical validity of this homogenization-based calculation procedure, results of the numerical homogenized model (incorporating joints) are compared to those of a homogeneous model (without joints), and to available experimental results obtained on a 3 m-high, 3 m-wide wall exposed to fire loading.

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ARCHITECTURAL DESIGN OF MODERN SMALL LECTURE HALL IN RELATION TO AIR CONDITIONING SYSTEM

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ABSTRACT

The paper is focused on architectural design of modern small lecture hall in relation to air conditioning system. Correct architectural design and design of air conditioning system is immensely important for students in the interiors of a university. Providing the optimal parameters of the thermal comfort in the interiors of a university is immensely important for the students. Meeting these parameters is inevitable not only from physiological point of view but also to achieve the desirable students' performance. Parameters of the thermal comfort are also influenced by air conditioning system in modern small university lecture hall. Correct design of air conditioning system parameters is very important. Experimental measurements of thermal comfort were carried out in the winter season in the modern small lecture hall of Vienna University of Economics and Business. The device Testo 480 was used for the measurements. Gained values of air temperature, air relative humidity, air velocity, globe temperature, indexes PMV and PPD are presented in the charts. Architectural design and modern air conditioning system of the small university lecture hall was evaluated on the basis of thermal comfort parameters. The paper concludes on how to create a harmony between architectural design and design of air conditioning system in the modern small lecture hall.

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INTERACTION BETWEEN ARCHITECTURAL DESIGN AND THERMAL COMFORT IN HIGH RESIDENTIAL BUILDING

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ABSTRACT

The paper is focused on interaction between architectural design and thermal comfort in high residential building. Providing the optimal parameters of thermal comfort in each room of flat is the basic prerequisite for the satisfaction with housing. Incorrect position and size of heating elements, incorrect positioning of furniture and incorrect use of residential interiors may significantly disturb thermal comfort. Residential areas in new residential buildings are much more intensively used as in other types of buildings. Surface of new flats is the most optimized. Experimental measurements were carried out in winter season in residential rooms of large flat in new high residential building. Device Testo 480 with temperature and humidity sensor, globe thermometer and turbulence sensor was used for the measurements. Obtained values of air temperature, air relative humidity, air velocity, globe temperature and indexes PMV, PPD are presented in the graphs. Heating system of flat and the possibility of its regulation, positioning and size of heating elements in individual rooms, positioning of furniture and utilization of rooms were evaluated on the basis of parameters of thermal comfort. In the conclusion of the paper are principles on architectural design of residential interiors and their heating in new residential buildings.

THE INFLUENCE OF AXIAL COMPRESSION AND MINOR AXIS BENDING ON THE BEHAVIOUR OF THIN-WALLED COLD-FORMED STEEL MEMBERS WITH OPEN CROSS-SECTIONS

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ABSTRACT

Thin-walled cold-formed steel elements represent an attractive structural solution due to the fast manufacturing and erection time on site. Their small thickness leads to imperfection and eccentricities sensitivities. An experimental program was performed on short members with lipped channel cross-section subjected to a compression force in a range of eccentricities between -60 mm and +60 mm. The nominal dimensions of the lipped channel cross-sections under investigation are $a \times b \times c \times t$ = 150×60×20×2 mm with and an internal radius r = 1.5 mm. The length of the columns was L = 450 mm. The specimens were manufactured on the folding machine. Before testing, the dimensions of all specimens were measured. The working tolerances of the linear dimensions were stated as ±1 mm, whereas the angular ones were about ±1º. Coupons were cut from the web and flanges of one specimen to perform material tensile tests. Based on those tests, the mean values of material properties were determined, i.e. yield stress f_y = 417 N/mm^2 and an ultimate strength f_u = 470 N/mm^2, with E = 210000 N/mm^2. Eccentric loads were applied to the specimens with the loading velocity of 1 mm/min. Shortening of all specimens was measured in two ways, i.e. (1) using the displacement gauge integrated with the machine crosshead beam and (2) from deformation fields obtained using Digital Image Correlation system (DIC). The DIC system allowed to measure not only shortening of the column but delivered the deformation field maps of the column walls as well. Besides the ultimate loads, the force displacement curves show post elastic response of the element. The quantitative results, presented as ultimate loads versus eccentricity curve, emphasize the influence of the eccentric load on the capacity of the element. Finite element analyses were performed based on material characteristic determined from tensile tests on specimens extracted from the channel section. The numerical models applied to simulate the behaviour of short members in eccentric compression have been built using the commercial FE software ABAQUS/CAE v.6.7.1. Rectangular 4-node shell elements with reduced integration (S4R) were used to model the thin-walled cold-formed steel members. The chosen mesh size for the shell elements was around 5×5 mm. Static non-linear analyses were carried out in displacement control. Both geometrical and material nonlinearities are included. An isotropic linearly elastic-perfectly plastic constitutive model was considered, with von Mises yielding criterion and associated flow rule. Due to the fabrication process, i.e. folding process, it was considered the presence of flexural residual stresses on the cold-formed steel section is negligible.

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FINITE ELEMENT ANALYSIS OF SHEETING CONNECTED OVERLAPPED Z-PURLINS

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ABSTRACT

Overlapping steel purlins over rafters ensures the continuity of the bending moment. A continuous beam with two equal spans of 6 m is investigated under gravity loading using the finite element method. The numerical model includes the beneficial interaction between the Z-purlins and the profiled sheeting. Finite element results show that the screw spacing and sheeting characteristics has a limited influence on the resistance of the studied cross-sections and connection. The effect of the overlapping length and detailing of the connection is studied through a parametric study. Seven overlaps varying from 100 mm to 1200 mm (1.6% to 20% of one span) capture the change of the failure mode from the overlap edge to the support region of the purlin. The connection detailing is studied considering multiple bolt/screw patterns. The detailing and length of the overlap connection has a major influence on the moment distribution of beam and consequently on the failure mode. The detailed finite element analysis shows that assuming the beam connection as continuous in 1D beam models lead to an unrealistic bending moment distribution and failure mode. Connecting the bottom flange using screws improves the overall load carrying capacity of the beam especially for short overlap lengths. The increase in resistance is attributed to the restraining effect on the free flange which fails due to distorsional buckling.

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INNOVATIVE LIGHTWEIGHT COLD-FORMED STEEL-CONCRETE COMPOSITE FLOOR SYSTEM – LWT-FLOOR PROJECT

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ABSTRACT

To provide the foundations for economic and social prosperity, countries all over the world need to be making a term investment in their building assets. However, there is a lack of a systematic approach, such as manufacturing innovations, to maximize the values of building components and materials in its entire lifecycle. Steel-concrete composite floor systems are one of the most cost-effective construction systems for multi-storey steel buildings because they combine structural efficiency with the speed of construction. These advantages depend on the efficiency of combining steel and concrete structural elements to avoid their inherent disadvantages. This paper presents a solution that integrates state-of-the-art knowledge in new, fast and productive spot-welding technology and innovative cold-formed steel-concrete composite solutions. The solution proposes a new construction method as a combination of built-up cold-formed steel members and cast-in-place concrete slab. The proposed floor system offers key benefits in terms of a high degree of prefabrication, reusability and long spanning capability. Corrugated web beams represent a relatively new structural element that has emerged in the past two decades and was developed for various applications, i.e. the main beams in single-storey steel frame buildings, secondary beams of multi-storey buildings, etc. Due to the thin webs, from 1.5 mm to 3 mm, corrugated web beams, compared to hot-rolled profiles or welded I-sections, allow significant weight reduction. The main benefit of this type of beams is that the corrugated web increases the beam's stability against local and lateral-torsional buckling and against web crippling, which may result in a more effective design from both technical and economic point of view. Within the paper, the planned activities of the LWT-FLOOR research project funded by the Croatian Science Foundation will be presented. To investigate and validate components and the proposed system, extensive experimental, numerical and probabilistic research will be conducted. Within the investigation, a particular focus will be given to spot-welding connections and innovative types of shear connections with the possibility of design for dismantling and the potential for re-use or recycling at the end of design life through the application of lifecycle analyses. Calibrated and validated numerical models based on experimental tests of the entire system and its components will, through probabilistic methods, evaluate the system suitability for larger spans and establish the analytical proposal for design recommendations.

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ADAPTATION OF STRATEGIES FOR THE REGENERATION OF PUBLIC SPACE IN THE CASE: COLEGIO TÉCNICO NACIONAL HERLINDA TORAL

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ABSTRACT

Throughout history, architecture in education has been seen as an essential component, but without a place the isolation of these spaces to protect their assets has caused the creation of visual and perimeter walls that isolate it from society, even turning it into an area unsafe after working hours, often turned into a tool for vandalism. This work starts from understanding terminologies such as: urban emptiness and open schools, factors that have promoted in other countries to improve the interrelation of spaces and inhabitants, as well as promoting inclusion and access to new recreational spaces in those places that lack thereof This research proposes the intervention in an educational center, as can be inferred in a space already built so that it can be regenerated, allowing the implementation of constructive proposals that improve urban planning and regeneration, the same that considers formal and functional characteristics with a detailed study of the place, to determine various aspects that influence the area of the Herlinda Toral school, certain spaces are identified as urban voids due to the lack of utility in them, for this reason the problem is generated to consider the best intervention strategy and achieve results that allow improving the conditions of the place for residents and students, in such a way that the resolution of strategies is implemented based on the references of projects that were carried out in countries such as Brazil and Colombia, finally with the adaptation of characteristics of design aligned to the requirements of the area is generated a revitalization of the case study. From there, urban strategies were generated within the sector, enhancing public spaces for recreation and recreation, their integration with the community and its immediate context, thus achieving a dynamic sector with social cohesion

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THE INTERPRETATION OF NATURE IN INTERIOR DESIGN

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ABSTRACT

The *control* over Nature can be traced back immediately after the realization of a safe home and the necessity to mark one's territory with furnishings and objects proving the conquest of the surrounding world raised. Nature without question is one of the major themes in Arts. Throughout history man used different visual expressions and ornaments to depict Nature. Interior design is overwhelmed today by the “minimalism movement” by erasing the figurative a in interior design process. However, there are numerous signs of a new trend in Arts, raised by the new line of artists, architects and designers. In such a context this research analyses the link between nature and man in interior design. This paper debates the importance of nature in visual arts by critical references to period style interior. The aim of this research is to understand the evolution of ornaments inspired by nature. The main focus is the Italian/ French Baroque period and the present time, where the utilization of figurative expressions of nature are imperative for us.

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ITERATIVE OPTIMAL DESIGN OF SPECIAL MOMENT RESISTING DEVICES FOR STEEL FRAMES

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ABSTRACT

Recently, the authors proposed a special device suitably designed to realizing an innovative moment resisting connection for steel beam elements. Such a device has been called Limited Resistance Plastic Device (*LRPD*). The following two main ideas substantially constitute the founding basis of *LRPD*: i) devote a particular selected portion of the beam element to the development of plastic deformations, leaving the remaining part of the beam element in the purely elastic range; ii) design the optimal device in such a way that its flexural stiffness and its resistance can be suitably assigned, being independent of each other. The use of the described innovative devices permits the designer to impose an established special structural response on the frame in which they are inserted. In particular, by exploiting the fundamental features of the device, i.e. the one that ensure that the device can show stiffness and strength independent of each other, a steel frame which is characterized by prefixed capacity curves can be designed. This special feature is particularly important in applied engineering especially, as an example, in the case of a frame which must be designed to substitute a masonry panel, i.e. a steel frame which must exhibit a structural behaviour as close as possible to the replaced masonry wall. In order to ensure the effectiveness of these devices, it is necessary that a suitable and complete plastic deformation field occurs avoiding any dangerous local instability phenomenon. Such a good behaviour can be ensured by designing the device dimensions in such a way that the smaller cross section, i.e. the one where the complete plastic deformation field is expected, possesses the characteristics of a class 1 or class 2 I-cross section, as prescribed in EN 1993-1-8:2006, Eurocode 3. In the present paper, a simple computational iterative procedure is proposed, devoted to obtaining a reliable sub-optimal design of the devices to be located in selected cross sections of the steel frame, ensuring the required elastic stiffness behaviour as well as the desired limit resistance. Some numerical examples show the good reliability of the proposed computational iterative procedure which is related with a very low computational effort. Finally, the expected elastic and limit behaviour of the devices and of the studied frames is verified by modelling the relevant structures in ABAQUS environment by using 3D solid tetrahedral elements.

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DURABILITY OF ARTIFICIALLY AND NATURALLY CRACKED STRUCTURAL LIGHTWEIGHT AGGREGATE CONCRETE

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ABSTRACT

Concrete is highly susceptible to cracking, either from loading or hygrothermal variations and deterioration mechanisms. This may greatly increase the concrete permeability, reducing its resistance to deterioration mechanisms, such as carbonation, chloride penetration and sulphate attack. Therefore, various investigations have been carried out regarding the influence of cracking on the durability of normal weight concrete (NWC). However, despite the research effort, there is still no consensus on how the transport properties vary with the crack width and what is the threshold value of this parameter below witch the durability is not significantly affected and lifetime design may be performed in uncracked concrete. Indeed, the influence of cracking depends on various factors, such as the concrete composition and number, depth, geometry and orientation of cracks. In addition, most published studies have been limited to the behaviour of NWC, without considering other special concretes, like Structural Lightweight Aggregate Concrete (SLWAC). Since the middle of the last century, SLWAC have been applied on various structures, showing adequate durability, at least comparable to that of NWC. However, knowledge on the durability behaviour of LWC is still poorly consolidated, especially comparing to that attained in NWC. During the last decades some researches have been conducted on the durability characterization of uncracked SLWAC, either based on laboratory acceleration tests or under in-situ real exposure conditions. However, so far, the influence of cracking on the durability of SLWAC have been barely explored. This study aims to analyse the influence of natural and artificial cracking on the carbonation resistance and capillary absorption properties of common SLWAC in the range LC20/22-LC55/60. To this end, SLWAC produced with two types of lightweight aggregates (LWA) was analysed in uncracked conditions and after inducing different crack widths in the range 0.1-0.3 mm. For comparison purposes, reference NWC of identical composition was also tested in similar conditions. Natural cracks were generated in concrete beams subjected to bending and artificial cracks were induced through a notch method. A new methodology was suggested to compare the absorption and carbonation behaviour between concretes of different crack characteristics. It is found that the influence of cracking is little affected by the type of aggregate, although there is a greater participation of porous lightweight aggregates in natural cracks. However, artificial cracking assumed more relevance in NWC than in SLWAC. The carbonation resistance of cracked concretes could be significantly reduced, up to nearly one half of that of uncracked concrete.

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MECHANICAL CHARACTERISATION OF CONCRETE PRODUCED WITH RECYCLED CEMENT

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ABSTRACT

The concrete industry is currently facing the serious challenge of reducing its significant environmental impact, regarding the extensive extraction of raw materials, large generation of construction and demolition waste and relevant CO_2 emissions. In this context, the low-carbon thermoactivated recycled cement (RC) has been emerged as a potential lever for the mitigation of these 3 vectors. However, due to the early stage of research in this domain, most studies have been only focused on the production of RC and its incorporation on cement pastes or mortars, without exploring its application in concrete production. In this study, it is characterized the mechanical behaviour of concrete produced with RC, either from waste cement paste or old concrete. To this end, a comprehensive experimental campaign involving the fresh, physical and mechanical characterization (compressive and tensile strength, modulus of elasticity) of concrete with RC and water/binder between 0.35 and 0.65 was carried out. It was found that the mechanical strength is little affected by the increase replacement of ordinary Portland cement (PC) with RC. Even considering 100% incorporation of RC, the mechanical strength was over 83% of that of the reference PC concrete with the same w/b. The incorporation of SP greatly improved the RC efficiency. Moreover, up to 15% incorporation of RC the mechanical strength of concrete was slightly improved, without either compromising its workability. From this study, it is shown the high potential of RC as an effective supplementary cementitious material. Up to 30% replacement, recycled cement directly retrieved from waste concrete according to a new patented method of the authors showed to be almost as effective as RC from waste paste.

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PUSH-OUT TEST AND FEM ANALYSIS OF CONTINUOUS SHEAR CONNECTOR

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ABSTRACT

Composite steel concrete bridges with embedded continuous shear connectors are one of the newer popular options for short span (up to 20 m) bridges. They can be used for both road and railway bridges and due to their low structural height, nowadays, they are also a welcome alternative for bridge reconstructions – the concrete part serves as the bridge deck as well as the main structure. Unfortunately, In the Slovak Republic, no such bridges have been built as of yet (2020). At Technical University of Kosice, Department of Steel and Timber Structures, an extensive research regarding the steel shear connectors have been launched. Its goals are to bring new, easier for construction (due to prefabrication process), more resistant with even lower structural height, and more economical (due to lesser usage of materials and quick construction) geometrical solutions for composite steel concrete bridges as well as to open and popularize this solution for developers in the Slovak Republic. In this article, one of the new types is presented. It has a cross-section in a shape of a trapezoid, with holes in all its sides, except the bottom flange. Their purpose is to create concrete studs and secure full shear transmission with higher shear resistance, but they also serve to create space for transverse reinforcing bars. Its geometrical and material characteristics are closely specified. Results and process of push-out tests performed in Laboratory of Excellent Research onto three specimens are described and compared to results of finite element analysis simulation performed in Abaqus software.

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ON THE LIMIT BEHAVIOUR OF MOMENT RESISTING CONNECTIONS UNDER UNCERTAINTIES

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ABSTRACT

Moment resisting connections are mainly designed to transfer bending moments and shear forces. Generally speaking, the design strength of a moment resisting connection can be classified as full-strength (i.e. the moment capacity of the connection is equal to or greater than that of the connected member) or partial-strength (i.e. the moment capacity of the connection is less than that of the connected member). Similar remarks can be made regarding the stiffness of a moment resisting connection which can be rigid or semi-rigid compared to the stiffness of the connected member. In the past, full-strength connections have been widely adopted especially in moment resisting frames and their structural performance relied on the proper behaviour of welding. However, the research following the 1994 Northridge and 1995 Kobe earthquakes (extensive damages to the beam-to-column connections) demonstrated the lower than expected performance of welded connections, stimulating the onset and development of pre-qualified connections to be adopted especially in seismic areas. Among these connections the most studied ones are those belonging to the Reduced Beam Section (*RBS*) typology, being the so-called “dogbone” connection the most adopted. The dogbone presents a strength lesser than the one of the original structural members but the same stiffness. Recently, the authors proposed a special device suitably designed to realize an innovative moment resisting connection for steel beam elements belonging to the *RBS* typology. Such a device, called Limited Resistance Plastic Device (*LRPD*), is constituted by three different portions: the central one is devoted to the onset and development of plastic deformations and presents geometrical dimensions reduced with respect to those of the original structural member; the external ones are devoted to recover the stiffness of beam-device system to that of the original structural member and present greater geometrical dimensions. This latter remark allows to affirm that, from a connectivity point of view, the stiffness of *LRPD* at the column-beam interface, is greater than the one of the original structural member. Another fundamental remark is that the structural connections are intrinsically characterized by uncertainties related either to geometrical or to material ones. Usually, the effect of uncertainties is covered by the use of safety coefficients and the analyses are performed referring only to the nominal values of the geometrical and mechanical characteristics. However, in order to perform a more complete interpretation of the mechanical behaviour of the studied connections, a non-deterministic analysis approach can be used. Aim of the paper is the characterization of the structural behaviour of the referenced connections (“dogbone” and *LRPD*) taking into account the main geometrical uncertainties and that related to the material strength by performing suitably Monte Carlo simulations and by determining the relevant M-N domains. Starting from the described characterization, different commercial steel profiles will be considered in order to build a series of M-N domains useful to quantify the safety level and the range of usability of the two different *RBS* approaches. Finally, the implemented applications will lead to demonstrate the greater reliability of *LRPD* compared to the classical dogbone.

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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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CONSIDERATIONS REGARDING THE REHABILITATION OF HERITAGE BUILDINGS USING MODERN TECHNIQUES OF "POINT CLOUD" DATA CAPTURE

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ABSTRACT

This paper aims to develop a comparative study on modern methods of collection and processing the "Point Cloud" data, necessary to evaluate the state of degradation of the buildings from the national patrimony as well as the use of the "Point Cloud" data in the process of their rehabilitation. The study will analyze two different methods of collecting and processing "Point Cloud" data, namely the terrestrial laser scanning method for capturing "Point Cloud" information and the UAV photogrammetric method using a drone to take images to be processed in to "point Cloud" type information of the main building of interest. The study aims to perform a detailed analysis on the accuracy of determining the geometric elements of heritage constructions obtained by applying the two advanced techniques of measurement and data processing, but also efficiency in terms of optimal time allocated to obtain final results. The objective of the research is achieved through a case study conducted on a historic building included in the national program for conservation and rehabilitation of buildings in the national heritage of Romania, located in Sighisoara, Mures County, Romania. In order to fulfill the proposed objective, modern techniques and technologies in the field of geodesy will be used, especially the photogrammetric ones, these being a result of the technical progress from the last period. The use of the two methods at the same time as achieving the objective can lead to obtaining a complete and detailed result by exploiting the advantages of each method applied separately. Based on the analyzes and the results obtained, having as reference point the way of data colection and processing the information or data present on the main facade of the buildings can be managed and used to establish the optimal solutions (strategies) for rehabilitation of heritage buildings by decision makers from whose administration it is.

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FRP MATERIALS – RECOGNITION OF NEEDS FOR ARCHITECTS AND BUILDERS IN THE USE OF COMPOSITES FOR THE BUILDING SECTOR

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ABSTRACT

FRP (Fibre Reinforced Polymers or Fibre Reinforced Plastics) is a wide group of modern materials commonly used in many fields of engineering, including construction. Generally, it is a composite material made of polymer matrix strengthened with use of fibres. The most commonly used are fibres made of carbon, glass, aramid, basalt, but they can also be natural fibres like hemp or flax fibres. The scope of applications in construction is also very wide. FRP materials in the form of mats or tapes are used for external strengthening of structural members. The products in the form of bars also are used as an internal reinforcement of concrete structures. Due to anti-corrosion properties, composite materials are commonly used in geotechnics and road construction. In form of laminates they are used for construction of bridges, wind farm structures and tanks. The big part of a construction market is also the production of various types of pipes. The reason of the research was the conclusion from the report of the Architects Council of Europe, which states that the majority of them have not received any education in FRP. Similar situation is with building construction workers with primary or secondary studies. Furthermore, a lack of IVET and CVET trainings to use FRP in the construction sector was detected, and this is, in the authors opinion, one of the reasons that limits the common use, as well as development of composites materials. The paper presents the analysis of the construction market in terms of FRP role, scope of use, trends and future expectations of the professional users. Also, the specific situation of architects, civil engineers and construction workers in the whole process of composite designing and applications is described. A special emphasis is put on recognition of professional knowledge received during regular education or vocational courses for all of the participants regardless of their role in the process. There was also analysed the educational offer of the trainings on the use of FRP for the construction sector and what were the basic skills provided. Besides, the most important competence requirements (skills and knowledge) for architects, civil engineers and construction workers were pointed in the paper. And finally, the challenges and opportunities in the context of the FRP use and steps required to meet these challenges in the construction sector were analysed. One of the conclusions was that the construction is a fairly conservative field and new materials have to prove their durability. From the national perspective, it is necessary to intensify work on national guidelines for the use of composites, or at least a handbook, extensively discussing the issues of using FRP composites in construction. Some of the international literature sources (such as the fib Bulletin 90) are difficult to access, and for the older staff, the language barrier is not without significance. Also, noteworthy is that the data provided in the paper were based not only on analysis of the statistical sources, but also on interviews with structural designers and contractors (workers and managers).

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EXPERIMENTAL INVESTIGATION ON THE FLEXURAL BEHAVIOUR OF THE GEOPOLYMER MORTAR BASED ON THE POWER PLANT FLY ASH

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ABSTRACT

Ecology is an important issue in the 21st century. Among other, it aims to significantly reduce the emission of carbon dioxide to the atmosphere and other harmful substances having a negative impact on the natural environment, life and human health. Such ecological friendly solutions are also sought in the construction industry. Geopolymers (or more generally alkali activated materials) seem to be an ecological alternative to the most popular building material, which is ordinary concrete. The basic component of concrete is Portland cement, the production of which uses not only the Earth's natural resources, but it is also a highly energy-consuming process. On the other hand, industrial waste (e.g. fly ash or blast furnace slag) can be used for the production of geopolymers, and the binding reaction is activated by a chemical activator (sodium or potassium hydroxide). The aim of the work is to determine the flexural strength parameters of the tested material activated with alkali, based on fly ash from the Belchatow Power Plant (the full chemical composition of the fly ash is presented in the paper). The mixture of sodium hydroxide and sodium silicate (in ratio 1:1.5) were used as a chemical activator. The strength tests were done after 1 day, 3, 7, 14, and 28 days. As there are no standards for test procedures for geopolymers, the bending strength tests were carried out according to the standards applicable to mortars. After forming, the cuboidal samples were placed for 24 hours in a climate chamber with a constant temperature of 40°C. The mould has been tightly wrapped in foil to prevent excessive evaporation that could cause early shrinkage of the specimens. The samples, after taking them out of the climatic chamber, were stored in constant conditions (room temperature 20°C) until the day of testing. Before the strength test, the samples were measured and weighted, and in the paper a graph of changes in the volume density of samples depending on their age is presented. The flexural strength was tested in a testing machine in the three-point bending test. The value of the failure force was read from the device, and then the bending strength was calculated. The values obtained from the calculations are presented. On the basis of the research, it was found that in the tested samples of geopolymer mortar, the increase in flexural strength was observed up to about 14 days from the date of the samples' preparation, then stabilization took place and no further changes in strength were observed (which certainly distinguishes this material from cement mortars). It is also interesting that the flexural strength value was influenced by the mixing time of the precursor and activator during the preparation of the mixture. This phenomenon is also described in detail in the paper.

TOWARDS CLIMATE CHANGE ADAPTED BUILT ENVIRONMENTS - RETROFITTING THE EXISTING BUILDING STOCK OF MULTISTOREY RESIDENTIAL BUILDINGS FROM THE 19TH AND EARLY 20TH CENTURY IN INNER CITY AREAS IN GERMANY

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ABSTRACT

In order to respond adequately to the new environmental conditions, which are expected to arise due to climate change, we need to modify our cities in a way that they continue to serve as pleasant and livable spaces for its inhabitants and visitors. Large parts of our existing building stock are not prepared for the predicted climatic changes. Adjustments are urgently needed. Within this paper a strategy has been elaborated how retrofitting can significantly contribute to the climate change adaptation of our urban environments which will be strongly required in the future. The focus of this study is directed to possible climate change related adaptations of multistorey residential buildings from the 19th and early 20th century in inner city areas of Germany. Building on the general principles of climate responsive and ecological architectural design and construction, it asks: how can our existing buildings be transformed in order to explicitly reduce the impact of climate change on our built environments. Based on an analysis and evaluation of the new climatic conditions, to which our buildings will be exposed to in the future, as well as on an analysis and evaluation of current knowledge of sustainable architectural and urban design and construction methods, subsequently a proposal of new guidelines for a climate change adapted retrofitting of multistorey residential buildings from the 19th and early 20th century in inner city areas of Germany has been developed. On one hand these optimisation proposals are addressed towards an adjustment in regard to respond better to longer heat and dry periods in summer, to heavier rain- and snowfall as well as to stronger storms. On the other hand, the adjustments are addressed towards criteria which serve to the mitigation of climate change, like an improvement of the buildings' energy performance and ecological efficiency. The results of this study demonstrate that the buildings focussed on are well suitable for retrofitting interventions, which would reduce the impact of climate change and which in parallel would constitute effective measures to strongly improve the buildings' ecological performance in general.

NUMERICAL AND PHYSICAL MODELLING OF THE PERFORMANCE OF THE PRO-VORTEX VANES IN SHAFT SPILLWAYS

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ABSTRACT

The paper focuses on the analysis of hydraulic conditions in the proximity of the intake part of high shaft spillways equipped with pro-vortex vanes and discusses recent enhancements in modelling of the shaft spillways and compares the acquired results of the performance of the spillway after complete removal or rehabilitation of the vanes in context of capacity and overall hydraulic conditions. Increasing requirements on safety of embankment dams during floods with respect to anticipated effect of the climate change scenarios on parameters of design floods demand further assessment of capabilities of outlet structures to meet the updated needs. Such dam safety assessments often conclude in the need of designing additional measures to improve existing structures. Despite different approach to the evaluation of the uncertainties and subsequent risk assessment the goal of improving safety of large dams remains consistent in the effort of all developed countries. Adjustments of the intake part of shaft spillways can present a valid design option for increasing capacity of the complex spillway / tunnel structure if supported by solid analysis of hydraulic conditions inside these structures. As the governing idea of the pro-vortex vanes is to ensure spiral flow inside the shaft and to minimize the pressure fluctuations the paper presents results from physical model of several designs of the pro-vortex vanes which approximated possible adjustment of tower like shaft spillway of existing large dam in Czech Republic and also results from CFD modelling illustrating the importance of combination of both modelling approaches. For the CFD part, different turbulence models are discussed.

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REVIEW OF RESEARCH PROBLEMS IN CONSTRUCTION, AS ANALYSED USING SURVEY STUDIES

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ABSTRACT

This paper is a review of the literature and focuses on recent studies in construction, specifically construction project engineering, in which surveys and/or interviews were used. This allowed an identification of current research trends in construction project engineering, essential and topical problems of contemporary construction, which were studied using surveys. Second, it was possible to demonstrate that surveys, despite often being used in the social sciences and finding rare use in the technical sciences, are nevertheless a highly effective tool that can be used to solve research problems in construction. They provide useful data that is then analysed, mostly using statistics, and the findings of such analyses and the conclusions that can be drawn from them support decision-makers in construction. The presented research problems that were solved using surveys are highly diverse and concern, among others: building information modelling (BIM), identifying adverse risk factors, design and execution errors, assessing a building's technical condition, assessing comfort, satisfaction and the social aspect of construction, conflicts and disagreements, cooperation and trust, management, success factors, prefabrication, technologies, waste, green building, sustainable development, safety and cost. In summary, the review of research problems analysed using surveys, as presented, can act as proof that such methods are recognised by scholars all around the world and are used in practically all thematic fields that concern construction project engineering. Survey study methods are a source of valuable data, either independently or in combination with other methods, and supply precious information that can diagnose and aid forecasting phenomena and problems, controlling processes and supporting decision-makers in the difficult process of making decisions, and are often the basis for specific choices.

URBAN CLIMATE OF VALPARAISO, CHILE: IMPLEMENTATION OF GREEN ROOFS AS MITIGATORS OF SUPERFICIAL UHI ON CITY

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ABSTRACT

The urban climate and the warming of the city are clear evidence of the anthropic impact on climate change. Mineral materials and surfaces and building shapes are factors that determine thermal storage processes: it generates the effect of surface heating and urban heat island. Vegetation is crucial in strategies to reduce this effect. This work studies the relationship between the implementation of green roofs and their small-scale cooling effect on the surface temperature in Valparaíso, Chile (South America) and the possible impact on the cooling of the urban space. Using remote sensing methods, the NDBI, NDVI and LST indices and the initial surface temperature scenario were defined. Envi-met software was used to determine the incidence of vegetated roofs in the urban climate and the thermal behavior of the surface and its incidence in the behavior of air temperature in the streets. The microclimatic extent of the thermal effect of these roofs was calculated from air and surfaces temperatures. The first results show that green roofs have a low incidence in air temperature at street level for the studied sector, mainly associated with their location on roofs of buildings away from concrete and asphalt streets. But at the same time there is a good performance in reducing the surface temperature by substituting elements and generating shade, which enhances its impact on the climate at street level for sectors with lower-rise buildings in mediterranean climate.

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ALIGNMENT OF BRAKING PERFORMANCE FOR TRUCK AND TRAILER

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ABSTRACT

Alignment of braking performance of truck trailer is an important parameter that affects its braking stability. This shows particular in critical situations or during braking on a surface with reduced adhesion. Alignment of braking performance can be automatic, which is one of quality of electronical brake systems. Further on, can be forcible, which is being executed during service a diagnostic work. This contribution is focused on analysis alignment of braking performance. Describing technical conditions, internal and external factors which affect it. Due to magnitude of this problematics, is in this article evaluated the optimization of braking affects truck trailers in the start-up phase. The analysis of the process – start-up braking effect has justification from the reason, that has primary influence on the stability truck trailer during braking and this can be the cause of collision situations or also traffic accidents. The parameter of alignment of braking performance has a primary influence on the braking stability of the truck trailers, which significantly affects road safety and is also important for the economy of the truck trailers.

THE CONTEMPORARY SUSTAINABLE NEIGHBORHOOD

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ABSTRACT

A sustainable environment is a small "Homeland" that is defined by a neighbourhood consisting of people and structures. This neighbourhood is stretched in time and space. The city of Krakow was chosen as a case study here. The contemporary environment of the Wola Justowska district is presented through the last 4 examples of residential buildings designed by the authors in this small district. These contemporary structures are compared with historical houses in Krakow, which were built by the authors' ancestors in the 19th and 20th centuries. The authors analyse the influences of the period of nineteenth-century Austrian occupation, the building boom of the interwar period, and the communist ban on designing and building in Krakow. The conclusions point to the spatial, functional, social, and economic aspects of human creation and functioning in a sustainable environment. In the concluding remarks of the paper, the authors note that the design and environmental processes look similar in the past century and today, and that the contemporary neighbourhood is shaped more by the cultural process than by design. The design, construction, and persistence of a building form is a process that is shaped by culture and simultaneously shapes the culture itself.

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THE MORPHOMETRIC ANALYSIS OF RIVER BEHELA UTILIZING GEOGRAPHICAL INFORMATIONAL SYSTEM

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ABSTRACT

In this paper, the delimitation of the river basin and the morphometric analysis is on the Behela River using Geographical Informational System. Geographical Information System (GIS) can be used for the identification of morphological features and analysing properties of basin. The morphometric parameters of the drainage network were calculated using data from the digital elevation model (DEM) with a resolution of 30 meter. The morphometric parameters of basin include the linear, aerial and relief aspects. Determining the morphometric properties of a river basin is useful in evaluating erosion processes, as well as in management of the water resources in the river basin. Horizontal fragmentation of the relief is another element of analysis, which highlights the frequency of alternation of valley corridors with interfluvial surfaces.

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THE RUNOFF SIMULATION BY SCS-CN MODEL IN A CATCHMENT AREA

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ABSTRACT

In the first part of the paper is characterized, catchment Behela, from point of view the hydro morphological and morphometric. The vegetation has a very important role in the formation of the runoff on hydrographical basin, one the one hand, because it influences the formation of soil types, and, on the other hand, because it determines the size of water infiltration possibilities, the reduction of evaporation and the reduction of soil erosion. Further, the paper aims to determine the runoff depth using the Soil Conservation Service Curve Number (SCS-CN) method. A rainfall-runoff model is a mathematical model describing the rainfall-runoff relations of a catchment area.

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MECHANICAL PROPERTIES OF HOT MIX ASPHALT WITH RECYCLED CONCRETE AGGREGATES

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ABSTRACT

In the road infrastructure industry, the reuse of solid waste is considered relevant as materials for the pavement construction. Recycled Concrete Aggregate (RCA) was used in this investigation as a partial substitute for coarse aggregate in Hot-Mix Asphalt (HMA). To establish the influence of this material on the mechanical properties of asphalt mixtures, HMA's were prepared at 0, 15, 30%(w/w) of RCA as partial replacement of the coarse fraction of the natural aggregates. So that, Marshall mix design properties (stability, flow, and volumetric properties) and mechanical properties (moisture sensitivity, stiffness) were considered. It was found that 15% of the coarse aggregates for RCA in the HMA, provided improved performance with regard to the control hot mix. Achieving potentially more durability.

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THE COMPARISON OF DIGITAL TERRAIN AND SURFACE MODELS FOR NEXT USAGE IN CHOSEN LOCALITY

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ABSTRACT

There are many possibilities of digital terrain model and digital surface model next usage due to their georeferenced character. The informational system of georeferenced data of Slovakia called ZBGIS gives new opportunities of downloading of digital data in various formats. There is possible to download ortophotomosaics, ZBGIS raster in various scales, point cloud but digital terrain models and digital surface models with great possibilities of their application in GIS calculations.

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FLOOD HAZARD CALCULATION BY USING DIGITAL TERRAIN MODEL

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ABSTRACT

Due to the global warming and the high environmental burden to the country, the risk of flood hazard increases hand in hand with the climate changes. It is not the only hazard, but parts of this hazard may be eliminated by using flood barriers, flood defences etc. There are anthropogenic possibilities of the flood barriers application, such as dams, bags, regulated riverbeds. There can also barriers with natural elements be used such as water gardens, water stages, balanced vegetation planting. The strength, dimension and position may be calculated from the proper terrain data.

Corresponding Author: Jakub Chromčák

QUANTITATIVE AND QUALITATIVE TERRAIN ANALYSIS BASED ON DIGITAL TERRAIN MODEL

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ABSTRACT

Within the Digital Terrain Models (DTM) processing and consequently qualitative and quantitative analysis, it is possible to gain a credible imagination of real terrain shape. In order to obtain appropriate DTM it is necessary to decrease the influence of the gross errors that have negative effects on the final DTM. These gross errors may degrade and in the worst case also ruin the calculations and the final outputs. The gross errors have greater impact and are harder to define in complicated terrain and pointing out these types of errors depends on the editor's experiences and terrain knowledge.

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COSMIC GEODESY CONTRIBUTION TO GEODYNAMICS MONITORING

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ABSTRACT

The cosmic geodesy provides methods and ways of various data acquisition. The collected data may be used for researches, calculations and analysis in different fields of interest. According to the reliability and redundancy of data provided by cosmic geodesy methods, it is possible to contribute to the geodynamics monitoring. The geodynamics monitoring enables the tectonic plates movement tracking and predicts the movements which may result in the disasters. Applying data provided by cosmic geodesy methods in the form of permanent observation station positions and their changes in time, in calculations, whose physical nature is based on the continuum mechanics, makes possible to monitor the direction, locality and size of visualised deformation tensors.

VISUAL ORTHOPHOTO CLASSIFICATION APPLICATION

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ABSTRACT

Data acquisition using remote sensing enabled new possibilities of their analysis and application. For the ecological stability calculations, it is needed to divide the observed area into subsections based on the land character. The selection may be done by various kinds of processing. For example, it may be done manually, but to increase the post-processing effectivity, it is necessary to find faster, automatic ways of the post-processing. Many software environments are able to solve this problematic by using spectral analyses and appropriate tools.

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DIGITAL TERRAIN MODEL GEOSPATIAL MODELLING

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ABSTRACT

The modelling means the world object cognition based on the analogy. This analogy presents idea and material imitation of some properties of existing world. It is processed by various anthropogenic objects, in which the chosen properties are presented, defined and characterised as shapes and relations of original objects. By easier characteristic, the simplified objects are created. These objects are specially created only for the world study. These types of objects are called models. To edit the digital terrain model correctly, it is needed to understand the geospatial modelling.

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THE REMOTE SENSING DATA ANALYSIS FOR THE ECOLOGICAL STABILITY PURPOSES

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ABSTRACT

The remote sensing offers the opportunity of miscellaneous data acquisition with various ways of their consequent analysis and application. The processed remote sensing data in the form of georeferenced orthophotoimages or orthophotomaps enable the study of the examined locality from the chosen observed feature point of view. According to periodical data acquisition, it is possible to monitor the ongoing and emerging actions in time and then prevent and predict the upcoming actions. With the increasing interest in environmental issues and nature protection, the natural environment monitoring, preservation, protection and remediation present the number one priority. From the ecological point of view, the orthophotos/orthophotomaps analysis present the up-to-date way of ecological stability calculation and monitoring.

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MINIMIZATION OF A POINT THERMAL BRIDGE BY A ROOF RESTRAINT SYSTEM HOLDER

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ABSTRACT

Roof restraint systems are designed for flat roofs for safe maintenance and repairs. By anchoring them, considerable point thermal bridges are created, which can also lead to condensation in the roof cladding. We deal in this work with the design of minimization of these point thermal bridges.

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INDOOR AIR POLLUTION IN HOUSING UNITS

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ABSTRACT

Pollution and poor quality of the indoor environment is a common problem in today's residential buildings. These problems are reflected in the well-being and health of the users of these buildings. Targeted identification of the various harmful substances (pollutants) is essential for understanding the interactions of components of the internal environment for the welfare and health of building users. The Czech housing units were selected for screening investigation of indoor air quality. Measuring of indoor chemical factors was performed during the year 2019. The indoor levels of TVOC, nitrogen oxides, indoor radon, and particulate matters PM_{10} were measured. The results provide introduce data on indoor air quality concerning seasonal changes which were in correlation to air change rate. These results, introduced in this paper, help to understand the indoor pollutants occurrence and help to design next more focused studies.

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DEA MODELLING EFFECTIVENESS OF BUILDING ENVELOPES

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ABSTRACT

Today, insulated building envelopes must not only meet thermal-technical, mechanical, and economic requirements but must also be environmentally friendly. These requirements are often contradictory, and it is not clear what the effective option is for a particular case. The aim of the paper is to compare twenty different variants of building envelopes, not only in terms of thermal-technical properties but also in terms of environmental parameters and time and financial demands. The result of the paper is the determination of effective variants by a suitable mathematical method with consideration of all the above-mentioned influences.

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SEARCH FOR REQUIREMENTS FOR THE WIDTH OF PEDESTRIAN ROADS IN THE CONTEXT OF THE CLASSIFICATION OF PUBLIC SPACE

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ABSTRACT

Walking has long been the primary means of human transport. Nevertheless, in recent decades, the insufficient emphasis has been placed on it in the creation and renewal of public space. It focuses mainly on the needs of road transport, the volume of which is constantly growing enormously. It is only in recent years that the view begins to be re-evaluated and trends in the organization of public space gradually changed, as it is true that a larger supply generates a greater demand. Therefore, leading architects are gradually changing their approaches to the organization of public space and put humans, pedestrian transport, and its requirements first. In the Czech Republic, the trend is gradually changing, as it is worldwide. Walking again plays an important role in the creation of sustainable mobility plans for the cities of the Czech Republic. The main problems arise in the actual implementation of these ideas, as the legislative requirements are formulated only in general, unlike the requirements for road transport, which sets out the requirements for minimum road profiles in the context of design speed and traffic intensity in a given cross-section. These requirements are set out in Decree No. 501/2006 Coll. on general requirements for land use and also in CSN 73 6110 Design of local roads (CSN is Czech technical norm). However, such a categorization of requirements for pedestrian roads is not yet solved uniformly for the entire territory of the Czech Republic, even though CSN 73 6110 deals with sidewalks (functional group D roads).). So far, this categorization is replaced only by seldom locally valid methodologies, manuals, or requirements and regulations in the town plans of individual cities. This paper aims to search for current approaches, legislative requirements, and approaches to addressing the width requirements for pedestrian roads in public space in the context of the classification of this area.

DETERMINATION OF THE MAIN WIRING POSITION BY GROUND PENETRATING RADAR DURING THE RECONSTRUCTION OF A TERRACED HOUSE

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ABSTRACT

Currently, ground penetrating radar (GPR) is commonly used in civil engineering. It can be determined the number and location of steel reinforcement and other subjects in concrete or similar materials. The article is focused on using GPR for determination of the main wiring location. The wall where the main wiring was located were demolished as a part of the reconstruction. By this step the new entrance hall were created. The position and course of the main wiring were determined by GPR measurement. During demolition work were used hand tools in area with installations to avoid the damage. A lower resolution was found when the individual wires were close together. However, the position of the marginal cables was determined with an accuracy of one centimetre.

SURVEY OF EXPOSURE TO ELECTROMAGNETIC FIELD IN A STANDARD HOUSING UNIT

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ABSTRACT

This contribution deals with a screening survey of electromagnetic emissions in various places of a typical residential unit of an apartment building located in České Budějovice (Czechia) with the connection of common electrical appliances. The TENMARS TM-190 Electromagnetic Field Meter was used for the measurement. The uncontrollable electromagnetic smog, it can have various negative consequences for the well-being and health of building users. The most sensitive organs to electromagnetic radiation are the skin, eyes, nervous system, and genitals. In the case of long-term exposure, headaches, stomach and skin problems, depression may occur, in the case of long-term exposure, spermiogenesis and cataract disorders, or the development of Unhealthy Buildings Syndrome (SBS) may occur. Electromagnetic fields should be minimized especially in rest areas, i.e., bedrooms because there is long-term exposure. The phase of a deep sleep, in which important mechanisms of regeneration, hormone production, and detoxification occur, can be significantly disrupted by electro-smog.

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CASE STUDY OF VOC EMISSIONS IN CZECH OFFICE BUILDINGS

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ABSTRACT

The paper deals with the problem of the occurrence of volatile organic compounds in the work environment, specifically in administrative public buildings in the context of the quality of the indoor environment (IAQ). The importance of indoor air quality has become an interest in research and development in the last 10 years, mainly due to the increasing quality of the airtight envelope of the building and the prevailing trend of forced ventilation. Indoor air quality is directly related to Sick Building Syndrome (SBS). The occurrence of VOC emissions within 10 selected office buildings in the South Bohemian Region in the Czech Republic is demonstrated in the practical case study. Detection of volatile organic compounds was performed using ultra-fast electronic zNose Model 4200 Analyzer based on gas chromatography with patented SAQ detector. The results of the case study demonstrate how important a quality element and the necessary implementation of the building and the design of the indoor working environment is.

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PRELIMINARY STUDY: SLEEP AND INDOOR ENVIRONMENT QUALITY

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ABSTRACT

The aim of the paper is to determine the basic principles for long-term research on sleep quality depending on the quality of the indoor environment (IEQ). Sleep and rest are some of the basic natural needs. People spend about a third of their lives sleeping. Sufficient sleep helps us to think more clearly, to better and more consistently solve complex tasks that are important for everyday life. The quality of the indoor environment plays an important role in the well-being and health of building users. For quality sleep, it is also necessary to ensure appropriate factors of the internal environment as a whole. Insufficient quality of the internal environment, which has long manifested itself as the Sick Buildings Syndrome (SBS), has a significant negative impact on sleep and the possible development of sleep disorders. The importance of the quality of the indoor environment increases with the restriction of free residence in connection with the epidemiological situation of COVID-19.

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SPECIFICS OF NEGOTIATING CONSTRUCTION CONTRACTS IN THE ONLINE MODE

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ABSTRACT

Current restrictions on mutual contacts have brought massive use of online communication. Barriers to online communication have fallen and have now become a regular part of the work of workers in many industries. This also applies to construction production and its preparation. However, the preparation of construction production depends on the number of documents and the digitization of construction documentation also represents a new form of preparation and approval of construction documentation. This paper focuses on two aspects of negotiating construction contracts online. The first is the modeling of the preparation of such a meeting with regard to the number of accompanying documents, and in the second part the author focuses on negotiation techniques through online tools. It turns out that while it is possible to use a number of persuasive and motivational techniques in personal contact, in the online mode it is still necessary to learn to communicate effectively. Negotiation is a process aimed at reaching agreement and setting goals. The purpose of the paper is to clarify the problems associated with low awareness of the need to change behavior in a virtual environment.

IMPACT OF THE COVID-19 PANDEMIC ON THE REAL ESTATE MARKET IN THE CZECH REPUBLIC

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ABSTRACT

The COVID-19 pandemic has affected a number of areas including the real estate market. The crisis occurred both on the demand and on the supply side, but also, for example, in the field of real estate valuation. Such crises are quite common on the real estate market with cyclically recurring situations. Therefore, it is necessary to pay attention to this issue and to be able to recognize the first symptoms of the problems. The aim of the presented article is to report on the development of the real estate market in the Czech Republic in the time period 2019-2021, focusing on the effects of the COVID-19 pandemic, if these had an impact on the market at all. Data from real estate advertising is collected in a period of one month; beginning April 2020, the data is collected in the period of 15 days. The data is concerned mainly with the offer prices of flats intended for rent or sale and represents all municipalities in the Czech Republic. The data is purged from duplicate advertisements, unreliable advertisements and advertisements for which the price data has not been filled in. The authors evaluate the real estate market using their own SW tool EVAL while the research refutes the premises about the significant impacts of the COVID-19 pandemic on the real estate market in the Czech Republic, which corresponds with the opinions of other authors. The research shows that the potential impacts are more noticeable especially in the short-term rental sector. The real estate market in the Czech Republic has been in imbalance for a long time as it is affected by many opposing factors pushing the supply and demand for real estate up and down at the same time. The situation regarding COVID-19 intensified this fact even more and caused a confusing and, in the future, difficult situation to predict.

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INFLUENCE OF SHEAR ON PLASTIC BENDING STRENGTH OF I CROSS-SECTIONS STEEL BEAMS

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ABSTRACT

In general, steel beams are stressed by bending and shear. Due to the loading a normal stresses σ and shear stresses τ arise in individual cross-sections of steel beams. But they are usually stressed mainly by bending. This follows both from several theoretical analyzes and especially from the corresponding experiments. Therefore, current standards for the design of steel structures allow the impact of shear to be neglected to a certain level of shear stress of the most stressed - decisive cross-sections of beams (EN 1993-1-1, respectively CSN EN 1993-1-1 and others). However, in the case of shorter beams, especially in places of support and in places of application of concentrated forces, the shear effects of the load can also be significant. In the case of more significant shear effects of the load, the plastic flexural strength of the decisive cross-sections and also the overall load-bearing capacity of the steel beams must be adequately reduced. However, the degree of flexural strength reduction with a significant effect of shear in the case of I cross-sections is still unambiguous. It is therefore important to experimentally investigate steel beams in the area of significant shear effects. The presented article contains selected results of experimental investigation of the significant effect of shear on the flexural strength of steel beams I cross-sections.

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WALKING AS THE MOST SUSTAINABLE URBAN TRANSPORT MODE

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ABSTRACT

Sustainable development of urban areas requires promoting economical transport modes such as walking, cycling, or public transport, particularly through building appropriate transport infrastructure. Urban pedestrianisation and walkability is a principal concept in sustainable planning and design. All over the world professionals try to design cities, neighbourhoods and places not around cars but for people. Walking, as pedestrian transportation became the main topic of multidisciplinary urban studies, projects and policies. To encourage walking the built environment must be adapted to the needs of users, of which the feeling of security is one of the most important. In every walkability measurement the safety is present. However, making cities socially and physically safe is one of the most important fundamentals of walkability, likeability, liveability and sustainability. The main objective of our research is to provide an essential contribution to systems knowledge of pedestrians' needs, thus stimulating structural and functional interventions, policy making and regulation to support the walking quality conditions across the Czech Republic. In urban planning, transport planning and traffic safety sciences a comprehensive, integrated systems approach is now needed. This attitude follows that path to determine pedestrians' needs with regard to the quality of physical and social environments, the transport system, and policymaking and implementation for a safe and healthy mobility of pedestrians. This study is conducted from 3 perspectives: transport and urban functionality, user´s perception, durability and future prospects. Special attention is given to the coherence and integration of these perspectives. The focus is on pedestrians' needs with regard to the strategic, tactical and operational levels of travel and sojourn decisions of pedestrians, particularly in city outskirts.

SKEWING OF CRANE DURING ACCELERATION

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ABSTRACT

During the work of crane and during its driving on the crane track, the so-called skewing of the crane arises. The physical phenomenon of crane skewing has been interpreted in various ways in the past. This corresponded to various physical models of skewing, which were created by various authors and which were presented in the standards for the design of crane structures and tracks. Current standards define the skewing as the so-called oblique running of the crane along the track with uniform movement. This is a situation where the force on the front guide means returns the obliqued crane when driving to the straight position. Theoretical formulas for the calculation of forces caused by skewing during oblique running crane were determined by Hannover. These relationships apply to movement of the crane with constant velocity along the crane track. The author of the article derived a model of a crane, which allows to investigate the movement of the crane along the crane track in general, it means both during uniform movement and during its acceleration or deceleration. It is a dynamic model that allows the solution of equations of motion to solve the coordinates corresponding to the degree of freedom and, among other things, to determine the forces between the crane and the crane track. This article presents the results obtained from this model for a specific selected crane during its acceleration. The contact of the front guide wheel is assumed, which is in accordance with the model derived by Hannover and which is also stated in the currently valid standards.

ANALYSIS OF CONSTRUCTION MARKET IN THE CR IN THE YEARS 2000-2020

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ABSTRACT

Construction industry can strongly affect the state economy. It is also an industry which is very sensitive to shock e.g. in the forms of economic crises. The great economic crisis, which started in 2008, had a great impact on this industry, and many enterprises operating in this industry were in danger of bankruptcy. However, compared to real economy, the construction market shows considerable inertia. Also, the current state affected by the COVID-19 pandemic is causing the worldwide decline in the demand for constructing new real estates and thus the stagnation of the construction industry. The objective of the paper submitted is to provide information on the development of construction industry in the Czech Republic in the years 2000-2020. The paper submitted deals primarily with the volume and overall amount of construction in the period specified above. To describe the development of the construction industry, data published mainly by the Czech Statistical Office, which keeps statistics by relevant categories of buildings. The basic principle is the classification of buildings by individual types and then by structures. The paper is divided into four parts dealing with the construction of houses, construction of apartment buildings, construction of non-residential buildings, and another parameter was the number of building permits in the monitored period. The performed analysis showed that the given period is a period of development of wooden constructions and application of other than conventional construction materials. There was also confirmed the inertia of the construction market compared to the real economy, where the peaks of the construction industry were always in the years of crisis, while the decline was always in the following years after the crisis, which is given mainly by the long cycles. The presented data are beneficial also mainly for construction companies, which can use them for better prediction of demand and management of resource capacity.

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PERCEPTION OF SPACE AND MENTAL MAPS: THE CASE STUDY OF CITY CHOTEBOR (CZECHIA)

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ABSTRACT

The issue of public space in cities has recently become an increasingly discussed motive not only among architects, but also politicians and ordinary citizens. This is a topic that reflects the satisfaction and quality of life of all residents. Public space can be characterized as a space accessible to people at any time of day, designed for a wide range of different age groups, social classes, genders, and races. The perception of urban space by its inhabitants is an important part of research into urban structure and spatial planning. The process of mental mapping makes it possible to define potentially dangerous or otherwise critical areas of cities. Mental maps could reveal the specifics of fear of a defined group of people, including their reasons. Addressed identification of stressors is a key basis for increasing urban satisfaction and security. The paper presents a case study of positive and negative localities based on mental mapping in a typically medium-sized city in the Czech Republic, in Chotěboř.

WOOD FLOORING IN COMBINATION WITH UNDERFLOOR HEATING SYSTEMS

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ABSTRACT

The main objective of the article is to inform about the wood flooring in combination with underfloor water heating systems. Wood is a very sensitive material that responds to its surroundings. For this reason, it is necessary to select a suitable wood, meeting the criteria of suitability for laying as flooring in combination with underfloor heating systems. It is also important to comply with the conditions of storage of wooden flooring and its installation under acceptable climatic conditions at the construction site, together with the technical regulations for the installation of wooden flooring in combination with underfloor heating systems, during the whole life cycle of the wood flooring. This article defines the basic input premise for the implementation of wooden floors in combination with underfloor heating systems, regarding the relevant technical standards and technological procedures valid in the Czech Republic. At the same time, the article describes possible failures of wooden floors in case of non-compliance with the above conditions. In the conclusion, we propose measures based on the described installation process failures of the wooden flooring in combination with underfloor heating systems, and after its use.
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SOCIO-ECONOMIC EVOLUTION OF ECUADOR: MAIN ECONOMIC INDICATORS AND SOCIAL PHENOMENA IN RECENT YEARS

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ABSTRACT

It is already known; however it is essential to emphasize how the socio-economic evolution of Ecuador is closely related to the progress of the economy and the development of Ecuadorian society. The evolution of its history has determined the behavior of variables such as inflation, migration, Gross Domestic Product GDP per capita and external debt, therefore, its dynamics make us believe in this reality since the republican beginning of our country to the present days which is the objective of this work. The interpretation was made based on a brief historical review of the main aspects of economic activity and the unequal social classes. In fact, this last phenomenon has been the main characteristic for the direct relationship with the primary sector. In addition to the entrenched epiphenomena in our nation which are the results of lethargic development per data from INEC and the CEPAL. The comparative perspective will be set in the economic and social indicators of recent years through a descriptive analysis, using the qualitative, quantitative and inductive methods. The methodology used in the article is situated in the positivist paradigm, as far as the certainty of the data as abstract reality corresponds to the objective of the research. The approach is quantitative based on statistical time series. The type of research is: descriptive, because it solves a theoretical line around the socio-economic variables studied. Correlational, because it associates the phenomenon of research in a logic of cause and effect. Explanatory, because it descends to the rational plane where the phenomenon is seen from different points of view associated with contexts, in the midst of tensions and socio-economic and cultural dimensions.

SCIENTIFIC PRODUCTION IN THE ECUADORIAN CONTEXT: A PERSPECTIVE ON THE KNOWLEDGE DISSEMINATION AMONG HIGHER EDUCATION INSTITUTIONS, PERIOD 2015-2019

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ABSTRACT

Scientific production continues to be a matter of vital importance in the Ecuadorian Higher Education System, year after year, the evaluation standards and the rankings of publications of Higher Education institutions take such indicators as a reference to stablish the quality of each university. For this purpose, it is essential to know the reality of the country in this area and the growth that the dissemination of knowledge has had in recent years statistically speaking. The aim of this research was to determine the current development of scientific production in Ecuadorian universities, in the period from 2015 to 2019, with an analysis of the global, national and local context. Therefore, the following information collection instruments were used: scientific databases, national control and accreditation entities, and digital repositories. The research focus was qualitative, with a descriptive-deductive methodology. The results showed that in Ecuador, the universities that are in the top category of the scale (A type), are more productive, about high impact publications, however, there is evidence of great progress in the middle segment universities (B type), in the factors related to research and dissemination of its results in scientific databases. The most relevant conclusion states that Ecuadorian universities have progressed in the research field, in comparison to previous years, however, the support of the state has not been adequate to give greater emphasis to the generation of scientific knowledge that allows to comply with one of the strategic axes contemplated by the “Toda una vida” National Development Plan.

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COMPARATIVE STUDY BETWEEN THE MANAGEMENT MODELS OF SOCIAL HOUSING PROGRAMS: SAV-BID AND FISCAL FINANCING, OF THE CANTON CUENCA BETWEEN THE YEARS 2010-2020

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ABSTRACT

The creation of management models for the construction of Social Interest Houses in the province of Azuay has been one of the most important actions to mitigate the existing housing deficit in the territory in the last ten years. Within this period, two management models have played a leading role: the SAV-BID Social Housing Program and the Fiscal Financing Housing Program. These models, created and promoted by the Ecuadorian State with the help of private actors and companies, have developed Social Interest Housing projects with the main objective of correcting the housing problems that afflict the population located in the most vulnerable socioeconomic strata of the country. With this background, a comparative study of the management models applied in Ecuador is proposed, through which the similarities and differences between each of them are evidenced, as well as the potentialities and weaknesses that have characterized these models both in their management as in your application. The study begins with the development of a referential framework where central issues are considered such as: characterization of the concept of Social Interest Housing, housing deficit in Ecuador, and the essential components required for the design and implementation of a housing management model, with the purpose of delimiting and understanding the context of the investigation. For the development of the study, a qualitative methodology is proposed, which uses a deductive-inductive system; where dimensions, sub-dimensions and variables are proposed to approach the study of management models from the general to the. The dimensions are defined as the great considerations and aspects that determine the models; The subdimensions are the analysis components where the results of the execution and application of the models are produced, and the variables are made up of the only aspects that allow the subdimensions to be operationalized. The results obtained broadly indicate that there are close similarities in the planning and structuring of the management models studied. However, there are differences in the source of financing and in the characteristics and obligations of the project actors that mark differences in the final production of housing. The study concludes that there are some differences that have allowed the SAV BID National Housing Program management model to generate greater production of Social Interest Housing. These differences are closely related to the active and continuous participation of the managers or home builders, a fundamental aspect that has allowed the success of the projects developed through this management model.

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SUSTAINABILITY ASSESSMENT METHODS IN EXISTING BUILDINGS: COMPARATIVE ANALYSIS IN HERITAGE ASSETS SIGNED FOR PUBLIC USE IN GIRÓN, ECUADOR

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ABSTRACT

This paper compares the sustainability evaluation methods applicable to existing buildings based on the most influential certifications at the international level (BREEAM-NSO, LEED-BP & M and VERDE GBCe), and their guidelines for application in three heritage buildings of the Girón canton (Ecuador). From 3 case studies (Municipal Palace, Museum House of Treaties, and Old Fire Department), previously documented at an architectural level, the components of water, energy, transport, materials, and innovation are evaluated according to the BREEAM-NSO and LEED-BP & M. Initially, it is determined that the latter is the one with the greatest technical feasibility and professional suitability. From now on it is established that, with small adaptations to the initial valuation mechanisms, a heritage building could be certified, especially when it is designated for public use, such is the case of the study universe. The recommended interventions are organized into two levels of incidence (lower and higher), and with this it is possible to exceed the initial compliance range positioned between 8 and 28%, and reach 40 and 62%, and even 80 and 90 %. In turn, this is feasible on guidelines, categories and an assessment system applicable to the reality of the context and the uniqueness of the buildings. When applying the methodology in three heritage buildings destined for public use in Girón (Ecuador), it can be observed that the methods give greater importance to the environmental dimension and that there are common issues such as water efficiency, energy resources, transportation, materials and resources and innovation.

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ANALYSIS OF HOUSING CONSTRUCTION AND DESIGN TECHNIQUES CONSIDERING BIOSECURITY PARAMETERS TO MITIGATE THE RISK OF CONTAGATION IN THE CONTEXT OF COVID-19

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ABSTRACT

The COVID-19 pandemic caused by the spread of SARS-CoV-2 has exposed some deficiencies in the built environment to mitigate the risk of contagion. In the specific case of single-family homes, the cleaning and disinfection habits applied to avoid contagion have forced the inhabitants to modify or adapt spaces that fulfil this purpose, which were not thought from their design to take measures to disinfect people. and objects. For this reason, the improvisation of spaces and the use of disinfection methods and protocols in the context of COVID-19 have evolved per the requirements of the population, the technology or existing disinfection methods, the suggestions given by the WHO and the organisms of health of each country, without a technical guide or a consensus regarding architectural design. To define the current disinfection requirements of single-family homes in a case study carried out in the city of Cuenca-Ecuador, a bibliographic analysis was first carried out on the modifications of design trends based on the largest pandemics, Surveys were then used to identify the biosecurity habits carried out by the families within the case study, where aspects such as the transit area from the entrance to the home to the clean part of the house, the area destined for disinfection are recognized. , among other. With these data, a zoning of the areas that an existing home must have and the architectural suggestions to apply in each case was elaborated. A zoning of black or highly contaminated areas, gray 1, gray 2 or medium contamination and white area or considered without contamination is proposed in similarity with the protocols within laboratories, and the design suggestions are based on the relocation of dedicated spaces for personal hygiene, disinfection of objects, laundries, and access routes. Suggestions are also given on the uses of natural disinfection methods and others based on technologies such as UV-C radiation applicable to disinfection of spaces. The design considerations raised in this study are validated by experts in the areas of public health, occupational health, and architectural design and research.

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FEASIBILITY OF EXPANDABLE POLYSTYRENE IN THE CONSTRUCTION OF HOUSING OF SOCIAL INTEREST IN THE CITY OF AZOGUES

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ABSTRACT

In Ecuador, the existing socioeconomic crisis has created an economic gap in which a large part of the people are in a medium - low social level, not only due to the lack of education or employment, but also due to the lack of decent housing. it is not reflected only among the population with limited economic resources, but also in those who, despite having the ability to support their family, still do not have a home of their own and together with people who do not even have the means to afford a decent home demonstrate the problem of the lack of decent housing in the country, which is why the use of expandable polystyrene (EPS) in civil construction is currently giving great results in terms of comfort, energy reduction, price and other benefits, that is why the objective of this investigative work is to analyze the feasibility of the use of EPS in the construction of social housing (VIS) carried out in the city of Azogues - Ecuador, carried out by the Ministry of Urban Development and Housing (MIDUVI). For which a bibliographic-documentary research methodology was used with a cross-sectional approach to studies about the use of EPS in construction. The results show that the quality of this material is highly reliable for use in the construction of houses, so it must be used in the VIS projects executed by MIDUVI, which will generate great benefits for all the actors involved, as a conclusion There are several studies that give credit for the functionality that EPS offers, especially because it offers the possibility of mixing with other traditional materials and giving a finished work of high quality in a short time.

BIOCLIMATIC ATLAS OF THE AZUAY PROVINCE, TO IMPROVE THE PLANNING OF BIOCLIMATIC ARCHITECTURE

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ABSTRACT

Currently bioclimatic architecture is booming, it focuses on the design and construction of buildings considering the interrelation with the climate, considering the different climatic conditions of each place, region or country, taking advantage of the elements and factors of the climate. The purpose of the study is to determine the areas of cold, comfort and heat throughout the year, for this it is proposed to carry out the Bioclimatic High of the Province of Azuay. To achieve this objective, the statistical analysis of the annual climatological data collected from the meteorological stations located in the province of Azuay was carried out, the data correspond to and belong to the National Institute of Meteorology and Hydrology (INAMHI). To analyze the hygrothermal comfort, we proceeded to calculate the averages of maximum and minimum temperatures, as well as the average of the relative humidity of each station under study, these data are condensed in the Biosol software, and applying the Morillón (2004) methodology the diagram of air conditioning isorrequisites is obtained where the cold, comfort and heat zones of each station located throughout the territory of the province of Azuay are identified. Because of this process, monthly maps are obtained, they were prepared through the geographic information system (GIS) Arc GIS. The maps obtained allow different construction professionals such as engineers, architects, urban planners and the public, to obtain reliable climate information to plan, design and build sustainable projects that respond to the specific climatological and comfort needs of the province of Azuay.

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ANALYSIS METHODOLOGY TO MITIGATE THE EFFECT OF THE URBAN HEAT ISLAND OF THE CITY OF CUENCA WITH EMPHASIS ON THE CONCRETE PAVEMENTS

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ABSTRACT

It is evident that the consequence generated by the Urban Heat Island (UHIE) in medium-sized cities with a population greater than 600,000 inhabitants generates a decrease in comfort for the user of the road network due to the increase in temperature and the difficulty of dissipating this. In the city of Cuenca there are many urban roads that are rigid pavement and construction and maintenance projects are currently being generated for them, so it is necessary to find solutions in the execution of concrete to reduce the UHIE effect. The investigation in an integral way has two approaches qualitative and quantitative - experimental. In the qualitative approach, the systematic review method supported by data meta-analysis is used to contrast information from secondary sources of case studies around the world on Urban Heat Island, and the most common and appropriate methods will be outlined through an outline. to reduce the effects of the object of study. Subsequently, this defined methodology will be put to the consideration of an expert judgment so that through its evaluation we can justify the proposed methodology. The result obtained is a method of analysis and experimentation that can be applied in the context of the city of Cuenca, allowing to determine the effects of radiation on rigid pavement construction materials, defining construction strategies and types of concrete that allow reduce the UHIE effect. The city of Cuenca accumulates large amounts of heat during the day and has difficulty dissipating it at night, so this research seeks to propose constructive alternatives and possible mitigation solutions to avoid or counteract the impact produced by the heat island through the most suitable method.

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DEVELOPMENT OF A SPRAY DISINFECTION MECHANISM FOR BATHROOMS IN HOMES IN THE CITY OF CUENCA

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ABSTRACT

The outbreak and spread of infectious and contagious diseases such as Covid-19, which is currently affecting the world population, especially Ecuador, highlights the inadequate handling of regulations regarding biosafety measures such as personal and object disinfection everyday use in a home. The objective of the research is to develop a mechanism that allows the continuous disinfection of a bathroom, through the application by spraying of disinfectant chemicals that are not harmful to health and thus guarantee a healthy home for the occupants, reducing the risk of contagion of diseases. intestinal and respiratory; and at the same time offering a comfortable method of disinfection. Methodologically, the sampling was carried out on surfaces of 6 houses of interest at the level of the home bathrooms in Cuenca - Ecuador, using swabs. Stuart medium was used to transport the samples. Bacterial identification was carried out using the semi-automatic RapID one method and conventional biochemical tests to determine the existence of pathogens. In addition to conducting a review of the state of the art for the selection of the best disinfectant and in turn the appropriate disinfection mechanism. Among the results obtained, the presence of pathogens is observed in the following percentages, 55% *Escherichia coli*, 18% *Proteus mirabilis*, 15% *Enterococcus faecalis*, 5% *Klebsiella aerogenes*, 5% *Staphylococcus coagulase negative* and 2.5% *Morganella morganii* in the different areas of the bathrooms where the samples were collected. The best disinfectant is determined to be quaternary ammonium used by means of a mist disinfection mechanism. The presence of microorganisms in areas that are used daily has consequences for the health of the inhabitants, for this reason, it is advisable to use quaternary ammonium to carry out the disinfection mechanism by nebulization, which is capable of eliminating 99.9% of these agents, guaranteeing a healthy environment without causing damage to its habitual occupants.

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HABITABILITY AND HYGROTHERMAL COMFORT ANALYSIS OF SOCIAL INTEREST HOUSES IN ECUADOR, TEMPERATE CONTINENTAL CLIMATE ZONE

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ABSTRACT

Housing plays an essential role in the development of world societies, but there is also a serious problem in terms of its ability to access, which is why it is necessary to present solutions that help reduce the housing deficit, as well as saving money. economic resources, with low-income housing being the mechanism to meet this objective. This type of housing, like the rest, requires satisfying characteristics of housing comfort, arising the need to study them to present results that contribute to their improvement. The objective of this research is to propose functional and hygrothermal improvements for social interest housing, within the temperate continental climate zone, by simulating habitability conditions using the Design Builder software and comparing the results with the application of recommendations. passive bioclimatic plants that, in addition to contributing to the quantitative housing deficit, achieve qualitative contributions, in order to improve the living conditions of people with limited economic resources in the country, who are direct beneficiaries of housing projects of these characteristics. In this research, the hygrothermal and habitability conditions of social interest housing were analyzed, of the Manuela Espejo Housing Project, year 2018, promoted by the Ministry of Urban Development and Housing, aimed at people with disabilities, the project is located in the canton Azogues, province of Cañar. The research approach is of an applicative nature, with a sectional scope and explanatory depth, based on primary and secondary information sources, whose data collection techniques were the surveys used to determine the perception of comfort of the inhabitants and supported by the documentary analysis, it was possible to analyze and establish housing and comfort improvements. The results of the present investigation show, based on the tests carried out, improvements in terms of habitability conditions, the result of an architectural proposal that compiles passive bioclimatic recommendations focused on the design of social housing in Ecuador. Therefore, this research contributes to the implementation of new social housing plans that not only help to reduce the housing deficit, but also contribute to improving the housing comfort within these buildings.

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AIR PURIFYING LATTICE THROUGH IONIZATION

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ABSTRACT

Within the city of Cuenca, located in the south of Ecuador, there are houses located around industrial zones, with high vehicular traffic, among others. These sectors are characterized by a high level of pollution (NO2, CO, CO2, PM 2.5) in relation to sectors that are located around green areas. As there is no system to reduce the emission of polluting gases, the population is affected by their impact on their health, especially children under two years of age and older adults. The diseases caused by this problem generally affect the respiratory tract. Through this research, it has been sought to generate an alternative solution to this environmental pollution within homes, it focuses on the purification of air from outside, reducing the mortality rates caused by respiratory diseases. Within this project, two investigative methodologies have been used; The first is the Documentary Analysis of secondary sources, in which the main air pollutants inside and outside the homes were determined, as well as the information on ionization and dissociation of gas molecules caused by combustion in vehicles and the city's industries, the data was obtained from scientific journals published in the last ten years, and municipal reports on the air quality of the city of Cuenca. The second Methodology is Design Thinking that allowed to establish the design of the air purifying lattice, this Innovation methodology has as phases; empathy, interpretation, ideation, and the prototype. As results, a prototype of an air purifying lattice was obtained, which serves as a filter, the same one that adapts to the windows of homes exposed to polluting gases. As soon as the prototype is linked to the electrical network of the houses, it activates a mesh, which performs the ionization and dissociation of CO2 molecules among other gases, allowing a large percentage of O2 molecules (purified air) to pass through. In conclusion, the design of this accessory allows to eliminate particles suspended in the air by means of an ionization system in order to improve the quality of the air that enters buildings and urban homes, thus avoiding respiratory diseases and therefore a decrease in the mortality from these causes. The proposed accessory considers that the air is not only affected by pollution, but by many components that significantly affect health, such as ions, which are electrically charged air particles, which is why it is considered that the ionization of the air It is a process in which electrons are gained or lost from molecules that are in atmospheric polluting gases. In this way, the air purifying lattice can be adapted to all homes regardless of their location close to city traffic and industries.

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SUSTAINABLE MOBILITY ACCIDENTALITY ANALYSIS IN URBAN PARISHES OF CUENCA

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ABSTRACT

Per the World Health Organization 1.25 million people die from traffic accidents. These cause high economic and social costs, in Ecuador the cost per deceased person is around $ 200,000 dollars. It is for this reason that the authorities must carry out studies that detect early the causes that produce road accidents, so that corrective measures are implemented to minimize losses. The reason for carrying out this research is to raise the level of safety of the roads of the Cuenca canton by detecting those variables that cause many accidents. The accident rates of each of the fifteen urban parishes will be analyzed, identifying the three parishes with the highest levels to later study the 5 critical points of each one. Information on the state of the road, horizontal signs, vertical signs and traffic lights will be collected from each of them to determine if the causes of the accidents correspond to the poor condition or operation of any road component. Once the problem or problems have been detected, changes and / or improvements to them are suggested. It is concluded that the two main causes of accidents are not respecting traffic signs and driving under the influence of alcohol, narcotic or psychotropic substances. The method used to determine the Road Condition Index is easily applicable, since it does not require any special equipment and the results obtained are reliable. At critical points, the main problems encountered regarding the condition of the road are: lack of roughness, presence of cracks and potholes. At critical points in relation to the status of the signaling, all intersections present problems in horizontal signaling, which is recommended should have a preventive and routine maintenance program throughout the year, evidencing that it is done when the signaling is very deteriorated.

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PROPOSAL FOR A SYSTEM OF COMMUNICATION AND TRANSFERENCE OF INFORMATION, REQUIREMENTS OF CONSTRUCTION INDUSTRY IN CUENCA

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ABSTRACT

The traditional construction industry and it's not very innovative methods used in the different construction processes, its inefficient communication systems that are commonly affected by the geographical distance that separates the headquarters from the execution of the project; They have caused changes to modifications of construction designs not to be complied with, or carried out on time due to the long chain of human resources involved, to this is added the large amount of information that is generated during the construction phase; causing problems in meeting the work schedule and raising the final budget. This study focuses on determining the characteristics and necessary requirements of a communication and information transfer system for the construction industry in Cuenca; by means of the existing bibliographic review and the compilation of information through surveys directed to a certain number of professionals in the construction branch of the city. The proposed system focuses on keeping all the areas that commonly participate in the execution of a project communicated, regardless of their geographic location; The central base allows the participants to be alerted to possible constructive changes and to store information generated throughout the execution of the project. The assigned participants will be responsible for the information entered by configuring a password, user and type of position. The inclusion of web technology for the coordination of changes and information transfer between all the active areas of the project allows keeping files and information updated, autonomous and truthful throughout the execution of a project, increasing productivity by 30%.

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COSTEO, ADOBE TECHNIQUE AS A SUSTAINABLE CONSTRUCTION SYSTEM IN THE CITY OF CUENCA

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ABSTRACT

Adobe is an old material used in construction, but with the passage of time the construction system has lost space and preference among the population, therefore, it becomes necessary to look for alternatives, techniques and professionals linked to the construction area to promote the use of ancestral construction systems. In Ecuador, given the climatic biodiversity conditions, the volcanic permeability and the geological faults that are common in the southern zone, they are the motivation to perfect the ancestral construction systems. Well, the concepts of sustainability applied to infrastructure houses with adobe, hand in hand with the relevant cost, make clear the problem that is not addressed and updated with the construction market conditions. Well, the low costs that adobe construction can represent, its insulation characteristics and temperature variation control must be added to an efficient analysis of unit prices. Thus, the present study carried out a cost of the items that are incurred in the construction of houses from the abobe, taking as a basis the theoretical references, an analysis of unit prices is established that identifies the particularities of the system, in this way, the study has an analytical, descriptive-conclusive approach whose data are analyzed from the results applied in surveys (n = 96) to the inhabitants of the rural sector of Cuenca and construction experts (n = 11). The average price of adobe house construction is $ 38,357.23 for a 150 m2 house, considering that real costs and construction activity are sensitive to changes in population and market prices.

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EVALUATION AND ANALYSIS OF UNIT PRICES OF THE EL TAPIAL CONSTRUCTION SYSTEM

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ABSTRACT

The tapial is part of the traditional construction worldwide, which uses environmentally friendly materials of natural origin such as raw earth, wood and water for its manufacture. The construction technique was used for the construction of habitable spaces, which are part of the ancestral construction system of our country; Despite the above, no updated studies on the costs required in the construction process have been identified in Ecuador. This is mainly due to the constant development of new technologies that introduce new construction systems to the market that use industrialized materials for their manufacture. Therefore, this document evaluated and analyzed the unit prices of the items involved in the construction of works using mud as its main component. Field and exploratory research was applied, through the application of surveys to a sample of 97 professionals of Civil Engineering and Architecture in the city of Cuenca, as well as 30 professionals with experience in construction of the indicated construction system. The Unit Price Analysis determined that the average cost of a 140 m2 typical house is $ 46,236.64 with an estimated cost of $ 330.26 per square meter; Similarly, the study determined a maximum cost of $ 53,172.14 USD with a value of $ 379.80 USD per square meter and a minimum value that represents $ 39,301.14 with a cost per square meter of $ 280.72.

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BAHAREQUE AS A SUSTAINABLE CONSTRUCTION SYSTEM. ANALYSIS OF UNITARY PRICES

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ABSTRACT

The bahareque is a form of vernacular construction that, with the help of modern materials with adequate techniques and knowledge, constitute an alternative to provide housing solutions. Despite this, the lack of knowledge and technical processes in relation to costs, gives rise to a research problem. Thus, this document presents a set of technical strategies based on the Cost-Benefit analysis of using bahareque as a raw material and structuring a unit price analysis tool to guide construction professionals. The study had a qualitative and quantitative approach, surveys were applied to the population and professionals in the construction area that allowed to approach the reality of the construction system in the city of Cuenca-Ecuador. It is evident that people know about the construction system, but show some resistance to its application because they are unaware of the advantages and disadvantages of the vernacular technique. With the cost analyzes carried out, it is concluded that a typical house of 130 m2 has a cost of $ 36,387.72 dollars; which, starts from concrete foundations, which support a reinforced masonry assembly that raises the wooden frames, associated with meshes that erect the walls with mortar and finally covered with roofs with a mixed material of wood and tile fired with clay.

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COMPARISON OF HYGROTHERMAL COMFORT AND LIFE CYCLE BETWEEN RECYCLED PLASTIC BLOCKS (PET) AND CONCRETE BLOCKS IN A SOCIAL TYPE HOUSING IN THE CITY OF CUENCA

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ABSTRACT

The qualitative and quantitative housing deficit in the city of Cuenca Ecuador is high, to provide help to the homeless, the Ecuadorian government decreed the Casa Para Todos project in 2018. This type of housing focuses on providing an accessible alternative for people with limited resources, however, the type of housing that is granted does not comply with the conditions and materials that guarantee the comfort of the users. Additionally, there is a large percentage of plastic garbage that is collected every day by the city's cleaning system, part of it is recycled and another part is deposited in sanitary landfills due to poor handling within the recycling chain and process. The main objective of this research is to determine the hygrothermal comfort and life cycle of a housing prototype with recycled and processed plastic material for the manufacture of modules that together form the walls of the proposed houses. To achieve the proposed objective, traditional concrete block systems are compared to recycled PET plastic walls, using the K coefficient (thermal conductivity) in the Desing Builder software, obtaining simulations of hygrothermal comfort and relative humidity. As a complement to the research, the analysis of the life cycle and environmental impact was carried out with the Sima Pro software. As results of the simulations, it was obtained that the relative humidity in the analyzed environments, parents' bedroom and living room, has a value of between 40 and 60% in the two construction systems, being within the comfort ranges. The internal temperature in the concrete block system fluctuates between 15 to 20 ° C while with the recycled PET block it is in the ranges of 17 to 20 ° C, which allows evidence that the house made up of recycled PET blocks has higher thermal gain in prolonged periods during the day and that the concrete block house has great heat losses due to the porosity of the material, so the use of recycled PET plastic blocks is recommended; deepen research on the life cycle and its environmental impact, as the results indicate that the recycled PET plastic block has a greater environmental impact in its life cycle than the concrete block.

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APPLICATION OF BIM MANAGEMENT IN THE WATER CONDUCTION CHANNEL OF THE CHICTICAY-PAUTE IRRIGATION SYSTEM

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ABSTRACT

This research proposes the implementation of the BIM management methodology in civil projects (linear infrastructures), specifically in the conduction of the Chicticay-Paute irrigation system that is supplied by a free surface channel that conducts 300 liters per second and irrigates approximately 1000 he has; which would allow to optimize material and human resources, and therefore costs through efficient construction obtained by said method. For the research, a survey was carried out with different BIM, hydraulic and road specialists who are involved in BIM management worldwide, this survey allowed to identify the programs that are used in the area of linear infrastructures. In addition, an investigation of the state of the art in the field of knowledge of civil infrastructures was carried out, determining the level of maturity of BIM in different countries. From the data obtained in the surveys, as well as the state of the art, it was possible to verify which are the accessible and optimal programs within our reach to obtain the expected results, the dimension to which it was designed and a methodology for the development of the 4D dimensions and 5D. With the defined programs, a channel section was modeled and the exact items were quantified to optimize the resources and time of the Chicticay-Paute irrigation system up to the 3D dimension and an explanation of said methodology for the development of the 4D dimension and 5 D. From the research carried out, it can be verified that it is necessary to implement the BIM management methodology applied to hydraulics in irrigation systems conduction lines (canals) to optimize resources and time.

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SUSTAINABLE URBAN MOBILITY PROPOSAL FOR THE CANTON SÍGSIG, AZUAY PROVINCE

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ABSTRACT

This research work was carried out with the purpose of evaluating and proposing a sustainable model of human mobilization for the urban center of Sígsig canton, Azuay province, Ecuador; attending to the displacements, means of transfer and reasons for travel. In the same way, the most frequent origin and destination were categorized, which later made it possible to directly conceive the circulation routes and their incidents with the central flow of circulation, both pedestrian and motorized. Based on the collection of information on the requirements that had to be obtained to shape a sustainable model, it was proposed as a starting point for the identification and study of human mobilization, the collection of primary information through direct interview with the analysis of transfer variants and reasons for circulation of a total of 1671 people passing through the urban center; allowing to have an approach on the most used means of travel and percentages of circulation, as well as the reference to the reasons for the trips. In the same way, based on secondary information from the PDOT (Territorial Planning Plan) of the Sígsig canton, the connection of the road axes that unload in the urban center was evidenced. Later, in the tabulation and analysis stage, the problems and their possible solutions on mobility and transfer activities were determined, prioritizing the means of transport used. Finally, it was found that a large part of the population tends to move on foot, followed by the use of commercial and private public transport, with a maximum of five passengers. In addition, the most frequent reasons for transfer are for study and work activities; activities that fully influence mobility, therefore, a model based on public transport is recommended that provides service to the most demanding sectors, based on the existing road pattern without breaking into the urban center.

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MICROZONIFICATION OF FLOOR WITH SLIDING IN NULTI PARISH

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ABSTRACT

Soil instability are problems that occur worldwide. These phenomena are generated by different causes: morphological, geological, climatic characteristics and the destabilizing effects induced by human activity. Therefore, it is important to monitor these events, understand their behavior, the causes that generate it, and mitigate this problem. Cuenca is located on three areas controlled by mega faults and 14 areas at risk from landslides. One of them is the Nulti community that registers landslides in 16 subzones during the past 10 years. The waters presence on the ground is one of the causes of these earth movements, and this generated infrastructural and environmental losses. According to the update of the Development and Land Management plan, the Santa Cecilia Pasto Romero neighborhood is one of the affected areas. This community is located in the Parish Center. This place lost a considerable number of houses and equipment like educational, health, religious, administrative infrastructure, because it has landslides of great magnitude. Given these antecedents, we carried out a study that allows to know the behavior of this soil against seismic waves and identify risk areas, their properties such as soil type, allowable loads, and elasticity modulus. In this way, the risks presented by these landslides were determined from a soil profile by processing the results of the Geophysical analysis like seismic refraction tests, standard penetration, and electrical soundings. This study generates future lines of research like slope stabilization and drainage designs. This study opens the possibility of being replicated in the other parishes of Cuenca.

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CALCULATION OF SOLAR COLLECTORS FOR THE OBTAINING OF HOT WATER, APPLIED TO SOCIAL HOUSING IN DIFFERENT CLIMATE FLOORS OF ECUADOR, COSTA, SIERRA, EAST AND HIGH MOUNTAIN

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ABSTRACT

Ecuador has significant potential in the renewable energy sector, the use of solar energy is an important part of it, through this research we want to determine the savings obtained using solar collectors in different climatic floors of the country applied in the home of social interest, the study cases are located in the Pasaje Canton-El Oro Province, Cuenca Canton-Azuay Province, Chordeleg Canton-Azuay Province and Huamboya Canton-Morona Santiago Province. The methodology used starts from the determination of the demand for drinking water per user (liters / person / day) to then establish the annual energy need (Mega joules), based on the geographical location of the house, solar radiation is obtained in a horizontal plane (kwh / m2 / day) and the useful hours of sunlight, with this the annual net energy available is determined, the relation of the demand with the available energy allows to obtain the area of solar collectors necessary to meet the demand of the house in different climatic floors of Ecuador. Thus, it is specified that in warm, low-altitude areas, 2.52 to 2.62 square meters are required, while in high areas, 2.85 to 2.69 square meters are required to obtain hot water for domestic use. The savings when acquiring a solar collector for hot water ranges from $ 2,954.38 to $ 4,067.38 in a period of 8 to 10 years, which demonstrates an economic advantage and in turn is an alternative to the consumption of liquefied gas. Per the analyzes obtained in the four areas, it is concluded that it is more profitable to install a solar panel in the Sierra area, in the case of study in the Cuenca canton, generating a saving in 20 years of the investment of an equivalent 77% at a value of $ 4,067.38 and a current net available energy of 3,395.04 mega joules per year.

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RECOMMENDATIONS TO GUIDE THE SUCCESS OF THE ROAD PROJECT MANAGEMENT, ANALYSIS OF THE TRIPLE RESTRICTION

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ABSTRACT

The present work is developed in Ecuador, Province of Morona Santiago, in response to previous investigations that determined that the failure in the execution of projects is due to the deficiency in the management of the restrictions by the project director. The research constitutes a contribution to scientific knowledge on Project Management, primary factors that influence the failure of projects and recommendations for the achievement of success in road construction projects. To achieve the objective set forth in this study, the conditions under which the construction of road projects for the years 2018, 2019 and 2020 were executed and culminated in the Autonomous Decentralized Government of Morona Santiago were analyzed by the contracting modality and the causes that contributed to a certain outcome of the projects. The focus of the analysis is focused on managing the cost, time and scope constraints (triple constraint) of the projects under study. The technique that was used was the content analysis applied to the contractual files of 81 projects contracted by processes of minor amount, quotation, bidding, reverse auction and by emergency per the Ecuadorian legislation for the public contracting of works. For data recording and subsequent analysis, the information was coded, identifying causes in the contractual files that directly or indirectly affected the categories of project cost, time and scope management. The results obtained show the causes that contributed to the failure of the projects and the state in which they culminated in terms of cost, time and scope initially established. The information obtained was the basis for formulating recommendations based on good project management practices that will serve those in charge of managing road construction projects to achieve success in future projects.

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NON-DESTRUCTIVE TESTS FOR THE EVALUATION OF WELDING IN STRUCTURES WITH ULTRASOUND

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ABSTRACT

Cuenca is a city characterized by maintaining a traditionalist construction system, with its own construction style, delaying technical progress in its development. Therefore, the use of evaluations in structures is scarce and even more so the tests in the different types of welding procedures, which is why, it is omitted to detect the flaws or defects that exist in the welding before, during and after the process. manufacturing and construction. The architectural and structural design of an architectural project depends on the knowledge and application of appropriate construction systems for the Andean region. The evaluation and identification of flaws, defects and discontinuities at the weld level, in the thickness of the material, will be developed through non-destructive tests by means of the ultrasound method, thus detecting internal, subsurface and surface discontinuities. This method is characterized by using high frequency sound waves, which identify anomalies in parts, materials and especially welds, generating an echo in the ultrasound instrument identifying the record of the failure. For this procedure, the buildings greater than five floors in the city of Cuenca will be taken as a sample, with the aim of technically implementing non-destructive tests using the ultrasound method to evaluate the flaws that exist in the welds, once the existing deficiencies, it will proceed to determine if the buildings respect the AWS D1.1 Regulation. Builders must be aware of implementing the evaluation and analysis of the structures through a procedure that complies with the necessary standards, which can identify the problems that occur at the structure and welding level.

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MONITORING OF THE STRUCTURAL HEALTH OF THE BUILDING OF THE CATHOLIC UNIVERSITY OF CUENCA

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ABSTRACT

The earthquake that occurred on April 16, 2016 in Pedernales, evidenced the vulnerability of the structures, a product of ignorance or lack of application of the earthquake-resistant design. The buildings with the highest percentage of damage were reinforced concrete structures, and as they were located in vulnerable areas, they became more susceptible to collapse. The area of the Austro has a latent seismic risk, since being crossed by several geological faults, they suffer the effect of constant microseisms. Structures must be able to resist and dissipate the energy produced by earthquakes, their stability and safety action is very important to avoid human and material losses. The effect of an earthquake on a structure puts its dynamic conception to the test, since it passes from the state of rest in which it is, to experiencing a vibratory movement, gaining strength its structural behavior, since its mass and rigidity will be factors that counteract the effects produced by earthquakes. Therefore, at a global level, the question has been raised of what can be done to protect the integrity and security of structures. By knowing the fundamental vibration periods of a structure, it leads to estimate its response to a seismic movement that may occur in a locality. The present investigation was directed to determine these periods, by means of the instrumentation of the building of the Catholic University of Cuenca, with a series of triaxial accelerometers that established the acceleration of the building before environmental vibrations and / or earthquakes, with the Fourier transform the frequency and implicitly through its inverse the fundamental periods of vibration of the structure were determined.

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MODELING AND EVALUATION OF THE SEISMIC CAPACITY OF TYPICAL BRICK URM BUILDINGS OF THE HISTORICAL CENTER OF CUENCA-ECUADOR

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ABSTRACT

The Historic Center of the city Cuenca (CHC) is in the southern region of Ecuador. It is well known that our country is located on the so-called fire belt of the Pacific Ocean, this area is characterized by having generated the most important seismic events in the history of mankind. More specifically, there are records that show that in the last 200 years the city of Cuenca has been exposed to earthquakes that have produced moderate to severe damage. These reasons make it possible to establish that the city of Cuenca and specifically its historic center could present important problems in the face of significant seismic events. Much of the CHC buildings date from the mid-20th century and have used unreinforced brick masonry (MNRL) to erect their constituent walls. This work is part of the Seismic Vulnerability Project Seismic Damage Scenarios of the Built Heritage of the Historic Center of Cuenca. In the context of the vulnerability project, the objective of the work presented was to establish a family of pushover curves of three buildings of unreinforced brick masonry typical of the CHC, attending to a parametric pushover analysis. The definition of typical buildings was based on an extensive architectural and geometric characterization of the traditional built heritage of the CHC. Based on focusing the study on two-story buildings (the most common), the size of the buildings' plan area (small, medium and large area) was assumed as a base parameter. From an analysis of the variability of different geometric and mechanical characteristics, and to study their influence on the pushover curves of the three typical MNRL buildings, the following study parameters were defined: 1) Compressive strength of the masonry of brick, 2) Capacity of lateral displacement of the elements of MNRL, 3) Thickness of walls. The pushover analysis was carried out with the RUAUMOKO program. The building model responds to an equivalent portico macro-model scheme that has been formulated and validated by the authors of this article. To consider the effects that the flexible floor presents on the dynamic response of this type of structure, a lateral load pattern will be used in the AENL that takes into account the contribution of higher order vibration modes. The results will be discussed in terms of the incidence of the variability of the study parameters in the basic characteristics of the pushover curves. These results will be an essential input for the next stage of the project consisting of estimating the damage at different levels of seismic action expected in the city.

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STRUCTURAL HEALTH MONITORING (SHM) OF THE SAN JOSE BRIDGE THROUGH THE USE OF SENSORS (IoT)

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ABSTRACT

Ecuador is a small country in Latin America, but with a lot of colonial structural wealth. In 1945 the railroad arrived at the City of Biblián in the province of Cañar, for this, it had to go through several bridges, one of them the Puente San Jose. Unfortunately, the current state of the bridge is deplorable and at first glance the need for an urgent intervention is clearly evident, there is a danger both for the residents of the place and for the vehicles that travel along this important road that had to be partially closed. The structural intervention, as it is a heritage bridge, must be carried out with the same materials. This iconic bridge that serves as a link between the city of Azogues and Biblián has withstood several earthquakes and has clear accumulated damage. This predictive research proposes to monitor the structural health of the bridge to control the damage in the structural reinforcement stage. Due to the architecture of the bridge, and its accumulated damage that is transmitted in a decrease in stiffness, the use of a computational model is difficult, so it is intended to link the use of technology, through an observational non-invasive structural health study, prospective type using sensors such as triaxial accelerometers in arduino connected to Raspberri pi processors of low cost and low energy demand and through the Internet of things IoT to store data through wireless data transmission, and software opensource; With this information it will be possible to evaluate damages and control the intervention stages in the Bridge. With monitoring data and analytical and computational models, the accumulated damage to the bridge can be identified and solutions proposed to maintain its structural health while preserving its heritage identity

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FRAMEWORK OF AUTOMATION IN DRINKING WATER ANALOGUE METERS, CASE: CITY OF CAÑAR

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ABSTRACT

The present investigation sought to reduce the errors that are caused by the current method of collecting readings from analog water meters, using a computer system to collect and process the data collected from analog water meters in the City of Cañar. At present, in the world there are automatic or intelligent measurement systems for water consumption, which are very expensive to implement. Also, there are still analog measurement systems that are still installed in third world countries due to their cost, and they have not reached their useful life. The intention to reduce errors in analog systems is based on a meta-analytical study, which allows to relate the current reality of the data collection methodology with the effectiveness of automatic systems, in order to establish a hybrid solution that allows use analog meters but that reading errors are reduced through the implementation of technology. To achieve this, a reading system has been designed using mobile devices and QR code labels that were placed on each analog meter in the city of Cañar. All this is integrated through the development of an Android APP that allows the reader to read the meter's QR code and detail the user's data and record the respective readings on the institution's server. With the implementation of this pilot plan, the costs of migrating to an intelligent metering system have been reduced, which did not affect the users, nor the institution in charge of water distribution. There has been a positive response from users, because the errors produced by human intervention in collecting the information have been reduced by 12%. At the same time, the institution has better control of the personnel who carry out the reading, which ensures that the data obtained is real and reliable.

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SEISMIC VULNERABILITY DUE TO CONSTRUCTION DEFECTS

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ABSTRACT

In Ecuador, informal construction is a recurring problem, especially in small-scale constructions, as well as medium-sized constructions in which strict control is not carried out during construction, this leads to deficient constructions, which reduces the resilience of the buildings. Even though these elements were designed by a professional with experience in structural design who follows at least all the guidelines of the current standards and used the necessary tools for their conception and design. Generating a sense of false security in the building's occupants. Failures do not usually occur in the short term, no matter how pitiful the construction method was. In case of anomalies, it is considered something futile easy to cover that only has aesthetic implications. This makes even the most experienced of technicians trust themselves, committing gross mistakes that can lead to the collapse of the structure. Given the problem, the degree of vulnerability in structures due to construction defects in beams was evaluated, by means of laboratory tests with different materials and perforations, to obtain the existing pathologies, their correlation with existing models and the loss of capacity. The construction defects notably increased the seismic vulnerability of the analysed elements, with emphasis on the perforations made for hydro sanitary and electrical interns that are within the areas where the formation of plastic hinges is expected, which will have a great impact on the structure. Since they are vitally important elements in special frames, it resists for a moment, its lassitude can generate a noticeable increase in the seismic vulnerability of the structure.

SEISMIC VULNERABILITY AND RISK OF LOSSES CASE STUDY CENTER OF THE CITY OF AZOGUES

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ABSTRACT

Ecuador is located in the Pacific Ring of Fire, a country with high risk and seismic sensitivity, evidenced by the 6.8-degree earthquake in Ambato in 1949, which left approximately 6000 dead, the 7.8-degree earthquake in Manabí and Esmeraldas in the year 2016 with 663 victims and 29672 buildings without the possibility of use. Currently there is a problem about seismic performance in reinforced concrete buildings, since many were built with old regulations; so, it is necessary to assess their vulnerability. Quito, Guayaquil and Cuenca, large cities in Ecuador, have formal studies of seismic vulnerability, mostly carried out by university students and teachers. In contrast, most small cities do not have these studies; or, they need to be updated to validate their results. This is the case of the city of Azogues. The objective of this research is to evaluate the vulnerability of structures using proven methods; as is the Hazus methodology, in the downtown area of the city of Azogues, in structures located around the Central Park, to establish the seismic performance in reinforced concrete buildings. The Hazus methodology, which determines the vulnerability of buildings from fragility curves, which are entered with inputs as the capacity, performance level and drift curves calculated through Ecuadorian models. The capacity curves, depending on various aspects such as: the material, number of floors, spans between columns, among others; they vary from building to building. In this sense, capacity curves were defined for sets of buildings with similar characteristics, coinciding with the Hazus methodology. It works with 36 structural shapes, for which it has defined its capacity curves, the capacity spectrum, the performance levels and the displacements were calculated with the CEINCI-LAB computer package. Then, the results obtained were compared with those of Hazus. For fragility curves, the model that most real simulates the response of a structure is the non-linear analysis, because it considers the decrease in stiffness in columns and beams, as well as the deterioration of the properties of the materials. In this sense, there are fragility curves of Ecuadorian buildings for four levels. These curves were prepared using the non-linear analysis, with the support of the IDARC program, used in this study. The earthquake readings enable the construction of a demand spectrum, which, when contrasted with the capacity spectrum, leads to the performance point. Its position sometimes varies per the elastic demand spectrum, which is diminished by its inelastic behavior. As the demand spectrum decreases, the damage will increase. Once the coordinates of the performance point are known, the fragility curves are used; and, the possible damages are defined, quantifying them in percentage.

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SOIL STRUCTURE INTERACTION IN A RISK AREA OF A BASIN WITH USE OF MICROPILES

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ABSTRACT

The construction of buildings in risk areas is an issue of great importance that not only occurs locally, but in various places. However, these are not the most suitable for constructing buildings. The lack of a culture of self-protection has led to the development of risky construction, which means building in dangerous areas, generating that the properties and their residents are vulnerable. Likewise, the lack of studies about the special conditions of the land to be intervened and the appropriate design and construction procedures allow deficiencies, which ends in damage to the buildings, causing economic losses that not only affect the homeowner but also the conglomerate. These expenses must often be borne by the city, which must seek alternatives in relocation or mitigation of these effects. Construction in vulnerable areas in Cuenca has been underway for a long time. Towards the year 1999 there were innumerable problems in the El Carmen de Guzho sector; and the period 2018, the municipality's risk department identifies the presence of about 60 unstable sectors. This makes the construction of buildings in these demarcations a challenging and a necessary problem today. Due to the flexible behavior of soils and their depth, the need arises to investigate their characteristics in a given study area. Through field and laboratory tests and with the application of simulations analyze the interaction with the structure of a proposed building. Thus, it will be possible to propose constructive alternatives that guarantee the structural safety of future constructions in the circumscription of the studied area and therefore the tranquility of the occupants of the same. Based on the problems presented, an investigation is proposed in which the type of soil within an established area is analyzed and constructive alternatives are proposed to achieve structural safety in medium-rise buildings. This knowledge will allow to carry out soil structure interaction simulations, which will provide knowledge to search for proposals with foundations based on micro piling, and thus it will be possible to propose constructive alternatives that guarantee the structural safety of future constructions in the circumscription of the studied area, and therefore the tranquility of the occupants of it.

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BIM MANAGEMENT METHODOLOGY FOR THE DOCUMENTATION OF ARCHITECTURAL RESTORATION PROJECTS: CASE STUDY OF CUENCA - ECUADOR

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ABSTRACT

The representative built cultural heritage for the city of Cuenca- Ecuador. The autonomous decentralized municipal government of the Cuenca canton in the area determined as the historic center, has photographic files and physical architectural plans of the inventoried buildings with historical heritage character, however, since there are no digital documents of the entire historical area, it will be generated difficulties while carrying out an intervention project in heritage properties, for this reason it is proposed to integrate a BIM management methodology that adapts to architectural restoration projects, allowing the generation of 3D three-dimensional digital files with a database of each architectural element that is present in the buildings of the study site, by collecting bibliographic information about BIM processes and by analyzing similar cases, in addition to the experiences obtained in interviews with experts. The interviewees in this area will be those involved, who will provide information about the reality they face in said processes, positions that in the aforementioned labor field there are qualitative variables that should be related to variables found in the review of similar cases, which must also be used and coded in order to achieve a BIM methodology adaptable to the reality of the place of study, including the seven dimensions of BIM, thus facilitating the handling, documentation and management of an architectural intervention, or of the restorations to be carried out in the built heritage of The City. Once the analysis of the data collected in the bibliographic review and case studies has been carried out, it is conceived to adopt the BIM methodology, for architectural heritage, which can be applied according to the reality in the city of Cuenca considering the possible limiting factors, of so that these methods to be applied can be part of a possible solution to the lack of protocols that regulate the documentation of the information on the architectural heritage built.

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ECONOMIC SUSTAINABILITY FOR THE IMPLEMENTATION OF THE VEHICLE TECHNICAL REVIEW UNIT FOR THE SIGSIG CANTON AZUAY PROVINCE

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ABSTRACT

This document performs the economic sustainability study for the implementation of a vehicle technical review center in Sigsig canton, Azuay Province. In the Sigsig canton there is no private or public company that provides the vehicle technical review service, therefore the offer within the canton is zero, which requires an analysis, since at present the only existing offer of these services are in the city of Cuenca provided by the municipal company EMOV EP, on the other hand, the Constitution of the Republic of Ecuador in article 264 mentions that it is the competence of the decentralized Autonomous Governments, Metropolitan and Municipal GADs to plan, regulate and control traffic, land transport and road safety within its cantonal territory. Therefore, the main objective of this study is to carry out an economic analysis of the different components that make up a CRTV, analyzing operating and maintenance expenses, equipment implementation, technical and administrative personnel in order to make a cash flow projected at 10 years where the economic viability of the project implementation will be analyzed. The accelerated increase in the population goes hand in hand with the increase in vehicles, according to the INEC, the canton Sigsig shows a growing trend in the population in the two census periods. The intercensal growth rate to the year 2001 is 0.89% (less than 1%), while for the year 2010 there is a considerable increase that reaches 11.09%, this shows that the population increased by one tenth part in the Intercensal period 2001-2010, based on this trend and as a secondary source the registration database in the last 10 years of the Decentralized Autonomous Government of the Sigsig canton and taking as a reference the transportation laws that govern the country, The economic study is carried out in order to satisfy each of the requirements demanded by the automotive fleet of the canton, also focused on the conservation of the environment. From an economic point of view, the project to be implemented must be sustainable, that is, the cost-benefit relationship of the project must generate positive results, since another of the key points of this project is financing, this being one of the main challenges regarding the implementation of a CTRV. The implementation of a Vehicle Review Technical Center will contribute positively to the ecological footprint left by the vehicle fleet, in addition to reducing catastrophes caused by imperfect vehicle techniques.

DETERMINATION OF METAL CONTAMINATION, PRODUCED BY THE MINING COMPANY "RANCHO GRANDE" IN THE SANTA BÁRBARA RIVER, CHORDELEG CITY, AZUAY PROVINCE

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ABSTRACT

The purpose of this research is to verify if the exploitation activities in the mining concession of construction materials in the river bed contribute to contamination with metals, since these, due to their degree of toxicity, represent a potential danger to biodiversity, as well as the health of the population, since the resource is used for different purposes, such as agriculture, livestock and recreation. Of the metals analyzed, there are two that present average levels in concentrations, iron and aluminum, at sample point 1 the element values are iron with 1,355 mg / l and aluminum with 1,651 mg / l, which are the natural conditions of the elements in the river; In sample point 2, the average concentration for iron is 30.581 mg / l, while for aluminum it is 31.302 mg / l, significantly exceeding that established in Ecuadorian regulations, while for Sample point 3, the average values are 0.926 mg / l for iron and 1.202 mg / l for aluminum, where the decrease in the concentration of these elements is evidenced, this possibly because several meters downstream, in the limits of the mining concession there is an area already exploited, the same one that measures 100 m long, 15 m wide and 4 m deep from the water mirror, which possibly fulfills the function of sedimenting these metallic elements. These elements can be linearly correlated, but it does not mean that aluminum cause. The contribution of the research will allow to analyze the adequate management of the hydric basins in Ecuador

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AUSE OF RECYCLED RUBBER AS THERMAL INSULATION APPLIED IN SOCIAL HOUSING OF INTER-ANDEAN REGION

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ABSTRACT

Waste tires (WT) have serious environmental consequences, especially because of their complex degradation and space occupancy. However, they have great rubber recoverability and reuse. This study of exploratory nature and experimental depth focuses its analysis on the use of recycled rubber of WT as a thermal insulation in a single-family social housing (SFSH) located in the province of Cañar in the Inter-Andean region of Ecuador with an equatorial cold climate of high mountain. The SFSH has been selected under a discretionary non-probabilistic sampling scheme, all in order to establish a theoretical and practical framework of reference. Under the exposed approach, the methodology used comprises a historical documentary review on the thermo-physical characteristics of recycled rubber. Consequently, energy simulations are recreated in a Building Information Model – BIM – of the SFSH using Design Builder software; this actuation allows the validation of the thermal behavior of the recycled rubber and its contribution to optimal habitability conditions inside the SFSH in terms of thermal comfort. Thermal comfort results are contrasted with Fanger's comfort curve applied to SFSH users. Finally, the results obtained accomplish to highlight quantitative conclusions that validate the use of recycled rubber from WT as a thermal insulation in SFSH, and in particular they substantiate reference guidelines for sustainable construction techniques applicable to SFSH located in Ecuador's Inter-Andean region.

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EVALUATION OF THE EXPOSURE TO NOISE OF CIVIL WORKERS WHEN EXCAVING AND COMPACING WITH PNEUMATIC EQUIPMENT IN THE SEWAGE EXECUTION STAGE. CASE STUDY: CUENCA – ECUADOR

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ABSTRACT

The World Health Organization reports that one of the risks of acquired deafness is related to construction work, the workers in this industry are the most important human resource in the execution of works, however, although there are precedents that indicate that workers who are exposed to harmful levels of noise may experience hearing impairment; In the city of Cuenca, as in the whole country, executive decree 2393 governs "Regulation of health and safety of workers and improvement of the work environment", which specifies the maximum exposure time per working day, it is unknown if there is hearing loss or impairment, when carrying out excavation and compaction work with pneumatic equipment in sewerage works, for this reason a statistical-comparative study, where the General Occupational Risk Insurance provides us with the statistics of occupational diseases on a monthly, annual and general basis; the field examinations carried out on the workers of the Cuenca case study, such as an audiometry that indicates whether there is hearing loss and a dosimetry that allows us to know the equivalent continuous noise level (LAeq), personal exposure to daily noise (LEX 8h) and dose of daily noise, through these variables obtained in the statistical review, will be related to the quantitative variables obtained in the field dosimetry, which will be analyzed and exposure to which the worker is subjected during a working day will be determined. of eight hours of work and the effects that said exposure produces, this result allows the employer or constructor to determine the capacity and performance of the workers since it will reduce fatigue, pain and increase job safety.

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PERFORMANCE ANALYSIS BY WORKING DAY IN THE PLACEMENT OF TOCHANO BRICK

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ABSTRACT

Considering the current economic and social situation that we are going through, which forces construction companies in the city of Cuenca to optimize costs that allow them to be competitive in the current economic situation. Considering the different scenarios that can occur in a high-rise building, several possible scenarios are analyzed that allow the gradual increase in the performance of the workers in the placement of tochano brick, with the objective of improving the construction processes carried out in the different works of the city of Cuenca Ecuador which is where the study is carried out, with the definition of specific tasks of the workers and with the help of mechanical and seasonal equipment that directly influence the sequential increase of the units placed per day. Information is collected based on surveys carried out among construction residents and builders in charge of the personnel in the city's constructions. Subsequently, two masons are hired for a month together with a supervisor whose objective is to analyze the phases of the process of laying the brick tochano to gradually propose improvements that allow the efficiency of the workforce, during the first 15 days of work of the workers are paid daily, thus encouraging the assimilation of the improvements proposed by the supervisor. After the first fortnight, it was decided to pay per square meter of masonry, during the study period employees were given several elements and materials consecutively that would help increase their performance at work. The scope of the study is to analyze masonry performance, minimize total job execution time, and increase total crew performance globally, allowing workers to increase their income and the builder to lower construction costs.

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POSSIBILITIES OF MANAGEMENT OF FLY ASH FROM MUNICIPAL SOLID WASTE INCINERATION PLANT IN BUILDING INDUSTRY IN THE CIRCULAR ECONOMY

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ABSTRACT

To improve the condition of the environment and prevent its degradation, global trends have moved from linear to the circular economy. Closing the loop is to protect natural resources, minimize waste, emissions, and pollution. The circular economy assumptions are based mainly on the 3-R: Reduce (minimum use of raw materials); Reuse (maximum reuse of products and components); Recycle (high-quality reuse of raw materials). In the waste management hierarchy, the last place in the circular economy is energy recovery. In the process of incinerating municipal waste, secondary waste is generated. Some of them, like fly ash, are hazardous waste. It includes, among others heavy metals, chlorine, sulfur, and other pollutions, hence it is currently not used as a raw material. The management of fly ash from municipal solid waste incineration plant in the construction industry is a part of sustainable development and the circular economy. Fly ash is a hazardous and heterogeneous waste, therefore it is important to know its physicochemical and construction properties, which are presented in the article. Fly ash has pozzolanic properties, therefore it can be a good binding and building material. For fly ash to be a component of the construction mixture, it is necessary to immobilize pollutants, heavy metals, and some elements so that they do not leach into the environment. For this purpose, the concrete structure and the C-S-H matrix should be compacted. Currently, fly ash is stabilized and stored in underground landfills. They are storage in closed salt, manganese, and potassium mines. However, the volume of post-mining voids is limited, and storage is not part of the circular economy. In addition, some countries do not have their fly ash storage facilities and it has to be exported across borders. This increases the carbon footprint and shortens the product life cycle.

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EVALUATION OF WATER RETENTION CURVES BY REGRESSION AND MACHINE LEARNING METHODS

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ABSTRACT

While solving various ecological and agricultural studies and projects in the landscape, an important variable that determines the properties and processes of the environment is soil moisture. Modelling of this variable is used as an essential tool in, e.g., land drought management or groundwater issues. E.g., irrigation management involves a systematic estimation of the soil-water status to determine both the appropriate amounts and timing of irrigation Characteristics of soil water regime are possible to determine by two methods. Generally accepted method is a method of the direct monitoring of soil moisture in a given area. However, complete monitoring of soil moisture on agricultural soils in Slovakia wasn't done. The situation in many other countries is often similar and usually, only some information published in research studies and scientific works related to irrigation, ecology, hydrology and pedology incompletely maps the situation. Monitoring of the soil water regime is time consuming activity. The alternative method for the determination of soil water regime (SWR) could be achieved by mathematical modelling. Using models depends on the availability of input data. Some input data - meteorological, climatic, hydrologic or crop characteristics are usually well available in corresponding institutions. On the opposite, the soil water properties appear as the key problem in the numerical simulation of SWR. From data needed, mainly the water retention curve (WRC) is usually not available. This work is dedicated to the determination of WRCs without using laboratory procedures, based on various easier available soil properties, e.g., particle size distribution, dry bulk density, organic C content, for example. This methodical approach, which is based on the supposed dependence of the soil water content on various easier obtained characteristics uses regression techniques, such as linear regression. Obtained functions are named pedotransfer functions (PTFs). Authors compared in this work multiple linear regression and machine learning method called support vector machines. The case study was accomplished for soils of the Záhorská lowland region. For creating of WRCs, the database of 140 soil samples from this area was used. This database consisted of WRCs points estimated in the laboratory, particle size distribution and dry bulk density. In both regression methods, the dependence of the soil water content on the amount of 1^{st}, 2^{nd}, 3^{rd} and 4^{th} grain categories (according to Kopecky classification) and dry bulk density for assessment of PTFs. Obtained PTFs were tested against measured WRCs of soils of Záhorská lowland. From the analysis of the results could be evaluated, that assessment of drying branch WRC points it is possible by using both methods but SVM offers more precise results. Using MLR and SVM significantly simplifies and speeds up the assessment of WRCs, which are the basic input to mathematical models of soil water regime.

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A COMPETENCY MODEL OF THAI SME CONTRACTORS FOR OWNER SATISFACTION IN CONSTRUCTION PROJECTS

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ABSTRACT

For construction projects, service quality involves the project owners' perception of the process in terms of interactions, activities, and the attainment of acceptable levels of performance from construction activities. The competency of contractors includes the personality hidden within them and that can drive them to perform well or meet the criteria set in the construction projects for which they are responsible. The purpose of this study was to formulate a competency model for Thai SME contractors undertaking construction projects in northeast Thailand in order to influence the satisfaction of project owners by using a structural equation model (SEM). A total of 198 questionnaires that were completed and returned by project owners were analyzed to confirm the model. The research found that the competency of contractors comprised three factors, namely: (1) knowledge, (2) skills, and (3) attributes. Guidelines for strategies to improve the competency of Thai SME contractors are discussed and presented in the results of this research paper.

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