ISBN 978-86-80297-97-2

IX INTERNATIONAL CONFERENCE CONTEMPORARY ACHIEVEMENTS IN CIVIL ENGINEERING

BOOK OF ABSTRACTS

SUBOTICA 2024

UNIVERSITY OF NOVI SAD
FACULTY OF CIVIL ENGINEERING SUBOTICA

For the publisher:	Prof. dr Milan TRIFKOVIĆ, Dean
Editors:	Prof. dr Vukan OGRIZOVIĆ Doc. dr Smilja BURSAĆ Doc. dr Jelena TATALOVIĆ
Organizing Committee:	Doc. dr Smilja BURSAĆ Doc. dr Olivera DULIĆ Doc. dr Milena GRBIĆ Doc. dr Dušan JOVANOVIĆ Prof. dr Ljiljana KOZARIĆ Prof. dr Vukan OGRIZOVIĆ Milica PAVIĆ Ramona PETROV Doc. dr Mila SVILAR Doc. dr Jelena TATALOVIĆ Prof. dr Martina VOJNIĆ PURČAR
Technical processing:	Doc. dr Smilja BURSAĆ Doc. dr Milena GRBIĆ Milica PAVIĆ Ramona PETROV
Publisher	University of Novi Sad, Faculty of Civil Engineering Subotica Kozaračka 2a, 24000 Subotica, Serbia URL: conference.gf.uns.ac.rs e-mail: konferencija@gf.uns.ac.rs
Book circulation:	200 copies
ISBN:	978-86-80297-97-2
Print:	Birografika MB, Subotica

Scientific Committee

Dr Biljana Antunović, University of Banja Luka, Faculty of Architecture, Civil Engineering and Surveying

Dr Teodor Atanacković, SANU

Dr Gyorgy Balazs, Budapest University of Technology and Economics

Dr Meri Cvetkovska, University "St. Cyril and Methodius", Faculty of Civil Engineering

Dr Saša Čvoro, University of Banja Luka, Faculty of Architecture, Civil Engineering and Surveying

Dr Domagoj Damjanović, University of Zagreb

Dr Radomir Folić, University of Novi Sad, Faculty of Technical Sciences

Dr Jovo Jarić, University of Belgrade, Faculty of Mathematics

Dr Vojkan Jovičić, University of Ljubljana

Dr Miloš Knežević, University of Montenegro, Faculty of Civil Engineering

Dr Miloš Kojić, SANU

Dr Srđan Kolaković, University of Novi Sad, Faculty of Technical Sciences

Dr Hrvoje Krstić, Josip Juraj Strossmayer University in Osijek

Dr Nađa Kurtović-Folić, University of Novi Sad, Faculty of Technical Sciences

Dr Vladan Kuzmanović, University of Belgrade, Faculty of Civil Engineering

Dr Duško Lučić, University of Montenegro, Faculty of Civil Engineering

Dr Goran Markovski, University "St. Cyril and Methodius", Faculty of Civil Engineering

Dr Siniša Mesarović, Washington State University, School of Mechanical and Materials Engineering

Dr Jasna Plavšić, University of Belgrade, Faculty of Civil Engineering

Dr Dušan Prodanović, University of Belgrade, Faculty of Civil Engineering

Dr Marina Rakočević, University of Montenegro, Faculty of Civil Engineering

Dr Dragoslav Šumarac, University of Belgrade, Faculty of Civil Engineering

Dr Slaviša Trajković, University of Niš

Dr Rade Vignjević, Brunel University

Dr Aleksandar Sedmak, University of Belgrade, Faculty of Mechanical Engineering

Dr Boris Podreka, SANU

Dr Mladen Zrinjski, University of Zagreb, Faculty of Geodesy

Dr Dragan Kuzmanović, University of Belgrade, Faculty of Transport and Traffic Engineering

Dr Goran Šimunović, University of Slavonski Brod, Mechanical engineering Faculty

Dr János Major, University of Debrecen, Faculty of Engineering

The International Conference on Contemporary Achievements in Civil Engineering, taking place in Subotica, Serbia, from April 25 to 26, 2024, is set to explore the latest innovations and forward-thinking ideas in civil engineering, architecture, and geodesy. This ninth edition of the conference is a platform for experts to share research, designs, and practices that push the boundaries of the field, offering a glimpse into the future of civil engineering.

The conference significantly contributes to the scientific community by serving as a forum for the presentation and discussion of the latest research, innovations, and practices within civil engineering and corresponding fields. It emphasizes the exchange of knowledge and ideas that foster scientific advancement and the application of new technologies and methodologies in the field, thereby playing a crucial role in shaping the future of civil engineering disciplines.

This year's conference is particularly momentous as it coincides with the 50th anniversary of the Faculty of Civil Engineering in Subotica. This landmark occasion not only celebrates half a century of academic and professional excellence but also reflects on the significant contributions the faculty has made to the field of civil engineering. The conference, in this celebratory year, stands as a testament to the faculty's enduring legacy and its commitment to advancing civil engineering.

Therefore, we wish to thank all the authors who have submitted their papers. Your contributions are invaluable to the scientific community and the success of this conference. Your research, insights, and dedication to advancing civil engineering, architecture, and geodesy help pave the way for future innovations and achievements. We are grateful for your participation and look forward to your continued engagement with our community.

Organizing Committee

CONTENTS

I INVITED PAPERS

RESPONSE SPECTRA OF RECORDING OF VRANCEA EARTHQUAKES OF 1977 AND 1986

Boris Folić[1], Miloš Čokić [2*], Radomir Folić [3]

[1] Inovacioni centar Mašinski fakultet. Beograd. Serbia
[2] Termoenergo Inženjering. Beograd. Serbia
[3] University of Novi Sad. Novi Sad. Serbia

[*] corresponding author: folic@uns.ac.rs

UDK: 550.34.016
DOI: 10.14415/CACE2024.01

ABSTRACT

Response spectra are used in the design of seismically resistant structures, and evaluation of (ground motion records) accelerograms. The spectrum represents the set of maximum responses of a series of systems with one degree of freedom (SDOF) using the method of linear dynamic analysis. The aim is to use the spectrum to cover as much of the frequency range of the respective location as possible. The paper discusses the response spectra of the Vrancea earthquake records in 1977 and 1986 and one spectrum of the Imperial Valley. These diagrams-spectra indicate the possibility of significant amplifications of structures and the occurrence of resonance effects if the natural period of the structure coincides with the maximum values of the spectrum. The positions of the Vrancea 86 measuring stations are in different locations and soil-structure conditions, but they are arranged on the semicircle of the Carpathians. The theoretical foundations of response spectra including the Fourier transform (FT) and inverse transform (IFT) as well as fast FT (FFT and IFFT) are briefly commented.

KEYWORDS:

RESPONSE SPECTRA, SDOF, FAST FOURIER TRANSFORM FFT, VRANCEA 86, VRANCEA 77, SEISMOSPECT

IMMOVABLE CULTURAL GOODS IN THE CONTEXT OF ECONOMIC SELF-SUSTAINABILITY – A CASE STUDY OF THE FORTRESS IN NIŠ

Nataša Živaljević-Luxor[1], Nadja Kurtović-Folić[2*]

[1] PE Urban Planning Institute, Nish, Serbia
[2] Faculty of technical sciences, University of Novi Sad, Serbia
[*] corresponding author: nfolic@gmail.com

UDK: 725.182:338.2(497.11 NIŠ)
DOI: 10.14415/CACE2024.02

ABSTRACT

The fortress of Niš has been the subject of detailed urban arrangement since 1983 indicating that the importance of planning this area was recognized by the society and the city authorities. The fortress, in its legally protected limits, covers an area of about 65 ha of the inner-city centre. It literally is the “city core”, because the entire city of Niš has developed, over 20 centuries, in response to it and the bed of the River Nišava. In this paper, we reviewed the achievements of the planning so far, the trends, as well as strategic planning goals. The fortress is considered part of the network of immovable cultural assets in the city area with the potential for economic self-sustainability. The desired increase in income from immovable cultural goods, as one of cultural industries with immense, yet unused, resources at disposal, and additional employment will certainly have a favourable impact on overall social development of the city.

KEYWORDS:

IMMOVABLE CULTURAL GOODS, BUILT HERITAGE, ECONOMIC SELF-SUSTAINABILITY

ON THE APPLICATION OF THE DOUBLE-AVERAGING METHODOLOGY IN MODELLING VEGETATED OPEN-CHANNEL FLOWS

Dejana Đorđević[1*]

[1] University of Belgrade, Faculty of Civil Engineering, Belgrade, Serbia
[*] corresponding author: dejana@grf.bg.ac.rs

UDK: 532.51:519.6
DOI: 10.14415/CACE2024.03

ABSTRACT

The double-averaging methodology (DAM) arose to respond to a need to provide a mathematically rigorous tool for describing spatially heterogeneous turbulent flows. Initial developments originate from micrometeorologists who revealed notable discrepancies between measured and simulated temperature and moisture fields above trees when using only Reynolds-averaged Navier-Stokes (RANS) equations with various turbulence model closures. The discrepancies were attributed to the spatial inhomogeneity of the flow field caused by vegetation. Thus, additional spatial averaging of RANS equations over horizontal planes sufficiently large to provide statistical averaging of all differences caused by an arbitrary distribution of plants and the influence of the biggest vortices responsible for the transfer of momentum was suggested. The advantages of using the DAM in open-channel hydraulics of gravel-bed rivers were recognised in the early 2000s when DAM was first applied and consequently improved. Open-channel vegetated flows are another example of spatially heterogene¬ous turbulent flows to which the DAM can be applied. The paper presents the results of the DoubleVeg project led by the author, in which a new set of equations was derived. After introducing the basic DAM concepts, the procedure of deriving Depth-Integrated Double-Averaged Navier-Stokes equations is presented. Consequently, the main challenges in solving these equations are discussed, and the results of initial testing of systems of homogeneous and non-homogeneous equations are shown.

KEYWORDS:

SPATIALLY HETEROGENEOUS FLOWS, REPRESENTATIVE AVERAGING VOLUME , POROSITY, DOUBLE AVERAGING, DIDANS EQUATIONS, ADAPTED ROE'S METHOD

DESIGN OF TIMBER STRUCTURES IN THE LKV SYSTEM

Žikica Tekić[1*]

[1] University of Belgrade, Faculty of Architecture, Belgrade, Serbia
[*] corresponding author: ztekic@arh.bg.ac.rs

UDK: 624.011.1.072.2
DOI: 10.14415/CACE2024.04

ABSTRACT

The LKV system (Lightweight Roof Girders) is a prefabricated, industrialized system that can be applied in the prefabricated construction of timber roof structures. LKV system consists of timber trusses of different shapes and different static systems, and their application can be in objects of different purposes. The structural design of timber structures in the LKV system is based on the basic principles of LKV design and the basic principles of functional organization of structures of various types of pitched roofs. Software design is an integral part of the process of creating project documentation, and it implies the use of computers for the purpose of automatic data processing and the possibility of choosing a number of variant solutions. The software package for the automatic structural design of lightweight roof trusses is a specialized design software for calculation of timber structures in the LKV system. Calculation of girders in the LKV system is carried out according to the limits states, and includes load analysis, static analysis, dimensioning of the truss elements, as well as the dimensioning of the connections, everything according to the Eurocode 5.

KEYWORDS:

timber structures, LKV system, steel connectors, software design, Eurocode 5

APPLICATION OF UNMANNED AERIAL VEHICLES FOR LEGALIZATION OF BUILDINGS

Siniša Delčev[1*], Olivera Vasović Šimšić[2], Jelena Gučević[1]

[1] University of Novi Sad, Faculty of Civil Engineering Subotica, Subotica, Serbia
[2]Academy of Technical and Art Applied Studies Belgrade, Department School of Civil Engineering and Geodesy of Applied Studies, Belgrade, Serbia
[*] corresponding author: delcevs@gf.uns.ac.rs

UDK: 519.2:627.8.09
DOI: 10.14415/CACE2024.05

ABSTRACT

Thanks to the development of technology, Unmanned Aerial Vehicles (UAVs) become affordable and easily available to a large number of users and can be used for various purposes. There is a wide range of types of UAVs, both in terms of size and the equipment that is mounted on them. The size of UAVs has an impact on the possibility of using them without the necessary flying permits, so-called: low-altitude flights that can be used for flying over the smaller land areas. Built-in equipment affects the application of UAVs. UAVs equipped with ultraviolet and thermal cameras can be used in agriculture, while photo cameras and Light Detection and Ranging (LiDAR) scanners are used for wide range of purposes, among which are surveying purposes. In Serbia, an issue often discussed in the media is the legalization of illegally built objects. The Law on building legalization was adopted to reduce the number of illegal objects in Serbia, because in the previous decades, numerous illegal construction was built and this issue needs to be solved in the near future. This law allows that UAV technology can be used for surveying purposes of illegally built objects and its legislation purposes.

KEYWORDS:

Unmanned Aerial Vehicles, object legislation, Real Estate Cadas

II CIVIL ENGINEERING

PLASTIC BENDING RESISTANCE OF COMPOSITE BEAMS ACCORDING TO SECOND GENERATION EUROCODE 4

Milan Bursac[1*], Svetlana M. Kostic[1]

[1] University of Belgrade, Faculty of Civil Engineering, Belgrade, Serbia
[*] corresponding author: bursacmilan4@gmail.com

UDK: 624.072.2:539.3
DOI: 10.14415/CACE2024.06

ABSTRACT

The paper discusses changes related to the calculation of the plastic resistance moment of a composite beam according to the second generation Eurocode 4. An efficient algorithm for determining the resistance moment through nonlinear analysis is presented, considering the limitation of compression strain in concrete. A comparison of results obtained using the first generation Eurocode 4 with calculation methods based on the second generation Eurocode 4 (rigid-plastic and nonlinear analysis) is conducted for a characteristic cross-section of a beam with a steel I-profile coupled with a solid concrete slab using ductile connectors and a full shear connection.

KEYWORDS:

FULL SHEAR CONNECTION, DUCTILE SHEAR CONNECTORS, PLASTIC BENDING RESISTANCE

CRITICAL VOID VOLUME FRACTION OF CONCRETE

Dragan D. Milašinović[1], Smilja Bursać[1*], Nataša Mrđa Bošnjak[2], Arpad Čeh[1]

[1] Faculty of Civil Engineering Subotica, University of Novi Sad, Kozaračka 2a, 24000 Subotica, Serbia
[2] Faculty of Architecture, Civil Engineering and Geodesy, University City, Bulevar vojvode Petra Bojovica 1, 78000 Banja Luka, The Republic of Srpska, Bosnia and Herzegovina
[*] corresponding author: bursacsmilja@gmail.com

UDK: 539.3/.4:666.972
DOI: 10.14415/CACE2024.07

ABSTRACT

The aim of this work is to theoretically and experimentally determine the critical void volume fraction of hardened concretes at the failure using a rheological-dynamic theory. The experiment involved testing the static compression of standard cylindrical samples. Dynamic stress-strain curves were determined by rheological-dynamical analogy (RDA). Changes in dynamic Poisson's ratio, creep coefficient, critical damage variable, modulus of elasticity and strength as a function of porosity are defined by P and S wave velocities. The fracture porosity, also called critical void volume fraction, is related to failure mechanisms of sample. In this paper, failure mechanisms related to axial splitting and shear failure of concrete samples are assumed.

KEYWORDS:

POROUS HARDENED CONCRETE, VOIDS, RDA, STATIC COMPRESSION, DYNAMIC STRESS-STRAIN CURVES

MODELLING OF POROUS METALS BY RDA-PT MODEL

Dragan D. Milašinović[1], Smilja Bursać[1*], Aleksandar Pančić[1]

[1] Faculty of Civil Engineering Subotica, University of Novi Sad, Kozaračka 2a, 24000 Subotica, Serbia
[*] corresponding author: bursaćsmilja@gmail.com

UDK: 539.3/.4:669.018
DOI: 10.14415/CACE2024.08

ABSTRACT

A theoretical model for porous viscoelastoplastic (VEP) materials is examined based on the principles of mass and energy conservation using rheological-dynamical analogy (RDA). The model provides the expressions for the creep coefficient, Poisson's ratio, modulus of elasticity, damage variable and strength as a function of porosity and/or void volume fraction (VVF). Compared with numerous versions of acoustic emission monitoring developed to analyse the behaviour of the total wave propagation in inhomogeneous media with density variation, the RDA is found to be comprehensive in interpretation and consistent with physical understanding. The reliability of the proposed rheological dynamic-percolation (RDA-PT) model is confirmed on metals by the comparison of numerical results with experimental ones.

KEYWORDS:

POROSITY, RDA-PT MODEL, WAVE PROPADATION, DENSITY VARIATION, CREEP EFFECTS, CRACKS

FFT ANALYSIS AND FILTERING OF OSCILLATING RESPONSE SIGNALS OF A SIMPLE WOOD GIRDER IN A VERTICAL PLANE

Ilija M. Miličić [1*], Ivana I. Miličić [2], Aleksandar D. Prokić [1]

[1] University of Novi Sad, Faculty of Civil Engineering Subotica, Kozaračka 2a, 24000 Subotica, Serbia,
[2] University of Novi Sad, Faculty of Technical Sciences, Dr Sime Milošević 12, 21000 Novi Sad, Serbia
[*] corresponding author: milicic@gf.uns.ac.rs, ilija.m.milicic@gmail.com

UDK: 519.876.5: 624.042.7
DOI: 10.14415/CACE2024.09

ABSTRACT

In this study, a computer simulation was conducted in the MATLAB 2021a software environment to verify the testing of the dynamic parameters of a wooden girder system. Accelerometer type TP54 with patent number 332/83 measured the oscillations. A digital oscilloscope, Hantek 6022BE, was used for visualizations of measurements. A low-pass Butterworth filter was used for signal filtering. We achieved good value of accuracy without applying a low-pass Butterworth filter. The signal filtering procedure applied during the software modelling of the response in the dynamic analysis only prolonged the processing and validation time of the treated girder. However, using a low-pass Butterworth filter is recommended as a "good practice". In conclusion, the original recorded individual responses of the girder's oscillations in the vertical plane under dynamic excitation exhibit high accuracy in the processed series of time-discrete signals with continuous amplitude.

KEYWORDS:

DYNAMIC ANAYSIS, DIGITAL SIGNAL, MECHANICAL ACCELEROMETER, OSCILLATION, SIGNAL FILTERING, GIRDER

CYCLIC BEHAVIOR PHENOMENA OF STRUCTURAL STEEL

Petar Knežević*[1], Dragan Čukanović[1], Zoran Perović[2], Aleksandar Radaković[3], Nikola Velimirović[3]

[1] Faculty of techical sciences, University of Priština, Kosovska Mitrovica, Serbia
[2] Faculty of Civil Engineering, University of Belgrade, Belgrade, Serbia
[3] State University of Novi Pazar, Department of Technical Science, Novi Pazar, Serbia
* corresponding author: petar.knezevic@np.ac.rs

UDK: 624.014.2:620.17
DOI: 10.14415/CACE2024.10

ABSTRACT

This paper will present the fundamental phenomena that characterize the cyclic behavior of ductile materials, especially structural steel. The introduced phenomena and effects represent the basis for understanding the behavior of elements made of structural steel under cyclic loading. The observed phenomena implementation in the corresponding computational models is the basis of an adequate and accurate description of the behavior of structural elements exposed to this type of loading.

KEYWORDS:

CYCLIC LOADING, STRUCTURAL STEEL, PLASTICITY, HYSTERESIS

LOW-COST RAINWATER RUNOFF MEASUREMENT DEVICE

Petar Praštalo[1*], Anica Milanović[1], Dušan Prodanović[2]

[1] Faculty of Architecture, Civil Engineering and Geodesy, Banja Luka, Bosnia and Herzegovina
[2] Faculty of Civil Engineering, Belgrade, Serbia
[*] corresponding author: petar.prastalo@aggf.unibl.org

UDK: 628.24
DOI: 10.14415/CACE2024.11

ABSTRACT

Due to increased urbanization and significant alterations of natural drainage catchment accompanied by climate change, there has been an increase in runoff due to reduced infiltration and increased flood risk in urban areas. For several years now, as part of the solution, green roofs, permeable pavements, and rain gardens have been proposed to increase infiltration while reducing overall runoff from urban surfaces. In order to effectively manage rainwater, in addition to water quality, monitoring is necessary, including flow measurement. To date, a large number of measuring device and instruments have been developed to measure the quantity of rainwater runoff. One such measuring device has been constructed in the hydraulic laboratory at the Faculty of Architecture, Civil Engineering, and Geodesy at the University of Banja Luka. This is an inexpensive and practical device for measuring rainwater flow, constructed from PVC drainage pipes, using a "V" weir as an overflow, commonly known as a Thomson weir. Laboratory testing of this measuring device has been conducted to identify parameters affecting the overflow coefficient to achieve greater accuracy in measurements. A total of five different equations for calculating the discharge coefficient have been proposed, depending on the geometry of the weir and flow conditions at the weir.

KEYWORDS:

MEASUREMENT, RUNOFF, PIPES, DISCHARGE COEFFICIENT

DFT ANALYSIS OF VERTICAL DISPLACEMENT SIGNALS OF A SIMPLE WOOD GIRDER BY MONITORING USING SENSORS VL6180X

Ilija M. Miličić [1*], Ivana I. Miličić [2], Radomir J. Folić [2]

[1] University of Novi Sad, Faculty of Civil Engineering Subotica, Kozaračka 2a, 24000 Subotica, Serbia
[2] University of Novi Sad, Faculty of Technical Sciences, Dr Sime Milošević 12, 21000 Novi Sad, Serbia
[*] corresponding author: milicic@gf.uns.ac.rs, ilija.m.milicic@gmail.com

UDK: 519.876.5:624.042.7
DOI: 10.14415/CACE2024.12

ABSTRACT

This study performed a theoretical-experimental procedure for monitoring and analysis of the intersection allocation in the middle of the line girder in the vertical plane using a laser sensor VL6180X. The applied measuring system is a non-destructive method, a new, easy-to-apply case of monitoring static and dynamic parameters in the structures of constructive systems based on the treated physical model. Registering test results is a single format of an electrical continuous digital signal collected in the Arduino programming environment in the time domain with simultaneous exporting to the widely used MS Excel format. Measurement results prepared for the fast Fourier transform using a self-made software model in the Matlab2021a environment. Therefore, software modelling using DFT and iDFT verified the relevant data in the temporal and frequency domain. Finally, DFT analysis showed slight deviations in vertical displacement of the girder system treated in this study compared to the results of the FFT-treated analysis of the identical displacement signal in the vertical plane.

KEYWORDS:

DFT ANALYSIS, DIGITAL SIGNAL, LASER SENSOR VL6180X, DISPLACEMENT, GIRDER

REHABILITATION AND RECONSTRUCTION OF THE UNDERGROUND PUMP STATION "RAILWAY STATION" ON THE SAVA SQUARE IN BELGRADE

Branislav Vuković[1], Ivana Perčić[1*], Danica Goleš[1]

[1] University of Novi Sad, Faculty of Civil Engineering, Subotica, Serbia
* corresponding author: ivanapercic97@gmail.com

UDK: 628.213:69.059.2/.3(497.11 BEOGRAD)
DOI: 10.14415/CACE2024.13

ABSTRACT

By the Urban Planning Project for the construction of Sava Square in Belgrade, initial plan was to build a new sewage pumping station, after which would follow the demolishment of the existing one. At the initiative of the contractor, the existing pumping station was also retained. To evaluate the condition of the existing structure, investigative works were performed, and the reconstruction project was designed based on these findings. This paper presents the planning, and the rehabilitation and reconstruction of the existing pumping station, which included the demolition of the above-ground parts of the station and part of the upper slab, the construction of a new slab over part of the structure, the strengthening of some structural elements, the construction of transitional slabs and the sealing of cracks, which were mainly caused by vibrations during the construction of the Square.

KEYWORDS:

REHABILITATION, RECONSTRUCTION, CONCRETE STRUCTURE, PUMPING STATION

APPLICATION OF PEARSON'S CORRELATION COEFFICIENT IN THE ANALYSIS OF CONCRETE SAMPLES

Svjetlana Banjac[1], Zoran Mitrović[2]

[1] HKP consulting doo, Banja Luka, BiH
[2] University of Banja Luka, Faculty of Electrical Engineering, Banja Luka, BiH
* Corresponding author: svjetlanavlaski@gmail.com

UDK: 539.4.014 : 519.22
DOI: 10.14415/CACE2024.14

ABSTRACT

The paper presents the possibility of applying statistical methods in construction, specifically the application of the Pearson correlation coefficient in the analysis of concrete samples. Using this coefficient, the dependence of two variables was analyzed. The goal of this paper is to draw a conclusion about the potential dependence (or estimate a measure of dependence) of the variables X and Y. By calculating the Pearson correlation coefficient, we confirmed that concrete with a higher density has a higher compressive strength.

KEYWORDS:

STATISTICS, CORRELATION COEFFICIENT, CONCRETE, DENSITY, COMPRESSIVE STRENGTH, DEPENDENCE OF VARIABLES

COMPARATIVE ANALYSIS OF WIND ACTION ON CONTAINER STACKS ANALYTICALLY AND BY FEM CONTACT ANALYSIS

Todor Vacev[1*], Danijela Đurić Mijović[1], Miloš Milić[1], Andrija Zorić[1]

[1] Faculty of Civil Engineering and Architecture, Niš, Serbia
[*] corresponding author: todor.vacev@gaf.ni.ac.rs

UDK: 624.042.41
DOI: 10.14415/CACE2024.15

ABSTRACT

Container stack sites are risky under wind action, especially for empty containers. Wind may cause sliding and overturning in case of stacking in several levels. One such site has been analysed to determine critical wind velocities that might cause unfavourable events. Calculations for typical cases were done, and wind forces were obtained by Eurocode. Sliding was checked comparing the total wind force with the friction resisting force, and overturning was checked comparing the overturning moment caused by wind with the resisting moment from container weight. These two phenomena have different physical nature and had to be analysed separately. The problem has been also analysed using Finite element method (FEM) and contact analysis. This method proved to be more advantageous, because sliding and overturning can be solved simultaneously. The conducted research can be used as an efficient method for solving similar problems.

KEYWORDS:

WIND ACTION, CONTAINER STACKS, EUROCODE, FEM CONTACT ANALYSIS

INTEGRATION OF VIRTUAL MODELS AND PHYSICAL CONSTRUCTION - CYBER PHYSICAL SYSTEMS (CPS) IN THE ARCHITECTURAL, CIVIL/CONSTRUCTION & TRANSPORTATION ENGINEERING INDUSTRIES (ACCTEI)

mr Mihailo Ostojic[1*], dr Milivoje Rogac[1]

[1] University of Montenegro - Faculty of Civil Engineering, Podgorica, Montenegro
* mihailoo@t-com.me

UDK: 004.92:624
DOI: 10.14415/CACE2024.16

ABSTRACT

Virtual modelling represents making a model of desired product in the virtual world, for the purposes of its testing and improving. Construction process visualization is using virtual models for monitoring working progresses in the real world, providing real-time information. Moreover, prior to construction, designing can be completed in these powerful software and models' testing in much more efficient way, rather than modelling and testing in a laboratory conditions. Also, using wireless technologies, the sustainability of the structure could be monitored and maintenance conducted. Because of numerous advantages it brings, the implementation of virtual models in industry, especially construction, represents serious move into the future. It saves time and money comparing to physical modelling, provides easy approach to designing and modifying. These are just some of the advantages. Construction industry, as pretty complex system, could have high benefits using virtual models, like improving communication and collaboration among all involved parties in project, reducing work completion time and errors bypassing, as well as high economic advantages, better control etc.

KEYWORDS

Virtual Modelling, Construction Industry, Real-Time, Design, Control, Monitoring

CONNECTION OF INTERCITY AND URBAN ROADS: CASE STUDY KULA, EAST SARAJEVO

Zoran Spajic[1], Igor Jokanovic[2], Milica Pavić[2*]

[1]Graleks d.o.o. Pale, Bosnia and Herzegovina
[2]University of Novi Sad, Faculty of Civil Engineering, Subotica, Serbia
[*] corresponding author: milica@gf.uns.ac.rs

UDK: 625.711.1(497.6 ISTOČNO SARAJEVO)
DOI: 10.14415/CACE2024.17

ABSTRACT

City traffic encompasses a wide range of daily needs, including passenger traffic, which is closely related to the social and personal activities of citizens, as well as commercial traffic, which is dependent on production process and market connections and is an indispensable part of life. On the other hand, the classification of intercity roads depends on factors such as capacity, speed, length, role in connecting different regions or cities, which enables the determination of optimal road planning strategies and connecting those into a single system through intersections. At the same time, understanding the functional level of intercity roads becomes crucial for the efficient connection of urban and intercity roads. Intercity and urban infrastructure must mutually establish complete spatial and functional coordination, while adapting to the changed conditions of movement on both networks. The paper analyses the conditions of connecting intercity roads and urban roads, including the presentation of specific example at the Kula location in East Sarajevo.

KEYWORDS:

INTERCITY ROAD, URBAN ROAD, INTERSECTIONS

THE ROLE OF THE URBAN GREEN INFRASTRUCTURE CONCEPT IN STORMWATER MANAGEMENT

Stanković Natalija[1]

[1] Faculty of Civil Engineering and Architecture University of Niš, Serbia
Student, Teaching Associate at the Chair of Urbanism and Spatial Planning
* corresponding author: stankovicnatalija1@gmail.com

UDK: 628.116.2:712.252
DOI: 10.14415/CACE2024.18

ABSTRACT

Urban planning is a crucial process for shaping the future of cities. This involves creating spaces that are sustainable, functional, and aligned with the needs of contemporary society, and laying the foundations for building cities that can successfully meet the needs of both current and future generations. It is projected that by the mid-century, at least two-thirds of the world's population will reside in cities, representing a significant increase from one-third recorded in the middle of the previous century. This increase necessitates not only providing space for living and working but also creating conditions for the general well-being and economic prosperity of residents. In this context, urban green infrastructure becomes a primary component of urban planning, contributing to the creation of sustainable, healthy, and pleasant cities adapted to contemporary challenges and the needs of their inhabitants. There are four fundamental principles that are based on a sustainable approach when planning the urban green infrastructure: green-grey integration (combining green and grey infrastructure), connectivity (creating networks of green spaces), multifunctionality (providing and enhancing diverse functions and services), and social inclusion (collaborative and participatory planning). By combining green and grey infrastructure, establishing networks of green spaces, providing diverse functions and services, and through collaborative and participatory planning, the concept of urban green infrastructure becomes a key element in shaping the urban spaces of the future. Green infrastructure offers multiple benefits, including improving the quality of life, supporting biodiversity conservation, efficient management of stormwater runoff, reducing flood risks, contributing to climate adaptation, developing a network of green corridors, enhancing the aesthetics of the city, and providing ecological, social, and economic

benefits. Contemporary stormwater management involves various technical measures aimed at mitigating the negative effects of atmospheric water. These measures encompass practices such as collection, infiltration, retention, water storage, reuse, and other relevant techniques. Numerous technical elements, such as rain gardens, bioretention, green depressions, tree-pits, porous paving, rainwater reservoirs, bioswales, underground infiltration trenches, among others, function to implement these technical measures. Within the framework of this research, the contribution of urban green infrastructure to overcoming challenges and improving the quality of life is analyzed, with a focus on appropriately channeling atmospheric water from streets in cities. The research explores how urban green spaces can respond to the demands of contemporary trends in urban development, economic changes, and the strengthening of social cohesion, with reference to relevant examples of good practices from abroad.

KEYWORDS:

URBAN GREEN INFRASTRUCTURE, STORMWATER MANAGEMENT, SUSTAINABLE URBAN DEVELOPMENT

SEMI-ANALYTICAL SOLUTION FOR ELASTO-PLASTIC DEFLECTION OF PRISMATIC SIMPLY SUPPORTED BEAMS WITH CIRCULAR CROSS-SECTION

Andrija Zorić[1*], Miloš Milić[1], Marina Trajković-Milenković[1], Todor Vacev[1], Ivan Nešović[1], Katarina Slavković[1]

[1] University of Niš, Faculty of Civil Engineering and Architecture, Niš, Serbia
[*] corresponding author: andrija.zoric@gaf.ni.ac.rs

UDK: 624.072.2:539.3
DOI: 10.14415/CACE2024.19

ABSTRACT

The solution for the elastoplastic deflection of simply supported beams with circular cross-sectio loaded by lateral force at the midspan is proposed. The solution is developed based on the assumption of homogenous and isotropic material with bilinear elastoplastic strain hardening behaviour. The elastic deflection of the beam is determined using the Bernoulli-Euler formula. For the plastic deflection, an incremental procedure is proposed considering that the differential equation of beam bending does not have a solution in closed form. The proposed semi-analytical solution is validated against experimental results on one sample, as well as against finite element analysis results of eight simply supported beam models with varying geometrical and material parameters. Satisfactory agreement between the proposed semi-analytical results and experimental and numerical results confirms the solution's validity.

KEYWORDS:

ELASTOPLASTIC BEHAVIOUR, STRAIN HARDENING, CIRCULAR CROSS-SECTION, SIMPLY SUPPORTED BEAM

THE INFLUENCE OF BASALT FIBERS ON THE COMPRESSIVE AND FLEXURAL STRENGTH OF LIGHTWEIGHT CONCRETE

Ivana Perčić[1*], Arpad Čeh[1], Danica Goleš[1]

[1] University of Novi Sad, Faculty of Civil Engineering, Subotica, Serbia
[*] corresponding author: ivanapercic97@gmail.com

UDK: 666.193:691.327.32
DOI: 10.14415/CACE2024.20

ABSTRACT

The composition and proportions of the mixture, as well as the properties of its components, are among the most important factors that affect the properties of fresh and hardened lightweight aggregate concrete (LWAC) and fiber reinforced lightweight aggregate concrete (LWAFRC). The aim of this paper is to evaluate, through own experimental tests and analysis of the results presented in the available literature, the impact of the addition of basalt fibers on the compressive and flexural strength of lightweight aggregate concrete, as well as their development over time. In the experimental part, samples of lightweight aggregate concrete made of ordinary cement with the addition of fly ash and a combination of crushed aggregate and liapore were tested. Basalt fibers were added to the mixture in the amount of 0,21%, 0,63% and 1,27% in relation to the total volume of fresh concrete. Control samples were made without the addition of fibers. Compressive and flexural strength tests were performed at the age of 7, 28 and 60 days. Based on the conducted tests and literature review, it can be concluded that the addition of basalt fibers increases the compressive and flexural strength of LWAC at all ages, as well as that this increasement is more pronounced in concretes with higher fiber content. However, significant discrepancies were observed in the results of different authors, so it is necessary to conduct additional extensive experimental research.

KEYWORDS:

LIGHTWEIGHT AGGREGATE CONCRET, BASALT FIBERS, COMPRESSIVE STRENGTH, FLEXURAL STRENGTH

DEVELOPMENT OF A STEEL-TIMBER COMPOSITE CONNECTOR

Miloš Milić[1*], Todor Vacev[1], Ivan Nešović[1],
Predrag Petronijević[1], Andrija Zorić[1], Radovan Perić[1]

[1] Faculty of Civil Engineering and Architecture, Niš, Serbia
[*] corresponding author: milos.milic@gaf.ni.ac.rs

UDK: 624.016:691.53
DOI: 10.14415/CACE2024.21

ABSTRACT

This study introduces an innovative steel-timber composite connector designed to optimize structural performance. The connector is made for maximal composite action with a focus on stiffness and ductility, making it suitable for versatile structures. Adopting rigid plastic characteristics, the connector proved to be capable to fulfil complex structural demands, especially regarding strength and flexibility. The research provides a broader insight into the behaviour of the composite structures, giving a theoretical foundation for engineers and researchers. This study can be a base for future development of steel-timber composite connectors in structural engineering applications.

KEYWORDS:

TIMBER, STEEL, COMPOSITE CONNECTOR, RIGID-PLASTIC CHARACTERISTICS

USE OF CONCRETE WITH FLY ASH FOR CONSTRUCTION RETENTION DAMS

Djordje Markovic[1*], Bojan Milovanovic[1], Aleksandar Savic[1], Vladan Kuzmanovic[1], Ljubodrag Savic[1],

[1] Faculty of Civil Engineering, Belgrade, Serbia
[*] corresponding author: markovicdjordje61@gmail.com

UDK: 532.532:666.972.125
DOI: 10.14415/CACE2024.22

ABSTRACT

This paper analyzes the possibility and profitability of using concrete with fly ash, from thermal power plants, for the construction of retention dams. The mechanical characteristics of fly ash concrete and conventional concrete are compared, as well as their quantities required for the construction of retention dams in the Pestan river basin. Based on preliminary measurements and estimates of designed dams with conventional and concrete with the addition of fly ash, the profitability of this solution is considered.

KEYWORDS:

RETENTION DAMS, CONCRETE WITH FLY ASH

EXPERIMENTAL-THEORETICAL ANALYSIS OF VERIFYING THE CURRENT PROCEDURE AND FINDING THE CORRECT PROCEDURE AND METHODS FOR TESTING COMPRESSIVE STRENGTH OF ORDINARY CONCRETE

Milan Kekanović[1], Danica Goleš[1], Ljiljana Kozarić[1*], Nikola Milosavljević[1], Hilda Horvat (Hilda Horváth)[1], Matija Benčik[1]

[1]University of Novi Sad - Faculty of Civil Engineering, Kozaračka 2a, Subotica, R. Serbia[2] Second Organization, Second City, Second Country
[*] corresponding author: kozaric@gf.uns.ac.rs

UDK: 620.178.1
DOI: 10.14415/CACE2024.23

ABSTRACT

Ordinary concrete with stone aggregates is the construction material widely used today worldwide for building various types of structures, from small to large. In large structures with significant spans, such as concrete bridges or high-rise buildings with substantial masses, it is particularly crucial for the concrete to possess good quality and reliable compressive strength. There are justified doubts raised by the author[1] of this paper, regarding the accurate and precise determination of compressive strength in concrete worldwide [1],[2].Furthermore, authors doubts and argues that the compressive strength of concrete (σ= MPa) at the proportional point (σ_p = MPa) is significantly lower, amounting to only 10% to 15% instead of 33% (σ_p= MPa) of the value of ultimate compressive strength ($\sigma_{m,k}$ = MPa), as it is currently interpreted in theory and practice worldwide. The first reason for doubt is the fact that the ultimate compressive strength ($\sigma_{m,k}$ = MPa) of the same concrete type depends on the size and volume of the test specimens being examined [3], [4], [5]. This suggests that the compressive strength of concrete (σ_m = MPa) is relative, which cannot be acceptable from technical and legal perspectives [2], [1].Our research, examines three different sizes of cylindrical test specimens, with heights of 15 cm, 21 cm, and 36 cm, and a cylinder diameter three times smaller than its height. This research confirms the justified doubt and demonstrates that the ultimate compressive strengths of concrete ($\sigma_{m,k}$ = MPa) are relatively uniform, regardless

of the cylinder size, and on average, they are lower by 23.27% compared to the currently calculated, presented, and adopted compressive strengths of concrete on standard specimens, which are 20x20x20 cm cubes [3], [4], [5].

KEYWORDS:

CONCRETE, COMPRESSIVE STRENGTH, MODULUS, ELASTICITY, SAFETY, RHEOLOGY, FLOW, BRIDGES

GROUND WATER LEVEL IN LARGE DAMS' BASINS MODELING

Ivana Mitrović[1*], Žarko Nestorović[2]

[1] Đerdap Usluge AD, Kladovo, Serbia
[2] JSC EPS Belgrade, Belgrade, Serbia
[*] corresponding author: ivana.mitrovic@djerdap.rs

UDK: 556.32:532.572
DOI: 10.14415/CACE2024.24

ABSTRACT

Large dams provide basic needs for contemporary way of life. They provide the availability of water in the dry periods of year and also are the sources of electricity production. Building large dams also have significant impact on the environment in their basins including ecological and hydrological consequences. The one of consequences of large dam building is influence on ground water regime which certainly is changed after water reservoir is formed upstream of dam. This research encompassed theoretical and experimental investigation about the influence of large dams' reservoirs formed on the ground water level in basin zone. The theoretical part of research is based on the literature investigation while the experimental part of research is based on the available data for DJerdap I groundwater levels.

KEYWORDS:

WATER LEVEL MONITORING, MODELING, MULTIDIMENSIONAL LINEAR REGRESSION

RESEARCH OF CHARACTERISTICS OF OIL-RESISTANT CONCRETES WITH ADDITIVES

Ildiko Molnar[1], Janos Major[2], Milan Kekanovic[3], Viktor Fabian[3], Erik Heđi[3], Mihajlo Mirosavljević[3]

[1] Óbuda University, Budapest, Hungary, molnar.ildikoster@gmail.com
[2] Debrecen University, Budapest, Hungary, drmajorjanos@gmail.com
[3]University of Novi Sad, kekec@gf.uns.ac.rs

UDK: 666.972.16
DOI: 10.14415/CACE2024.25

ABSTRACT

During the project, we have to fulfill the following goals:
1. The material is oil-repellent concrete and the exact and specific recipe for its production. Advantages:
- The expected 30% increased compactness
- Doubled sulfate resistance
- Doubled lifespan
- Cost savings generated due to the novelty of the oil repeller are expected to be 15-20%
- Also minimization of polluting properties
2. Equipment that measures and transmits concrete technical data/parameters
3. Concrete service life prediction cloud-based digital platform service

KEYWORDS:

OIL-REPELLENT, SULFATE RESISTANCE, CHEMICAL RESISTANCE

MONITORING BIM MODELS IN VIRTUAL AND AUGMENTED REALITY (VR/AR)

S.G. Emelyanov[1], A.V. Brezhnev[1*], A.I. Pykhtin[1], N.E. Semicheva, Ph.D[1]

[1] Southwestern State University, Kursk, Russia
corresponding author: brarvik@icloud.com

UDK: 004.92:624
DOI: 10.14415/CACE2024.26

ABSTRACT

The article discusses the possibilities of using BIM technologies, as well as virtual and augmented reality technologies for monitoring building information models. An analysis of the advantages of modern technologies and their impact on increasing quality and reducing costs in the construction of buildings and structures is given. The scope of application of this solution is considered.

KEYWORDS:

BIM, INFORMATION MODEL, PROGRAM, 3D MODEL, CONSTRUCTION, AUGMENTED REALITY

THERMODYNAMIC APPROACH TO ISOLATION OF RESIDENTIAL BUILDINGS - BUILDINGS WITHOUT THERMAL BRIDGES

Milan Kekanović[1*], Dragoslav Šumarac[1], Milan Trifković[1], Miroslav Kuburić[1], Stanko Ćorić[2], Arpad Čeh[1], Žarko Nestorović

[1] Faculty of Civil Engineering Subotica, University of Novi Sad, Kozaračka 2a, 24000 Subotica, Serbia
[2] Faculty of Civil Engineering in Belgrad, Bulevar Kralja Aleksandra 73, 11000 Beograd, Serbia
[*] corresponding author: kekec@gf.uns.ac.ra

UDK: 536.7:728.2
DOI: 10.14415/CACE2024.27

ABSTRACT

A high energy efficiency class for residential buildings can be achieved if the insulation principles are more stringently considered. Also, it is necessary to analyze and define where the heat losses occur realistically. However, there is a question whether the calculation of energy gains (solar, from electrical devices, and people) that is recommended in some Rulebooks on the energy efficiency of buildings is sufficiently accurate and reliable. It is known that energy gains can only increase the guarantee of achieving the projected energy class of the observed facility, and therefore, it should be careful in their calculation. In this paper, it is presented with constructive solutions of the walls and floor plates that are made with less volume of ordinary concrete and bricks in order to reduce the ability of thermal energy accumulation. All foundations must be completely thermally insulated with lightweight concrete, and balconies have to be fully concreted with lightweight concrete as well as gable walls. Energy-efficient design and construction solutions for lightweight cassette floorboards and facilitated walls are proposed. There is warm air beneath the ceiling of the rooms, so thermal insulation must be placed on the ceilings of the floorboards of each floor. It is a solution and a condition to prevent thermal energy input into the floor concrete slab and to transfer it to the walls. In this case, the warmer air below the ceiling would naturally move around the room to the floors in the physical tendency of heat transfer and thermal heat equilibrium. This would help prevent heat loss and

a general sense of heat for occupants on the floor of the room. The walls at the corners of the buildings should be semi-circular because in this way we prevent the occurrence of significant linear losses of thermal energy. Another reason for such corner solutions is increased safety in case of seismic actions. The aesthetic appearance of such buildings is superb and worthy of the attention and admiration of both building occupants and passers-by.

KEYWORDS:

CONCRETE LIGHTWEIGHT FLOORBOARDS, THERMAL BRIDGES, ENERGY EFFICIENCY

WAYS TO REDUCE THE IMPACT OF HARMFUL EMISSIONS FROM BOILERS AND VEHICLES ON THE ENVIRONMENT

Vladislav Pakhomov[1], Ekaterina Pakhomova[1], Natalia Semicheva[1*]

[1] Southwest State University, 50 let Oktyabrya, 94, 305040, Kursk, Russia
[*] corresponding author: semicheva-ne@outlook.com

UDK: 614.72:66.074
DOI: 10.14415/CACE2024.28

ABSTRACT

Studied the influence of emissions from industrial enterprises, enterprises of fuel and energy complex, heat generators of autonomous heat supply systems and motor transport on the atmosphere. Offered the description of innovative design for purification of flue gases of boiler plants and exhausts of motor transport, their functioning principles and the process of purification of flue gases from their harmful components. The possibility of using granulated blast-furnace slag as adsorbents in the designs of outdoors air conditioners intended for purifying the atmospheric air in the surface layer from harmful components of car exhausts is considered. The study was carried out within the framework of realization development program of Southwest State University of the Priority 2030 program.

KEYWORDS:

PURIFICATION, HEAT GENERATOR, FLUE GASES, GRANULATED BLAST-FURNACE SLAG, GAS ANALYZER NITROGEN OXIDES, FUEL, EMISSION, HEAT SUPPLY, ADSORBENT, TEMPERATURE, NATURAL GAS, ECOLOGY

METHODS FOR DETECTING COLLISIONS AND ERRORS USING BIM TECHNOLOGIES IN THE DESIGN OF HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS OF HIGH-RISE BUILDINGS

Artem Brezhnev[1], Elvira Aleksapolskaya[1], Natalia Semicheva[1*]

[1] Southwest State University, 50 let Oktyabrya, 94, 305040, Kursk, Russia
[*] corresponding author: semicheva-ne@outlook.com

UDK: 624.9:005.8
DOI: 10.14415/CACE2024.29

ABSTRACT

This article discusses algorithms for interacting with an information model to detect and eliminate collisions and design errors in the design of microclimate systems of high-rise buildings. The work describes the methods of model verification, the principles of interaction of participants in the project, including the BIM Engineering Department, heads of engineering teams and directly engineers of designers of construction organizations and design bureaus. The work examines the effectiveness of using the algorithm to check the quality of the model.

KEYWORDS

BIM, INFORMATION MODEL, PROGRAM, 3D-MODEL, CONSTRUCTION, HIGH-RISE BUILDINGS, COLLISIONS, DESIGN ERRORS

THE POTENTIAL OF NATURAL ZEOLITE USE IN INDUSTRIAL WASTEWATER TREATMENT

Jovana Topalić[1*], Tiana Milović[1], Vladimir Mučenski[1]

[1*] Faculty of Technical Sciences, Department of Civil Engineering and Geodesy, Novi Sad, Republic of Serbia
corresponding author: jocatopalic@gmail.com

UDK: 628.3:549.67
DOI: 10.14415/CACE2024.30

ABSTRACT

Industrial wastewater composition is different from that of communal wastewater. The industry is the main polluter of water streams. For industrial wastewater, it is specific to have a lot of heavy metals, which are toxic for the environment and can modify the ecosystem itself. Removal of these contaminants requires cost-effective technologies, and a variety of techniques have been developed in the past decades for dealing with wastewater treatment. This research needs to point out the potential of natural zeolite use as an adsorbent in wastewater treatment. High absorbency and ion-exchange capacity, availability in countries, and low price are the main advantages of using natural zeolite.

KEYWORDS:

ZEOLITE, WASTEWATER, TREATMENT, ADSORPTION

MODELS FOR HYDROPOWER PRODUCTION ANALYSIS

Milovan Bjelica [1*], VladimirZotović [2],

[1] Hidroelektrane na Trebišnjici, Trebinje, Bosna i Hercegovina
[2] Energoprojekt, Beograd, Srbija
[*] corresponding author: bjelicamilovan@gmail.com

UDK: 621.311.21
DOI: 10.14415/CACE2024.31

ABSTRACT

Hydro potential utilization is significant source of sustainable development, including economic growth and environmental preservation. Even though the utilization of hydro potential causes some negative influence on environment, it is still significantly smaller than any other influence caused by other source of similar contributions to contemporary civilization. The main contribution of hydro potential is the production of electricity. Electricity production is dependent of the available water in reservoir, height differences, gravity acceleration on the site and efficiency of generators. These parameters are coupled in the power equation, resulting by the potential of electricity for certain power plant. In this research we consider the power equation.

KEYWORDS:

POTENTIAL, POWER, GRAVITY, HEIGHT, FLOW, DERIVATIVE

TOWARDS THE NEW GENERATION OF EUROCODE 7

Iva Despotović[1*], Nemanja Bralović[2]

[1] associate professor, Faculty of Mechanical and Civil Engineering in Kraljevo, University of Kragujevac, Kraljevo, Serbia
[2] assistant professor, Faculty of Civil Engineering Subotica, University of Novi Sad, Subotica, Serbia
[*] corresponding author: despotovic.i@mfkv.kg.ac.rs

UDK: 624.1:006.3/.8
DOI: 10.14415/CACE2024.32

ABSTRACT

Between 1991. and 1999., three versions of the Construction Eurocodes were published as pre-norms ("EuroNorm Vornnorm", ENV). The duration of each version was 3 years, when they could be used but without the status of fully adopted European Norms (EN). The experiences gained during the application of these pre-norms were used to harmonize and modify the pre-norms according to the final form of the European Norms (EN). Many pre-norms underwent significant changes and revisions until the final transformation into the fully adopted European Norm (EN). Work on the final version of the Construction Eurocodes began in June 1996 and continued until November 2006, when the final part of Eurocode 9 was ratified. International working group CEN TC250 (European Committee for Standardization) works on the new generation of Eurocode 7, after the shortcomings were noticed and the problems that appeared during the application of the current Eurocode 7 were considered in detail. The standard has been reorganized so that it now consists of three parts (instead of 2), new chapters were added (methods for soil improvement, the influence of groundwater), design rules were simplified, "alternative" methods were avoided, and the selection of nationally determined parameters was reduced. The paper presents the key changes in relation to the current Eurocode.

KEYWORDS:

EUROCODE 7, SECOND GENERATION, KEY CHANGES

NEUTRON SHIELDING PARAMETERS OF SELECTED TYPES OF CONCRETE

Ksenija Janković[1*], Srboljub Stanković[2]

[1] IMS Institute, Belgrade, Serbia
[2] Vinca Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia
[*] corresponding author: ksenija.jankovic@institutims.rs

UDK: 539.12/.16:666.972
DOI: 10.14415/CACE2024.33

ABSTRACT

In this scientific research, the definition of appropriate neutron shielding parameters is presented and the results of calculations or measurements of these parameters are presented for four selected types of concrete that are used in protection against neutron radiation. A method for calculating the fast neutron effective removal cross section is considered, which has its own specificities because it takes into account different types of interactions of fast neutrons with the materials from which the selected types of concrete are made. In addition, the values of macroscopic neutron absorption cross section for thermal neutrons, macroscopic neutron scattering cross section and total macroscopic neutron attenuation cross section, which includes scattering of fast neutrons and absorption of thermal neutrons, are presented for the selected types of concrete. Based on the analysis of neutron shielding parameters, type of concrete with coarse-fine aggregate limonite-limonite has a higher level of ability to protect against neutron radiation compared to concrete with coarse-fine aggregate magnetite-limonite and concrete with barite-barite.

KEYWORDS:

NEUTRON SHIELDING, CONCRETE, ATTENUATION, ABSORPTION, REMOVAL CROSS SECTION

ESTIMATION OF HIGHWAY CONSTRUCTION COSTS USING MACHINE LEARNING

Mila Svilar[1], Igor Peško[2], Ramona Petrov[1*], Nikola Banjac[3]

[1] Faculty of Civil Engineering, University of Novi Sad, Subotica, Serbia
[2] Faculty of Technical Sciences, Department of Civil Engineering and Geodesy, Novi Sad, Serbia
[3] Faculty of Security Studies, Educons University, Novi Sad, Serbia
[*] corresponding author: ramona.petrov@gf.uns.ac.rs

UDK: 625.7:004.85
DOI: 10.14415/CACE2024.34

ABSTRACT

Cost estimation is one of the basic foundations of cost management science and requires appropriate control and monitoring. The methodology of this research is a systematic review of the literature on the current implementation of state-of-the-art techniques such as artificial intelligence for solving complex problems in the organization of construction during the construction of highways. This paper aims to evaluate the accuracy of the cost estimation methods applied in the analyzed studies in order to gain insight into how well the methods based on empirical and historical data of realized construction projects work. Besides that, an effort was made to identify, synthesize and evaluate the impact of factors affecting unit prices and total costs of highway construction. Construction cost estimates can be conducted at different points in time during the project. Depending on the phase of project development, appropriate parameters are taken on the basis which the models are formed. It is conclud that the evaluation of models modeled by artificial intelligence has good capabilities and that it can be applied as a suitable mathematical tool for determining the estimating of the costs and performing works in all phases of construction. Through the comparative analysis of models for estimating the cost of highway construction, this paper contributes to the overall research, as well as by identifying and categorizing comprehensive cost factors in order to improve the estimation of highway construction costs.

KEYWORDS:

Machine learning, cost estimation, highway construction

III ARCHITECTURE

URBAN TRANSFORMATIONS AND PLANNING STRATEGIES FOR DEVELOPMENT OF LARGE HOUSING ESTATES IN THE POST-SOCIALIST CONTEXT: THE EXPERIENCE OF THE BALTIC COUNTRIES

Vasilevska Ljiljana[1*], Živković Jelena[2], Slavković Magdalena[3]

[1] Faculty of Civil Engineering and Architecture University of Niš, Serbia
Full Professor
[2] University of Belgrade Faculty of Architecture, Serbia
Associate Professor
[3] Faculty of Civil Engineering and Architecture University of Niš, Serbia
Teaching Assistant
[*] corresponding author: ljiljana.vasilevska@gaf.ni.ac.rs

UDK: 71:316.334.56(474)
DOI: 10.14415/CACE2024.35

ABSTRACT

The fall of socialism and radical political changes in the 1990s established a new social, economic and cultural environment which shaped a new urban reality of the post-socialist city. One of them relates to inherited large housing estates (LHEs), one of the most striking spatial legacies of socialism whose future is considered as one of the key challenges in the urban development of the post-socialist city. National and local government's responses to LHEs development can be recognized through different strategies and planning approaches. The paper discusses those that are characteristic of the Baltic countries - Estonia, Latvia and Lithuania. Their experience of adapting the strategies and urban policies to the EU development and planning context may be of importance for the institutional and planning environment in Serbia. Besides the conceptualization of the post-socialist urban and housing policy and their influence on the transformation of LHEs in the Baltic countries, the paper is organized around two key research aims: 1) to investigate the types and intensity of physical-functional transformation of LHEs in the Baltic largest cities through up-to-date research of current challenges and future prospects of LHEs; and 2) to investigate national and local governments response to LHEs development in the post-socialist context, i.e. to identify a major

planning strategies. The research findings suggest that building- and place-based urban regeneration, rather than downsizing or even demolition of LHEs, is the sustainable strategies for their future development. Although a comprehensive regeneration strategy is seen as sustainable solution for Baltic countries context, there are still many challenges for its implementation. Possibilities and limitations for its application in the Baltic cities are reviewed in order to identify opportunities and obstacles for implementing a comprehensive regeneration strategy in the context of Serbia, for which it is a novelty.

KEYWORDS:

LARGE HOUSING ESTATES, POST-SOCIALIST URBAN TRANSFORMATIONS, PLANNING STRATEGY, THE BALTIC COUNTRIES

MODELING OF "ENTERTAINMENT AND EMOTIONS" CITY FUNCTION

Lilia Tchaikovskaya[1*], Ekaterina Pakhomova[1], Aleksei Shleenko[1]

[1] Southwest State University, Kursk, Russia
[*] corresponding author: lili-zubkova@mail.ru

UDK: 316.334.56:519.87
DOI: 10.14415/CACE2024.36

ABSTRACT

The purpose of this study is to form a mathematical model of "Entertainment and Emotions" city function.
Methodology: a theoretical and multiple approach is used to formalize the model of "Entertainment and Emotions" city function.
Conclusions: As a result of this study, a model of "Entertainment and Emotions" city function was obtained, which determines the possibility of describing the state of "Entertainment and Emotions" city function as well as its quantitative assessment.
Impact interpretation: the results of this study can be used in the process of further study of city functions, as well as in the implementation of urban planning activities.

KEYWORDS:

CITY FUNCTION "ENTERTAINMENT AND EMOTIONS," CITY FUNCTION MODEL, COMFORT OF URBAN ENVIRONMENT

UNLOCKING THE BENEFITS OF ENERGY RENOVATION IN BUILDINGS: CORRELATING REGULATIONS ACROSS REGIONAL COUNTRIES

Milos Nedeljkovic[1*], Miomir Vasov[1], Dragan Kostic[1], Dusan Randjelovic[1], Vuk Milosevic[1]

[1] University of Nis, Faculty of Civil Engineering and Architecture of Nis, Nis, Serbia
[*] corresponding author: milos.nedeljkovic@gaf.ni.ac.rs

UDK: 502.171
DOI: 10.14415/CACE2024.37

ABSTRACT

The Regulation on Energy Efficiency (EE) of buildings is a normative legislative document with mandatory application in almost all regional countries. This paper will present a comparative analysis of the building's energy rehabilitation according to the Rulebook on EE Buildings of the Republic of Serbia, Croatia, and Slovenia. A comparative analysis of energy performance, i.e., the benefits of energy renovation of buildings, was done as a case study for the building. The verification of the existing condition from the point of view of the EE building and the energy rehabilitation proposal was carried out according to the mentioned valid regulatory documents of the region's countries, using the software package URSA Construction Physics 2.

The analysis presented in this study seeks to offer designers insights into design practices from other countries while also encouraging variability and flexibility in decision-making processes when selecting thermo-hygroscopic characteristics for optimizing the building's thermal envelope solution.

KEYWORDS:

REGULATORY DOCUMENTS, ENERGY REHABILITATION, REDUCTION OF ENERGY CONSUMPTION, CO_2 EMISSIONS

POSSIBILITIES OF USING OLD SHIPPING CONTAINERS AS MODULAR UNITS IN A CELLULAR SYSTEM FOR THE CONSTRUCTION OF MULTI-STOREY APARTMENT BUILDINGS

Aleksandra Cilić[1], Jelena Savić[1], Danijela Đurić-Mijović[1], Maša Ranđelović[1], Jelena Stevanović[1]

[1] Faculty of Civil Engineering and Architecture, Nis, Serbia
* corresponding author: aleksandra.cilic@gaf.ni.ac.rs

UDK: 728.22:621.869.88
DOI: 10.14415/CACE2024.38

ABSTRACT

The paper presents the possibilities of using old shipping containers for the construction of multi-storey apartment buildings. Instead of accumulating large amounts of waste materials for recycling, and polluting the air during the recycling process, containers can be used as modular units in a cellular system. Housing units can be formed by combining two or more shipping containers or by using only one larger container for apartments for singles. Such buildings represent an economical solution of providing the housing space. They are also suitable for student housing and accommodation for refugees. These types of buildings are fully compatible with modern trends of sustainable architecture and the construction process is faster than the conventional one.

KEYWORDS:

SHIPPING CONTAINERS, CELLULAR SYSTEM, MULTI-STOREY BUILDINGS, HOUSING, SUSTAINABLE ARCHITECTURE

DEGRADATION OF THE IDENTITY OF URBAN STRUCTURES BY INTENSIVE CONSTRUCTION

Dušan Stajić, Ana Momčilović Petronijević, Ivana Cvetković, Mirko Stanimirović

[1] Faculty of Civil Engineering and Architecture, University of Niš, Serbia
[2] The Institute for Heritage Preservation Niš, Serbia
[*] corresponding author: dusan.stajicgl@gmail.com

UDK: 711.4 : 904
DOI: 10.14415/CACE2024.39

ABSTRACT

The migration of people to the cities leads to the need for a more extensive housing stock and, therefore, to expanding housing and public buildings. Unfortunately, this causes the problem of changing the visual identity of the old city centers. Cultural monuments and buildings with monumental properties are threatened, not only directly by upgrades and excessive adaptations but also by the position of newly constructed buildings. The silhouette of the city and the specific ambient unit, which once consisted of religious buildings, memorials, or other significant objects, is being drastically changed.

The paper analyzes authentic micro-locations and buildings with monumental properties, which once represented significant benchmarks in certain parts of the city. However, they have lost this function due to excessive construction in their immediate vicinity. It is impossible to see them in the multitude of surrounding buildings.

The paper aims to point out this increasingly frequent phenomenon through several examples that present the problem well. At the end of the work, guidelines are given that are essential for preserving the ambient units of cities.

KEYWORDS:

PROTECTION OF ARCHITECTURAL HERITAGE, CULTURAL PROPERTY, VISUAL DEGRADATION, URBAN DEVELOPMENT, IDENTITY OF URBAN UNITS

THE USE OF ARTIFICIAL INTELLIGENCE AS A METHODOLOGICAL TOOL IN INTERPRETING SPATIAL SENSATIONS

Relja Petrović[1]

1 University of Belgrade - Faculty of Architecture, Belgrade, Serbia
* corresponding author:

UDK: 004.8:71
DOI: 10.14415/CACE2024.40

ABSTRACT

Spatial perceptions have always played a crucial role in determining the quality of architectural form. The scholarly literature recognizing the inseparable connection between architecture and psychology dates back to the early twentieth century, with environmental psychology emerging as a distinct branch of this scientific discipline in the 1960s. Contemporary environmental and climate change issues have notably drawn attention to topics within the realms of psychology and the environment.

Past sociological and spatial analyses of residential areas predominantly relied on survey and interview methods. Today's technological advancements enable us to analyze collected data through modern applications and devices. A significant innovative moment arises with the introduction of artificial intelligence onto the scene. Based on deep machine learning technology, applications for identifying human emotions have been developed, among others.

This paper problematizes the use of these modern tools in interpreting spatial sensations, aiming to offer new perspectives on existing theoretical frameworks and concepts through innovative methodological approaches.

KEYWORDS:

ARCHITECTURE, ENVIRONMENTAL PSYCHOLOGY, SPATIAL SENSATIONS, ARTIFICIAL INTELLIGENCE, METHODOLOGICAL APPROACHES

THE PHANTASMAGORIA OF DRAWINGS AS A METHODOLOGICAL OUTLINE OF DESIGN

Milena Grbić[1*]

[1] Faculty of Civil engineering Subotica, Subotica, Serbia
[*] corresponding author: mdelevic@gmail.com

UDK: 7.012
DOI: 10.14415/CACE2024.41

ABSTRACT

The intention of the work is to show how the phantasmagoria expressed by the drawing can be applied as a methodological outline of the overall design of architecture, as a connecting element between architecture and other areas.
The work is directed towards the communicative potential of drawings to convey a thought or message and thus establish contact between people. The paper will show the relationship established by the drawing between the various fields of architecture, archeology and anthropology. A multi-perspective approach to designing is conditioned by the need to comprehensively perceive and express the idea, and to explain the modalities of the functioning of the drawing as a research, communicative and expressive tool in that process, and to present its meanings on the concrete example of the design of the exhibition of the Archaeological Department in the City Museum in Subotica.
The contribution of the work is to show how a drawing can have meaning, intonation and suggestiveness of a personal and immediate address, which is its constant potential.

KEYWORDS:

DRAWING, DESIGN PROCESS, VISUAL CULTURE, RESEARCH IN ARCHITECTURE, CITY MUSEUM OF SUBOTICA

CONCEPTUAL SOLUTION OF TERRACED HOUSES IN NIŠ

Bogdan Krmpot[1*], phd Branislava Stoiljković[1]

1 University of Niš, Faculty of Civil Engineering and Architecture in Niš, Niš, Serbia
* corresponding author: bog.krmpot@gmail.com

UDK: 728.3(497.11 NIŠ)
DOI: 10.14415/CACE2024.42

ABSTRACT

Terraced houses are the result of adapting residential units to the terrain, thus integrating the landscape into the architecture of the residential space. This type of houses combines the natural slope of the terrain and architectural design, creating a space that has merged with its immediate surroundings. These houses are not only architectural artifacts, they are also a symbol of human adaptability to the natural environment and sustainable construction. The paper presents the conceptual architectural-urban solution of the terraced settlement in the suburban area of the city of Niš, which is located outside of the central city zone. In addition to the functional solution, are also discussed the urban solution of the location, the shaped solution and examples of good practice. The project task is defined in addition to the collected necessary data on terraced houses and site analyses. The entire investigation consists of several phases that rely on a theoretical basis and practical analysis. The combination of description, site analysis, study of examples of good practice and development of a conceptual solution represents a comprehensive methodology that allows readers to understand the topic more deeply and provide concrete and useful conclusions. This paper provides a basis for further research and practical application, emphasizing the need for a holistic approach in the planning and design of terraced houses in order to achieve optimal results in an urban environment.

KEYWORDS:

TERRACED HOUSES, CONCEPTUAL SOLUTION, URBAN SOLUTION, FUNCTIONAL SOLUTION, SHAPED SOLUTION, HOUSING, TYPOLOGY OF HOUSING, ARCHITECTURAL PLANING

ANALYSIS OF APPLIED DESIGN STRATEGY IN A CONSTRUCTED FAMILY VILLA: A CASE STUDY

Monika Štiklica[1]

[1] Faculty of Civil Engineering, Subotica, Serbia
* corresponding author: studio@monikastiklica.com

UDK: 728.3
DOI: 10.14415/CACE2024.43

ABSTRACT

This paper explores the applied design strategy in a constructed family villa, focusing on the needs of a family with three children aged between 1 to 13. Through a case study, it will analyze how the design strategy was tailored to the needs and lifestyle of this specific family. Special attention will be given to the distribution of space in the villa as a key element of functionality and comfort, as well as to the amenities integrated into the building to enable a quality life and entertainment for the entire family. Furthermore, we will explore how spaces were designed for children of different ages, and how the building was executed from the perspectives of energy efficiency and sustainability. Through this case study, the aim is to identify key aspects of the design strategy that contributed to the optimal living experience, as well as to provide recommendations for creating design strategies as a task for designing residential spaces.

KEYWORDS:

DESIGN STRATEGY, FAMILY VILLA, CASE STUDY, LIVING, DESIGN, FUNCTIONALITY

POSSIBILITIES IN TRANSFORMATION THE FACADES OF EXISTING DILAPIDATED BUILDINGS - A DIALOGUE OF EPOCHS

Jelena Savić1*, Danijela Đurić Mijović[1], Aleksandra Cilić[1], Danijela Milanović[1], Miloš Nedeljković[1]

[1] University of Niš, Faculty of Civil Engineering and Architecture, Niš, Serbia
* corresponding author: jelena.savic@gaf.ni.ac.rs

UDK: 692.232:72.012.6
DOI: 10.14415/CACE2024.44

ABSTRACT

The appearance of the facade, paint, applied materials; their formation, integration and adaptation to the environment influence the formation of the first impression of the building. Over time and under the influence of different factors, each facade is losing its original values. Many existing buildings cannot be demolished due to their historic and architectural value. Most of these buildings waste vast amounts of energy, also give poor comfort to occupants and have alterations during their active lifetime.

There are number of reasons for transforming a building envelope - from pure aesthetics to changes that are prompted by problems associated with leakage, increased moisture, heat losses/gains, impact of the earthquakes, etc. Today's challenge is focused on improvement of the existing buildings, in order to reduce the overall energy balance which is mainly related to the envelope. Contemporary technology and technique offer numerous possibilities of making use of this heritage in order to create urban space of a new quality and exhibit surprising aesthetic values. Based on in situ studies and literature research, the paper presents ways to transform the aesthetic image of any building with the aim of achieving sustainable design. In the end, the very act of inscribing another architectural epoch and the characteristic style of another architect gives the building a new interpretation and a new experience.

KEYWORDS:

EXISTING BUILDINGS, TRANSFORMATION, FAÇADE SYSTEMS, NEW INTERPRETATION

INFLUENCE OF SPATIAL ARRANGEMENT OF OPEN PUBLIC SPACES ON PEDESTRIAN MOBILITY AND ACTIVITIES

Stefan Škorić, Ph.D.[1*], Dijana Brkljač, Ph.D.[2], prof. Aleksandra Milinković, Ph.D.[3], prof. Milena Krklješ, Ph.D.[4]

[1,2,3,4] Department of Architecture and Urban Planning, Faculty of Technical Sciences, University of Novi Sad, Trg Dositeja Obradovica 6, Novi Sad, Serbia
[*] corresponding author: stefan.skoric@uns.ac.rs

UDK: 625.711.6(497.113 SUBOTICA)
DOI: 10.14415/CACE2024.45

ABSTRACT

The paper explores relations between spatial characteristics of open public spaces and pedestrian mobility and activities. The analysis of selected public space in the city of Subotica is based on application of new methodologies and software tools in public life studies, specifically with the method of space syntax. The focus of the research is on arrangement of physical and visual obstacles, that furthermore have important role in pedestrian mobility through the aspects of connectivity and visual integration at different parts of the public space. The aim of paper is to determine the influence of physical obstacles that can induce negative effect on the pedestrian mobility and visibility at the public spaces, and to suggest possible directions for improvements. Assessment of most frequent pedestrian routes and main points for public activities at minor public space can further be used for development of research model designed for analysis of much greater network of public spaces.

KEYWORDS:

PUBLIC SPACE, PEDESTRIANS, MOBILITY, SUBOTICA

EMERGENCE, DEVELOPMENT, AND TRANSFORMATION OF VILLA ZONES IN NOVI SAD DURING THE 20TH CENTURY

Dr. Tatjana Babić[1], Dr. Milena Krklješ[1*]

[1] University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
[*] corresponding author: milenakrkljes@uns.ac.rs

UDK: 711.582:728.84
DOI: 10.14415/CACE2024.46

ABSTRACT

The urban transformations that occurred in the territory of Novi Sad undoubtedly influenced changes in the structure and typologies in various urban zones. On the other hand, certain zones that emerged and developed during the 20th century under the influence of socio-economic and political changes shaped a specific image of the city and its parts in different periods. This influence is particularly recognizable in parts of the city where villa zones emerged and developed, formed by the construction of this specific form of single-family housing reflecting a high standard of family life. This paper analyses examples of several villa zones in Novi Sad that emerged during the 20th century through three specific socio-economic and political periods. During the city's development, villa zones represented characteristic areas formed on the city's expansion routes and thus heralded urban transformations in the city. The aspects of this research include examining the significance of villa zones in the process of shaping the urban character of the city, as well as observing the influence of the narrower urban context on the design of examples of quality residential architecture such as villas. The aim of the paper is to, based on the analysed case studies of these properties in Novi Sad, which emerged during the 20th century, understand their role in specific socio-economic and political contexts for the city of Novi Sad, as well as to assess the significance these areas have today in the city's landscape.

KEYWORDS:

VILLA, URBAN CONTEXT, URBAN TRANSFORMATION, NOVI SAD, 20TH CENTURY

THEMATIC CONTENT ANALYSIS OF INTRODUCTORY ARCHITECTURAL STUDIO COURSES IN THE REPUBLIC OF SERBIA

Olivera Dulić[1*]

[1] Faculty of Civil Engineering Subotica University of Novi Sad, Subotica, Serbia
[*] corresponding author: olivera@gf.uns.ac.rs

UDK: 378.16:72
DOI: 10.14415/CACE2024.47

ABSTRACT

The presented research analyses the introductory segment of architectural education in the Republic of Serbia using the method of thematic content analysis. Five schools of architecture were selected, whose 15 courses were subjected to content analysis, and it was found that all introductory studio courses follow the same conceptual model. This conceptual model implies the development of three aspects of architectural design simultaneously: theoretical and conceptual aspects, practical and functional aspects and structural and material aspects. A comparison of the obtained results with the available literature shows that this approach is in line with contemporary tendencies in architectural education.

KEYWORDS:

ARCHITECTURAL EDUCATION, DESIGN STUDIO, INTRODUCTORY STUDIO COURSE, ARCHITECTURAL PEDAGOGY, CONTENT ANALYSIS

DIDACTIC APPROACH TO AUTODESK REVIT TRAINING COURSE

Aleksandar Kostić[1], Katarina Krstić[1*], Dušan Turina[1], Nikola Simić[1]

[1]Akademija tehničko-umetničkih strukovnih studija - odsek Visoka građevinsko-geodetska škola, Beograd, Srbija
[*] corresponding author: a.sale.kostic@gmail.com

UDK: 37.026:004.42 AUTODESK
DOI: 10.14415/CACE2024.48

ABSTRACT

Didactic approach to Autodesk Revit training course represents a complex process that requires planning, structure and continuing support so that students can efficiently accept the necessary knowledge and skills for using this architectural design software.
Revit is one of the most popular tools for building construction modeling and the training course, regarding its usage, becomes more important for building industry professionals. One of the key aspects of didactic approach to Autodesk Revit training course is defining clear goals and expectations by the teachers or the coaches who pass on the knowledge. Creating the detailed plan of the training course, which includes theoretical and practical elements as well as the evaluation of the students' improvement, are the key steps in the learning process. It is also important to adjust the training course to the trainees' needs and the level of knowledge in order to make sure that every student has the opportunity to develop the skills in working with Revit.

KEYWORDS:

DIDACTIC APPROACH, AUTODESK REVIT, INTERACTION, CRITICAL OPINION, TEAM WORK

GREEN BUILDINGS, ENERGY EFFICIENCY AND RAISING AWARENESS ABOUT ENVIRONMENTAL PROTECTION

Ivan Stevović[1*], Jovana Jovanović[2], Sabahudin Hadrović[3]

[1] Innovation Centre for the Faculty of Mechanical Engineering, Belgrade, Serbia
[2] Faculty of Construction Management, University UNT, Belgrade, Serbia
[3] Institute for Forestry, University of Belgrade, Belgrade, Serbia
[*] corresponding author: istevovic@mas.bg.ac.rs

UDK: 624:502/524
DOI: 10.14415/CACE2024.49

ABSTRACT

The main goal of this research is the integration of green building practices, energy efficiency measures, and raising awareness about environmental protection as crucial in addressing the pressing challenges of climate change and resource depletion. This research encompasses the correlations of these elements and their results as impact on sustainable development. Green building principles emphasize the use of eco-friendly materials, energy-efficient designs, and sustainable construction techniques to minimize environmental impact. Raising awareness about environmental protection require researching and positive practice analysing in order to be able for making optimal eco-conscious decisions. The goal is mitigating climate change, conserving natural resources, and creating healthier living environments. This manuscript underscores the necessity of integrating these strategies to achieve long-term sustainability goals and foster a greener, more resilient future for generations to come. Two the most efficient world's models of green buildings are presented in this manuscript, with its particular results in energy efficiency achievements.

KEYWORDS:

GREEN BUILDING, ENERGY EFFICIENCY, ENVIRONMENTAL PROTECTION, GREEN ROOFS, ECOLOGY MANAGEMENT

ARTIFICIAL INTELLIGENCE METHODS ON SUSTAINABLE PATH IN THE FUNCTION OF ENERGY EFFICIENCY INCREASE

Ivan Stevović[1*], Jovana Jovanović[2], Mihailo Jovanović[3]

[1] Innovation Centre for the Faculty of Mechanical Engineering, Belgrade, Serbia
[2] Faculty of Construction Management, University UNT, Belgrade, Serbia
[3] Faculty of Management, Herceg Novi, Montenegro
[*] corresponding author: istevovic@mas.bg.ac.rs

UDK: 004.8:502/504
DOI: 10.14415/CACE2024.50

ABSTRACT

Artificial intelligence (AI) methods have emerged as pivotal tools in the quest to enhance energy efficiency across diverse sectors. This research presents the multifaceted applications of AI methods and models and their transformative impact on optimizing energy consumption, reducing energy consumption and fostering sustainability. One of the primary applications of AI in energy efficiency lies in predictive analytics. Machine learning algorithms analyse vast datasets, including historical energy consumption patterns, weather data, and operational parameters, to forecast future energy demand accurately. These predictive models enable proactive decision-making, allowing stakeholders to anticipate fluctuations in energy usage and adjust operations accordingly, thereby minimizing waste and optimizing resource allocation. Furthermore, AI-driven optimization models play a crucial role in maximizing energy efficiency. By formulating complex optimization problems and considering various constraints and objectives, such as cost minimization, demand satisfaction, and emission reduction, these models identify optimal solutions for energy-intensive processes. Whether it's scheduling energy-intensive tasks, optimizing energy distribution in smart grids, or designing energy-efficient building systems, AI optimization methods and models offer unprecedented opportunities to enhance efficiency and sustainability.

KEYWORDS:

ARTIFICIAL INTELLIGENCE, ENERGY EFFICIENCY, SUSTAINABLE DEVELOPMENT, METHODS, INCREASE

IV GEODESY

THE FLOW OF CONFISCATION AND RESTITUTION OF LAND

Marina Davidović Manojlović[1*], Gordana Nataroš[2]

[1] Faculty of Technical Sciences, University of Novi Sad, Republic of Serbia
[2] Real estate consultant, Novi Sad, Republic of Serbia
[*] corresponding author: marina.davidovic@uns.ac.rs

UDK: 347.232(497.11)
DOI: 10.14415/CACE2024.51

ABSTRACT

This paper analyzes primarily the confiscation and later return of land on the territory of the Republic of Serbia. The focus of the research is on the following four legal institutes: confiscation, nationalization, sequestration, and expropriation. The first law that raised the issue of land restitution was passed in 1991. This law returned agricultural land that had passed into social ownership, on the basis of the Agricultural Land Fund, or through confiscation. After that, in 2009, the Law on Planning and Construction provided denationalization in the form of construction land conversion. Following the standard of the European Union, the Law on Restitution of Confiscated Property and Compensation was finally adopted in 2011, which is still implemented by the Restitution Agency.

KEYWORDS:

CONFISCATION, NATIONALIZATION, SEQUESTRATION, EXPROPRIATION, RESTITUTION

ABSOLUTE GNSS RECEIVER ANTENNA CALIBRATION AT THE FACULTY OF GEODESY - UNIVERSITY OF ZAGREB

Antonio Tupek[1*], Mladen Zrinjski[1], Đuro Barković[1], Krunoslav Špoljar[1]

[1] University of Zagreb Faculty of Geodesy, Kačićeva 26, HR-10000 Zagreb, Croatia
[*] corresponding author: antonio.tupek@geof.unizg.hr

UDK: 582.28
DOI: 10.14415/CACE2024.52

ABSTRACT

Global Navigation Satellite Systems (GNSSs) receivers are essential sensors for modern global positioning, navigation, and timing applications. Geodetic GNSS positioning applications are based on carrier-phase measurements, where the understanding of the GNSS signal's electrical reception characteristics, i.e., the receiver antenna phase center corrections (PCCs), is crucial. With the main objective of determining the PCC models of GNSS receiver antennas, only a few antenna calibration systems are in operation or under development worldwide. The International GNSS Service (IGS) publishes type-mean PCC models for almost all geodetic-grade GNSS antennas. However, the type-mean models are not perfect and do not fully reflect the signal reception properties of individual antennas. In this paper, the automated GNSS receiver antenna calibration system, recently developed at the University of Zagreb Faculty of Geodesy in Croatia, is shortly presented. The developed system is an absolute field calibration system based on the utilization of a Mitsubishi MELFA RV-4FML-Q 6-axis industrial robot. PCC modelling is based on triple-difference carrier-phase observations and spherical harmonics (SH) expansion. Global Positioning System (GPS) L1 and L2 frequencies calibration results for the LEIAX1202GG NONE antenna are presented. Furthermore, the individual and IGS type-mean PCC differences are quantified and the influence of both PCC models on geodetic positioning is analyzed.

KEYWORDS:

GNSS, ANTENNA CALIBRATION, INDUSTRIAL ROBOT, PHASE CENTER CORRECTION, GPS L1, GPS L2

GEODETIC MEASSUREMENTS ACCURACY UNDER DIFFERENT LEVEL OF LIGHT

Maja Đorđević Radulović[1], Danijela Radosavljević[1*], Andriana Bekerević[1], Evica Šejnjanović[2], Žarko Nestorović[2]

[1] Đerdap Usluge AD Kladovo, Kladovo, Serbia
[2] JSC EPS Belgrade, Kladovo, Serbia
[*] corresponding author: jakovljevic.danijela@gmail.com

UDK: 528.1
DOI: 10.14415/CACE2024.53

ABSTRACT

The measurements realized by geodetic method are provided in different condition of limited visibility. This case especially appears in the case of industrial geodesy applications where the highest possible accuracy is required. Also these measurements are usually provided in the conditions of short deadlines and there is no time for checking their accuracy on the site. These facts imply that surveyor should be well experienced and trained in order to obtain the reliable results of measurement. This research was conducted with aim to determine the accuracy of surveyors' measurements and to determine if the results are correlated under different conditions of visibility. The visibility was measured by flux meter.

KEYWORDS:

VISIBILITY, PROBABILITY DISTRIBUTION, HYPOTHESIS TESTING

COMPACTION AND ARRONDATION ON THE TERRITORY OF SERBIA

Gordana Nataroš[1]*, Milorad Vučković, Milan Trifković[2]

[1] Real estate consultant, Novi Sad, Republic of Serbia
[2] Faculty of Civil Engineering, Subotica, University of Novi Sad, Republic of Serbia
* corresponding author: jeja023@gmail.com

UDK: 349.414(497.11)
DOI: 10.14415/CACE2024.54

ABSTRACT

The work entails presenting the importance of compaction and arrondation to facilitate the resolution of accumulated land-related issues, along with addressing infrastructure and public facility needs for settlements and cities. The process of expropriation followed by land return and restitution has created additional problems. Arrondation, as the only viable solution, involves consolidating fragmented and scattered farm holdings into larger, unified pieces. Land surveying and geodetic-legal procedures are conducted by laws and regulations. Over time, consolidation has become an indispensable tool for realizing spatial, urban, and other land territory arrangement plans.

KEYWORDS:

CONSOLIDATION, ARRONDISSEMENT, RESTITUTION, GROUPING OF PARCELS

PENDULUM MOVEMENT ON LARGE DAM DEPENDENCES ON OUTER INFLUENCES

Stefan Istodorović[1], Žarko Nestorović[1*]

[1] JSC EPS Belgrade, Kladovo, Serbia
[*] corresponding author: zarko.nestorovic@djerdap.rs

UDK: 519.2:627.8.09
DOI: 10.14415/CACE2024.55

ABSTRACT

Large dams are permanently monitored for their stability determination. One of the methods for their relative stability determination is by using pendulums. The movement of pendulum in X and Y direction should represent the dam movement during time. The possible question is: “does the pendulum movement is dependent on the outer factors and how it is dependent on them. In this research it is investigated the model of pendulum movement and its dependence of air temperature, water temperature and temperature of concrete and also of the water levels.

KEYWORDS:

LINEAR REGRESION, STATISTICAL HYPOTHESIS, MODEL

APPLICATION OF TERRESTRIAL LASER SCANNING TECHNOLOGY IN THE ANALYSIS OF THE COLUMNS VERTICALITY AND THE CREATION OF A 3D MODEL OF THE SPORTS HALL

Marko Z. Marković[1], Mehmed Batilović[1], Đuro Krnić[1*], Marijana Vujinović[1], Zoran Sušić[1]

1 University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
* corresponding author: djuro.geo@uns.ac.rs

UDK: 528.021.7:004.92
DOI: 10.14415/CACE2024.56

ABSTRACT

The research presented in this paper focuses on the application of Terrestrial Laser Scanning (TLS) technology to analyse the verticality of columns and create a 3D model of the sports hall in the suburban settlement Futog, city of Novi Sad, Serbia. The examination of the verticality of the columns was performed by generating horizontal sections and extracting the cross-sectional profile of each column from the point cloud. These analyses enabled the determination of the columns' deviations from the verticality by comparing the coordinates of the centroids of the cross-sections. The 3D model of the object's exterior and interior was generated using the point cloud in the Revit software package. All surveying works, including Terrestrial Laser Scanning, establishment of geodetic network, registration and georeferencing of point clouds, analysis of column verticality, and the creation of 3D model, were performed according to relevant standards and regulations for this type of surveying work. The research results indicate the high efficiency and precision of TLS technology in identifying verticality deviations of columns and creating precise 3D model, which significantly contribute to the digitalization of construction objects.

KEYWORDS:

VERTICALITY OF COLUMS, 3D MODEL CREATION, TERRESTRIAL LASER SCANNING

CONTEMPORARY USERS OF STOKIS TOPOGRAPHIC AND CARTOGRAPHIC DATA

Ivana Racetin[1*], Robert Župan[2]

[1] University of Split, Faculty of Civil Engineering, Architecture and Geodesy, Split, Croatia
[2] University of Zagreb, Faculty of Geodesy, Zagreb, Croatia
[*] corresponding author: ivana.racetin@gradst.hr

UDK: 528.7:004.62
DOI: 10.14415/CACE2024.57

ABSTRACT

The official topographic-cartographic information system of the Republic of Croatia (STOKIS) has been in use since the end of its first creation phase in 2010, for a scale of 1:25000. The word use comes from the Latin word “usus” and it is about the action and effect of use. Its general and basic concept refers to the action of something to perform a task or fulfil a goal. Based on that definition, it would follow that a user is a person who benefits from something, that is, uses something. By analogy, the term map users are people who use maps for a specific reason [1]. Today, STOKIS and its databases are being updated. During the last decade, a certain number of different STOKIS users has been developed in the Republic of Croatia. The paper deals with traditional and contemporary users of topographic and cartographic products, including users in a construction industry, as well as users of STOKIS and the possibility of their expansion to potential new groups.

KEYWORDS:

DATABASE, USER, STOKIS, TOPOGRAPHIC DATA, CARTOGRAPHIC DATA, USAGE

MARKET VALUE ASSESSMENT OF CADASTRAL PARCELS USING HIGH-AND-BEST-USE ANALYSIS AND YIELD APPROACH

Dragan Kostić[1*], Milorad Zlatanović[1], Miomir Vasov[1], Miloš Nedeljković[1], Srđan Aleksić[2]

[1] University of Niš, Faculty of Civil Engineering and Architecture Niš, Serbia
[2] Low company Aleksić, Niš, Serbia
[*] corresponding author: dragan.kostic@gaf.ni.ac.rs

UDK: 332.6
DOI: 10.14415/CACE2024.58

ABSTRACT

The purchase of cadastrial parcels for the implementation of infrastructure projects for the purpose as a borrow area or exploitation fields of natural resources in the field of construction, encounter difficulties due to insufficiently precise low regulations regarding the definition of the methodology for determining the market value of cadastrial parcels.
It is known that in the Republic Geodetic Autorithy registers has no data of traded parcels with the potential of stone/gravel material, therefore the Comparative Approach is inappropriate.
In such cases, it is necessary to apply the High And Best Use analysis and the Yield Approach, which should estimate the amount of profit that the buyer/user of the expropriation will make and determine the share of the client's property rights in the potential profit as an equal contractual participant. This paper will show how to aply Yield aproach to determine market value od parcel.

KEYWORDS:

PARCEL MARKET VALUE, HIGH-AND-BEST-USE, YIELD APPROACH

TERRESTRIAL REFERENCE FRAMES: FOUNDATION FOR POSITIONING AND EARTH SCIENCES

Marijana Vujinović[1*], Vladimir Bulatović[1], Marko Z. Marković[1], Mehmed Batilović[1], Đuro Krnić[1]

[1] University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
[*] corresponding author: marijana.vujinovic@uns.ac.rs

UDK: 528.28
DOI: 10.14415/CACE2024.59

ABSTRACT

One of the main challenges in Geodesy is the definition and realization of stable Global Geodetic Reference Systems with geometric and physical characteristics which is necessary for applications in science and society. For that reason, International Association of Geodesy (IAG) has established the Global Geodetic Observing System (GGOS), which is integrating the three basic components: geometry, the earth rotation and gravity. The global reference frame in the GGOS is a realization of the International Terrestrial Reference System (ITRS), a world spatial reference system co-rotating with the Earth in its diurnal motion in the space. Global Geodetic Reference Systems are necessary for determining the position on Earth and in space, as well as the precise measurement of changes caused by geodynamic and climatic processes. They represent a unified basis for geospatial data, positioning, satellite navigation and other applications. The backbone of this integration is the existing global ground network, based on analysis of data from key space geodetic techniques VLBI, SLR, GNSS and DORIS.

KEYWORDS:

REFERENCE FRAMES, ITRF, GEODYNAMIC PROCESSES, GNSS, SPACE GEODETIC TEHNIQUES

MODEL FOR RISK MANAGEMENT IN LAND CONSOLIDATION PROJECTS REALIZATION

Marinković Goran [1], Ilić Zoran [2*], Nestorović Žarko [3]

[1] Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia
[2] Academy of Technical and Educational Vocational Studies, Niš, Serbia
[3] JSC EPS, Belgrade, Serbia
[*] corresponding author: zoran.ilic.ni@akademijanis.edu.rs

UDK: 332.3/.6:005.334
DOI: 10.14415/CACE2024.60

ABSTRACT

Land consolidation projects (LCPs) are complex, long lasting and include huge number of stakeholders with potentially opposite interests. The complexity and duration of LCPs are sources of potentially risks which could lead to the LCPs exceeding the planned costs, delay of LCPs realization and even though to their failure. These facts imply that the risk management should be included in the LCPs as their inherent activity. This research is devoted to the issue of defining the role and investigating the significance of risk management inclusion in the LCP project.

KEYWORDS:

COMPLEXITY, STAKEHOLDERS, DURATION, LIFE CYCLE, PROBABILITY

THE ROLE AND SIGNIFICANCE OF LAND CONSOLIDATION PROJECTS ON THE SUSTAINABLE DEVELOPMENT OF THE AREA. CASE STUDY: THE MUNICIPALITY OF BAČKA TOPOLA

Jelena Tatalović[1*], Milan Trifković[1], Bogdan Bojović[1]

[1] University of Novi Sad, Faculty of Civil Engineering Subotica, Subotica, Serbia
[*] corresponding author: lazicjelena@uns.ac.rs

UDK: 349.412:502.131.1
DOI: 10.14415/CACE2024.61

ABSTRACT

This paper will analysis the impact of land consolidation projects on the sustainable development of the area. The research is focused on the analysis of the effects of land consolidation on agricultural land, in the municipality of Bačka Topola. The conducted research should give an answer to the question of whether the realization of land consolidation projects improved the quality of agricultural land, in accordance with the principles of sustainable development.

KEYWORDS:

LAND CONSOLIDATION, SUSTAINABLE DEVELOPMENT, GROUNDWATER LEVEL

PARADOXES OF REGRESSION MODELS

Milan Trifković [1], Miroslav Kuburić[1], Žarko Nestorović [2*]

[1] Faculty of Civil Engineering, Subotica, Serbia
[2] Joint stock company "Elektroprivreda Srbije" Belgrade, Serbia
[*] corresponding author: second. zarko.nestorovic@djerdap.rs

UDK: 519.22
DOI: 10.14415/CACE2024.62

ABSTRACT

Regression analysis is often used to represent the discrete set of points with one line; nevertheless it was straight or curved line which approximates the discrete set of points in plane in "best" possible way. Regression is also suitable to exchange the behaviour of one point in time defined by set of points with one formula. But it also could produce some confusion about obtained results. Namely the exchange of discrete set of points by formula means that coefficient of line should be determined by means of least square method. The further analysis could lead to the insignificance of some coefficients but their elimination from the model could result with significant deviation between real results and improved model. In this research some cases from practice were investigated and discussed.

KEYWORDS:

STATISTICAL HYPOTHESES TESTING, SIGNIFICANCE, ACCURACY

CIP - Каталогизација у публикацији
Библиотеке Матице српске, Нови Сад

624(048.3)

INTERNATIONAL Conference Contemporary Achievements in Civil Engineering (9; 2024; Subotica)
Book of abstracts / IX International Conference Contemporary Achievements in Civil Engineering, [Subotica, April 25-26. 2024.] ; [editors Vukan Ogrizović, Smilja Bursać, Jelena Tatalović]. - Subotica : Faculty of Civil Engineering, 2024 (Subotica : Birografika MB). - 132 str. : ilustr. ; 25 cm

Tiraž 200. - Bibliografija uz svaki rad.

ISBN 978-86-80297-97-2

а) Грађевинарство – Апстракти

COBISS.SR-ID 142278409

PATRON

REPUBLIC OF SERBIA,
MINISTRY OF EDUCATION

REPUBLIC OF SERBIA,
MINISTRY OF SCIENCE, TECHNOLOGICAL DEVELOPMENT AND INNOVATION

REPUBLIC OF SERBIA,
PROVINCIAL SECRETARIAT FOR HIGHER EDUCATION AND SCIENTIFIC RESEARCH

CITY OF SUBOTICA

SPONZORI

ABA PROFESSIONAL DOO, BEOGRAD

ASTRINEXLAB D.O.O., GRAD ZAGREB

GEO-PROJEKT SM DOO, SREMSKA MITROVICA

GEOSIGMA S&D DOO, SOMBOR

GEOSOFT DOO, BEOGRAD

GEOPUT DOO, BEOGRAD

SMB-BETONJERKA DOO, SUBOTICA

TERAX NISKOGRADNJA DOO ZA IZVOĐENJE GRAĐEVINSKIH RADOVA PROMET I USLUGE, SUBOTICA

KARIN KOMERC MD DOO, NOVI SAD

GEO OPREMA D.O.O., JELAŠNICA