WMCAUS 2019

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World Multidisciplinary
Civil Engineering - Architecture - Urban Planning
Symposium

ABSTRACT COLLECTION BOOK

Eco-friendly Symposium - WMCAUS

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JUNE 2019 17-21
Prague - Czech Republic

Preface

This Abstract Collection consists of the abstracts of papers presented in the “World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium” in the city of romance Prague (Czech Republic) during 17-21 June 2019. The World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium (WMCAUS) aims to provide a forum for discussion of the latest findings and technologies in different fields of Civil Engineering, Architecture and Urban Planning, to give opportunities for future collaborations, to be a platform for sharing knowledge and experiences in the fields of Civil Engineering, Architecture and Urban Planning, to lead for providing a forum for early career researchers for presentation of their work and discussion of their ideas with experts in different fields of Civil Engineering, Architecture and City and Urban Planning such as; Construction Management and Engineering, Construction Materials, Geotechnics, Hydromechanics, Structural Engineering, Building Performance Simulations, Transportation, Architectural Space, Social Sciences and Architecture, Architectural Culture, Theories of Vision and Visuality, Architectural Design and Methods, Architectural Historiography, Architectural Heritage and Conservation of Historical structures, Sustainability in the Built Environment, Urban Planning, Public Space, Urban Design, Theories and Methods, Regional Planning, Archaeological Method and Theories, Sustainable Urban Development, Urban Sociology, Economics and Politics, Risk Management and Mitigation Planning, GIS-Based Modelling for Mitigation Planning, Computer Aided Design, Mathematical and Statistical Methods, Integrated Coastal Zone Planning and, Management, Accreditation of Civil Engineering, City and Regional Planning Education.

WMCAUS 2019 is the 4th of the Annual series. However, nowadays there had been many local or international meetings related to Civil Engineering, Architecture, Urban Planning Sciences, we decided to organize a traditional style of symposium, friendlier and very fruitful alternative world symposium which is not a festival-like super-large convention, too chaotic and busy to have a chance to discuss something in deeper with other participants.

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

We would like to express our sincere gratitude to all 500+ submissions to WMCAUS 2019 from 50+ different countries all over the world for their interests and contributions in WMCAUS 2019. We wish you enjoy the World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium – WMCAUS 2019 and have a pleasant stay in the city of romance Prague. We hope to see you again during next event 5th Anniversary WMCAUS 2020 which will be held in Prague (Czech Republic) during the period of 15-19 June 2020.

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Mariusz Antolak

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Convener: Anna Maria Wierzbicka
Warsaw University of Technology, Poland

WARSAW MODERNISM – BOGDAN LACHERT
Anita Orchowska

INTERPENETRATION OF THE ARCHITECTURAL AND URBAN REALMS IN THE WORK OF ARCHITECT MAREK BUDZYŃSKI
Krystyna Ilmurzyńska

OSKAR HANSEN - AN ARCHITECT LOOKING INTO THE FUTURE
Anna Maria Wierzbicka

STEFAN KURYŁOWICZ. ARCHITECTURE OF CHANGE 1989 - 2011
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URBAN COMPOSITION THEORY BY KAZIMIERZ WEJCHERT AS A SPATIAL MORPHOLOGY MODEL
Artur Jerzy Filip

AFFORDABLE SINGLE-FAMILY HOUSING: FROM THE TRADITIONS OF THE WARSAW SCHOOL OF ARCHITECTURE
Piotr Trębacz

A GOOD FLAT ACCORDING TO HALINA SKIBNIEWSKA
Iwona Szustakiewicz

THE VISUAL PERCEPTION OF ARCHITECTURE ACCORDING TO THE THEORY OF JULIUSZ ŻÓRAWSKI
Paweł Trębacz

WORKS OF KAROL JANKOWSKI (1868-1928), CZESŁAW PRZYBYLSKI (1880-1936) AND RUDOLF ŚWIERCZYŃSKI (1883-1943) AS THE BACKGROUND FOR THE CHANGES IN ARCHITECTURAL DESIGN TEACHING AT THE FACULTY OF ARCHITECTURE OF WARSAW UNIVERSITY OF TECHNOLOGY IN THE 1920S
Anna Agata Wagner

HISTORY OF CITY PLANNING AT FACULTY OF ARCHITECTURE, WARSAW UNIVERSITY OF TECHNOLOGY: THEORY AND PRACTICE
Alicja Szmelter, Justyna Zdunek-Wielgołaska

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Karolina Tulkowska

Specific Session: Technology, Organization and Management in Construction Projects

Convener: Elżbieta Radziszewska-Zielina
Cracow University of Technology, Poland

WARSAW MODERNISM – BOGDAN LACHERT
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CZESŁAW PRZYBYSLKI – REMINISCENCE OF DIDACTIC AND CREATIVE ACTIVITY
Agnieszka Lewandowska

Specific Session: Dimensions and Principles of Sustainability in Architecture

Convener: Ivan Silaci
I & M.S., s.r.o., Czech Republic

CREATIVE SUSTAINABILITY AND ITS APPLICATION IN THE DESIGN OF THE EXHIBITION IN SLOVAK NATIONAL MUSEUM
Ivan Siláči, Paulína Ebringerová

EXTERNAL IMAGE OF VITICULTURAL TOWNS LOCATED AT THE FOOT OF LITTLE CARPATHIAN
Livia Šišláková, Andrea Šeligová

SOCIAL AND CULTURAL ROLE OF GREENERY IN DEVELOPMENT OF CITTASLOW TOWNS
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COMMUNITY ENGAGEMENT AS A SUSTAINABLE TOOL IN TRANSFORMING MASS HOUSING URBAN STRUCTURES: CASE STUDY OF PETRŽALKA ESTATE, BRATISLAVA, SLOVAKIA
Viktor Kasala, Katarína Smatanová

STAKEHOLDERS - AN IMPORTANT PART OF A SUSTAINABLE CITY CONCEPT
Ľubica Vitková, Ján Urban

POTENTIAL OF CULTURE FOR SUSTAINABLE URBAN DEVELOPMENT
Ivan Siláči, Ľubica Vitková

THE QUALITY OF INDOOR ENVIRONMENT OF INTELLIGENT BUILDING – GLOBAL PHENOMENA OF SUSTAINABLE ARCHITECTURE
Branislav Puškár, Edita Vráblová, Dušan Kočlík

Session Title:

Construction Management and Engineering

LABORATORY PERFORMANCE EVALUATION OF CO-POLYMER BASED DUST SUPPRESSANT MIXED WITH POORLY SAND

Ziyan Wu [1], Chun-Hsing Ho [2], Junxin Huang [3]

[1] Department of Civil and Environmental Engineering, Stanford University; USA
[2] Dept. of Civil Engineering, Construction Management & Environmental Engineering, Northern Arizona University, USA
[3] Hunan Institute of Technology, Hengyang, China

ABSTRACT

Fugitive dust, generated along unpaved roads or uncovered construction sites, defined as a type of atmospheric matter (PM), is considered as a major source of air pollution in metropolitan areas. Fugitive dust can potentially cause respiratory illness and lung damage for humans, and even lead to premature death in sensitive individuals. Aiming to reduce the fugitive dust emission on unpaved roads, scientists did various lab experiences to analyse the performance of different types of dust suppressants mixed with different soils. In our previous papers, we evaluated the co-polymer based dust suppressant (CPS) mixed with loamy sand (soils are from Sedona, Arizona) and silty clay (SP-SC) (soils are from Flagstaff, Arizona). The objective of this paper is to analyse the efficiency of fugitive dust reduction and present the quantitative laboratory evaluation of CPS mixed with poorly sand (SP). The soils were sampled from Page, Arizona. Soil classification is based on United Soil Classification System (USCS). Four concentrations of CPS (0%, 1%, 3%, and 5% by weight) were diluted and mixed with soil samples to prepared soil specimens. A series of laboratory experiences were performed on the soil specimens including moisture retention test, surface strength test, dynamic rolling test, and scanning electron microscopy (SEM) imaging. The laboratory results show that the higher the concentration of CPS is, the better CPS performs, and CPS with 5% concentration by weight controls the dust emissions better as compared with the other three concentrations, provided the results from the moisture retention rate, surface strength, dynamic rolling resistance, and interlock/cohesion effect in SEM images are promising.

Corresponding Author: Ziyan Wu

LABORATORY PERFORMANCE EVALUATION OF POLYMER-BASED DUST SUPPRESSANT MIXED WITH POORLY SAND

Ziyan Wu [1], Chun-Hsing Ho [2], Junxin Huang [3]

[1] Department of Civil and Environmental Engineering, Stanford University, USA
[2] Dept. of Civil Engineering, Construction Management & Environmental Engineering, Northern Arizona University, USA
[3] Hunan Institute of Technology, Hengyang, China

ABSTRACT

According to the International Organization for Standardization (ISO), fugitive dust is defined as atmospheric solid with particle size smaller than 75 μm. Fugitive dust is considered as a type of atmospheric matter (PM), and it is a major contributor to the air pollution in urban area. Due to the harms of fugitive dust to public health, various dust suppressants mixed with different soils from unpaved roads have been quantitative tested and evaluated in order to control and reduce the dust emission of unpaved roads. In our previous papers, we evaluated the polymer based dust suppressant (PBS) mixed with loamy sand (soils are from Sedona, Arizona) and silty clay (SP-SC) (soils are from Flagstaff, Arizona). However, the effectiveness of PBS on the dust emissions on sandy soil has not well studied. Therefore, this paper aims to evaluate the efficiency of fugitive dust reduction of the polymer-based dust suppressant mixed with poorly sand (SP). Soil is sampled is Page, Arizona, and the soil is classified according to United Soil Classification System (USCS). Soil samples were mixed with four different concentrations of PBS (0%, 5%, 10%, and 15% by weight). A series of laboratory experiences were performed on the soil specimens, including moisture retention test, surface strength test, dynamic rolling test, and scanning electron microscopy (SEM) imaging. The laboratory results show that as the concentration of PBS increases, PBS performs better. PBS with 15% concentration by weight controls the dust emission better compared with the other three concentrations, based on the moisture retention rate, surface strength, dynamic rolling resistance, and interlock/cohesion effect in SEM images.

Corresponding Author: Ziyan Wu

LIGHT CLAY- AND STRAW BALE-BASED BUILDING TECHNOLOGIES

Wojciech Drozd [1], Marcin Kowalik [1], Jolanta Harasymiuk [2]

[1] Institute of Construction Management, Tadeusz Kościuszko Cracow University of Technology, Warszawska 24 St., 31-155 Kraków, Poland

[2]Institute of Building Engineering, Faculty of Geodesy, Geospatial and Civil Engineering University of Warmia and Mazury in Olsztyn, Heweliusza 4 St., 10-718 Olsztyn, Poland.

ABSTRACT

The article deals with issues related to light clay and straw bale in modern housing. It presents the characteristics of clay and straw, as building materials. Attention is paid to the possibility of using these raw materials for building walls in single-family houses. In addition, the paper presents a thermal analysis for this type of walls and the resulting conclusions, which allow for the treatment of straw bale and light clay as a viable alternative to commonly used technologies for erecting buildings. According to the PN-EN ISO 6946: 2008 standard, thermal resistance and heat transfer coefficient were calculated for selected vertical partitions. Other natural building technologies have been omitted.

Corresponding Author: Wojciech Drozd

USE OF A 3D LASER SCANNER FOR INVENTORY OF HISTORICAL CHAPELS

Joanna A. Pawłowicz

Institute of Building Engineering, Faculty of Geodesy, Geospatial and Civil Engineering,
University of Warmia and Mazury in Olsztyn,10-724 Olsztyn, Heweliusza str. 4, Poland

ABSTRACT

In this work we've discussed results of measurements made by 3D laser scanning. We analysed historical monuments in the village of Glotowo in warminsko-mazurskie country (Poland). The buildings are part of a complex of chapels that make up the Way of the Cross. The differences in the results of various measurement techniques and tools have been analysed by the classic method: using the Leica manual laser rangefinder and modern technology using the Leica 3D Scan Station C10 laser scanner. An inventory of three objects, brickwork, similar in layout, differing in size and finishing details was made. The work has been richly illustrated with images showing the state of the chapels and images depicting sequences of data processing in the cloud of points and AutoCAD. In the content we analysed the essence of the issue of laser scanning, the history and the purpose of the measurement system. The summary contains a summary of the results, in the form of tables, obtained with two methods of measurement of the same elements and comments. In this work primarily, we analysed and developed drawn ups on the basis of both methods of measurement and the obtained accuracy. The final Inventorying is based on the average measurement results obtained with a 3D scanner.

VALIDATION OF A PHYSICALLY-BASED EROSION MODEL BASED ON A CONTINUOUS RAINFALL SERIES IN THE SLOVAK CONDITION

Zuzana Némethová, Silvia Kohnová

Slovak University of Technology, Department of Land and Water Resources Management, Radlinského 11, 810 05, Bratislava, Slovakia

ABSTRACT

The study presents a validation of the physically-based EROSION-3D model in the Slovak catchment. During the last decade there has been intention to develop a new generation of erosion models in order to replace the worldwide use Universal Soil Loss Equation with more effective methods. One of those methods is represented by the physically-based models which provide a tool rely upon descriptions of the processes occurring in the real natural conditions. The essential element of the physically-based models is that they are process-based, reflecting the most recent advances in erosion and hydrological research. In the modelling of soil erosion is a validation and verification of the methodologies used consider as the general problem. The importance of a model validation can be seen in a building of confidence in the ability of the model to generate satisfactory simulation results and in order to discover the strengths and weaknesses of the model used. The physically-based ERROSION-3D model is suitable not only for the research purposes, but also for the engineering practices, e.g. for assessing the effect of changing agricultural management practices and their impact on soil losses. The validation of EROSION-3D model has been performed on the continuous rainfall series for the selected period 2015 - 2016. The modelled results were compared with the real measured sediment deposition data acquired by the bathymetry survey of the Svacenicky Jarok polder using the Autonomous Underwater Vehicle device EcoMapper in the same period. Svacenicky Jarok polder is a part of the flood protection measures in the investigated territory of Myjava region in Slovakia. The final results present a comparison between the modelled and observed results with an assessment of the efficiency of the EROSION-3D model together with the different field management practices in the catchment during the selected period.

Corresponding Author: Zuzana Némethová

AN ASSESSMENT OF CHANGES IN ECOLOGICAL STABILITY AND LANDSCAPE MANAGEMENT PRACTICES OVER THE LAST CENTURIES: A CASE STUDY FROM VRBOVCE, SLOVAKIA

Roman Vyleta, Peter Valent, Zuzana Németová

Department of Land and Water Resources Management, Faculty of Civil Engineering, Slovak University of Technology, Radlinského 11, 810 05 Bratislava, Slovakia

ABSTRACT

The landscape is an open system influenced by natural and anthropogenic factors that in a long-run fundamentally affect its state and development. A comprehensive understanding and assessment of the anthropogenic impacts on the environment is a key prerequisite to maintain its good ecological state. However, as the impacts of anthropogenic activities on the environment are omnipresent, necessary measures for their mitigation should be addressed to improve the landscape ecological stability. In Slovakia, agricultural activities on large blocks of land are considered as one of the main anthropogenic factors negatively influencing the landscape ecological stability, which however could be eliminated by effective landscape management activities. This study assesses the ecological stability of the cadastral area of the village of Vrbovce in both historical and current contexts and suggests several “green” measures aiming at improving its ecological stability. The information about the land types and structures were obtained by manual vectorization of historical and current topographical maps. Based on this information analysis of land utilization and its development was carried out for a period of more than 250 years. For each historical period, a coefficient of ecological stability was evaluated to assign a degree of ecological stability for each period. Moreover, an analysis of positive and negative landscape-ecological impacts was also performed to identify the problematic areas within the cadastral area that need to be addressed by mitigation measures. Based on these analyses several mitigation measures were suggested to improve the ecological stability of the area. Most of them were related to the agricultural land, which makes up a significant part of the area and represents its less ecologically stable part. The proposed measures respect the original rural character of the area and its specific scenery which is a result of centuries of man-land interaction. The measures are mostly focused on transforming some of the less ecologically stable areas into natural grasslands which would be used for ecological cattle and sheep breeding as these activities were historically the primary source of living in this area.

Corresponding Author: Zuzana Németová

PROCESS FOR THE PARAMETERIZATION OF A SOIL EROSION MODEL BASED ON A SMALL RAINFALL SIMULATOR

Zuzana Némethová, Michaela Danáčová

Slovak University of Technology, Department of Land and Water Resources Management, Radlinského 11, 810 05, Bratislava, Slovakia

ABSTRACT

Soil erosion due to water is an extensive problem in many countries, especially accelerated erosion, where the natural rate has significantly increased in the most recent period. Its extent impacts on land management practices is the main factor causing soil degradation. Rainfall simulators are very popular as a standard instrument to conduct research on topics such as soil erosion, infiltration or surface runoff. They are used in laboratory or field experiments in erosion studies to assess the impacts of changes in the tillage management with regard to the erodibility of soil. Results of the experiments can be used in the modelling of surface runoff and sediment transport by hydrological models. This study presents the results of experimental measurements of surface runoff made by an artificial rainfall on an experimental plot. The artificial rainfall was generated using a small rainfall simulator, which allows changes in rainfall intensity and duration. The object of this study was analysed after the surface runoff occurred and the weight of the soil particles was transported from the experimental plot. These results have been used to determine the soil input parameters for the physically-based EROSION-2D model and for the verification of the model parameters. The EROSION-2D model represents a physically and event-based approach for the prediction of soil loss and runoff. The model only requires eight soil input parameters. Some of those parameters can be easily obtained by classic and widely-used methods (soil analyses, terrain measurements, evaluations soil map), and other parameters can be determined from rainfall experiments which represent the main aim of the study. The rainfall intensity has been set at 5 mm/min with 20 minutes of simulated rain and it corresponded to an intensity with a return period of 100 years. During the experiment a continuous course of the surface runoff and soil moisture were recorded. The results from the simulations were applied to simulate the soil erosion processes in the physically-based EROSION-2D model. For the parametrization of the model artificial rainfall events were used with an intensity of 2.7 mm/min and rain durations of 12 and 13 minutes. The parametrization of such models represents a necessary and significant part of any scientific work. The experimental results show that outputs from the rainfall simulations can be reproduced successfully, and based on the results, the process of determining the model´s parameters can be successfully performed.

Corresponding Author: Zuzana Némethová

RESEARCH OF BEHAVIOR OF BED JOINTS REINFORCED MASONRY WALLS WITH AND WITHOUT OPENINGS MADE OF AUTOCLAVED AERATED CONCRETE UNDER HORIZONTAL SHEARING

Radosław Jasiński

Department of Building Structures, Silesian University of Technology, Akademicka 5, 44-100 Gliwice, Poland

ABSTRACT

The assumption of analytical computational models lies in the cooperation of wall bands (Rosman 1971), which is provided by upper and bottom lintels of openings. As shown in the publication (Jasiński 2018 - WMCAUS 2018) on nonreinforced walls with openings made of AAC, the occurrence of cracking markedly reduced the stiffness of walls and values of destructive stresses in relation to elements without reinforcement. There was no advantageous cooperation between the components of the wall. In order to increase the resistance and load-bearing capacity of walls with openings, it was proposed to use reinforcement in bed joints. The walls were reinforced with steel trusses of EFZ 140 / Z 140 type (Z1 type) and meshes made of plastics (Z2 type). This paper demonstrates our own results from tests performed on ten masonry units made of autoclaved aerated concrete. The tests were performed in eight series of two elements (16 specimens). The first two series denoted as HOS-AAC-Z1 included two elements without openings, with the length l = 4.43 m, height h = 2.43 m, and thickness t = 180 mm reinforced with Z1 and Z2 type of reinforcement. The wall tests were performed under initial compressive stress values σ_c = 0.1 N/mm^2 and 1.0 N/mm^2. In remaining four series, used walls (external dimensions l = 4.43 m, h = 2.43 m, t = 180 mm) with different opening shapes denoted by convention as A, B and C. Elements with A-type opening, 1.48 m wide and 0.98 m high, consisted of two models marked with the symbol HAS-AAC-Z1 (Z1 type of reinforcement) and HAS-AAC-Z2 (Z2 type of reinforcement). The models were tested under two values of initial compressive stress σ_c = 0.1 N/mm^2 and 1.0 N/mm^2. Elements with B-type opening, 2.66 m wide and 0.98 m high, consisted of two unreinforced models were marked with the symbol HBS-AAC-Z1 (Z1 type of reinforcement) and HBS-AAC-Z2 (Z2 type of reinforcement). The models were tested under two values of initial compressive stress σ_c = 0.1 N/mm^2 and 0.50 N/mm^2. The third series included a window opening with the width of 1.62 m and the height of 0.98 m, and a door opening with the width of 1.03 m and the height of 1.90 m. The arrangement of openings was denoted by convention as C. Similarly as in case of walls with A- and B-type openings, the series of C-type opening included tests on two models marked with the symbol HCS-AAC-Z1 (Z1 type of reinforcement) and HCS-AAC-Z2 (Z2 type of reinforcement). The models were tested under two values of initial compressive stress σ_c = 0.1 N/mm^2 and 0.50 N/mm^2. The models were made of AAC masonry units with identical pratameters as at the paper (Jasiński 2018, WMCAUS 2018): $f_{c,mv}$ = 2.97 N/mm^2, E_{cm} = 2041 N/mm^2, f_{vo} = 0.306 N/mm^2, G = 475 N/mm^2. The results were compared with test results for unreinforced walls with openings, tested under the same initial conditions. We described the failure mechanism and changes in cracking morphology. Stress values were compared at the time of cracking and destruction.

REALIZATION PROCESSES OF ROADBUILDING PROJECTS IN CZECH REPUBLIC: NECESSARY INFORMATION TO EXECUTE PROCESSES

Jan Radl, Jiri Kaiser

Faculty of Civil Engineering, Czech Technical University in Prague, Thákurova 7/2077, 166 29, Prague, Czech Republic

ABSTRACT

Road buildings projects are unique for their typical aspects. These typical aspects are long-term preparation process (app. 16 years) and construction phase (app. 4 years). Construction of road building influences large area in country and has big impact on environment. Construction road building projects very often suffer from project delays and increasing budget because of many causes. Paper analyses process of obtaining information and other conditions for realization of roadbuilding projects. Paper describes main road building project actors and main time schedule delays. After that the process is analysed and necessary information identified. Finally, other necessary conditions for realization process are identified. Realization of roadbuilding process diagram (focused on documentation) was created and verbally evaluated.

Corresponding Author: Jan Rádl

FACTORS AFFECTING PERFORMANCES OF SMALL PROJECTS IN SMALL ISLAND STATES – STAKEHOLDERS' PERCEPTIONS

Asish Seeboo

University of Mauritius, Faculty of Engineering, Civil Engineering Department, Reduit, Mauritius

ABSTRACT

Numerous are the studies that investigate the performances of big construction projects. However, in this particular investigation the emphasis is on small construction projects. The intent was to capture the perceptions of the major stakeholders, that is the clients, contractors and consultants on the factors that could possibly affect the performances of such small projects, which have limited budget, are of short durations and to further complex the situation, the projects are executed in small island states, such as the Republic of Mauritius. After an extensive literature search, a list of 61 performance indicators was made, which was further grouped into 10 main clusters, namely (i) cost; (ii) time; (iii) quality; (iv) productivity; (v) owner; (vi) regulator; (vii) employee; (viii) health and safety; (ix) learning; and (x) environment. A performance success survey was devised, tested and refined before circulating to the major stakeholders (response rate; client – 89%; contractors – 68.5% and consultants – 56%). With Kendall's coefficient of concordance W = 0.954 being greater than 0.5, the degree of agreement amongst stakeholders was found to be statistically significant. Hence the major 5 factors that impeded on the performances of smaller construction projects being executed in small island countries were found to be due to (i) poor leadership skills; (ii) absence of skilled force; (iii) inadequate liquidity within the company; (iv) escalation of material prices and (v) unavailability of resources.

Corresponding Author: Asish Seeboo

SOURCES AND CAUSE OF POOR PERFORMANCES ON RESIDENTIAL BUILDING PROJECTS – CASE STUDY OF THE REPUBLIC OF MAURITIUS

Asish Seeboo, Virendra Proag

University of Mauritius, Faculty of Engineering, Civil Engineering Department, Reduit, Mauritius

ABSTRACT

In this particular study the intent was to determine the sources and causes of poor performances on residential projects with specific attributes. The methodology adopted was through observation of the construction (from start to end) of 18 houses, and to be part of the study the houses needed to satisfy specific requirements such as; (i) floor area of residence should not be exceeding 1615 square feet; (ii) the residence had ground floor only; (iii) the residence will be made of reinforced concrete elements and cladded with cellular blocks using cement mortar; (iv) acceptance of the client to be part of the survey; (v) acceptance of the client to give access to the site during the execution of the works; (vi) acceptance of the client to give access to the plans and financial information; (vii) construction to be executed by a team of masons or small to medium contractor supplying labour only; and (viii) the client will be the sole party to deal with the different suppliers throughout the project. The researcher did not intervene during the execution of the works. Miscommunication, improper planning and absence of internal supervision of the different construction works lead to reworks which added to the overall cost of the project as well as it increased the duration. In many cases, the end product did not even match the average industry standard, and this is attributed to the fact that there was no quality controller, both internal or external, during the whole construction process. It was also found that these residential building projects have small project value that could not afford any consultant. To bridge the gap between the client and the contractor, it is primordial to have the third stakeholder (consultant) into the picture. The proposed consultant's scope of works will have to be precisely defined and the fees charged will have to be rational, bearing in mind that these projects have small budgets for their implementation.

Corresponding Author: Asish Seeboo

PROPOSED MODEL FOR ENHANCING PERFORMANCES OF SMALL PROJECTS IN SMALL ISLAND STATES – CASE STUDY OF THE REPUBLIC OF MAURITIUS

Asish Seeboo, Virendra Proag

University of Mauritius, Faculty of Engineering, Civil Engineering Department, Reduit, Mauritius

ABSTRACT

In this study the sources and causes of poor performances on small residential building projects, within the island of Mauritius, were used to devise a model that would enhance success on such types of construction ventures. The model was initially tested and refined. During the observational studies, 18 houses were observed within various districts around the island. Throughout the investigation, no two houses were constructed by the same builder/labour contractor or team of workers. For the validation of the proposed system, the same 18 teams were contacted. However, to form part of the selection list, the following criteria were mandatory: (i) the Builder/Contractor had to be agreeable to follow the proposed framework and, as per the previous endeavour, will supply only labour; (ii) the Client was also agreeable to follow the proposed model; (iii) residence was less than or equal to 1615 square feet; (iv) the residence was only one level high; (v) the residence was made of reinforced concrete elements and cladded with cellular blocks; (vi) construction started in August 2017; and (vii) the consultant on the project was myself. The impact of the system on the different projects proved to be very successful on many frontiers. The constructions were executed within the expected budgets with very little or insignificant deviations. Duration of projects was as expected and the quality of the resulting works was above average industry standard. Health and safety recommendations were implemented on all of the sites with the result being zero major/fatal accidents. Wastage on site was reduced considerably. Feedbacks collected with the different stakeholders were all positive, which proved that the proposed framework had boosted the performance of these residential building projects.

Corresponding Author: Asish Seeboo

THE USE OF COMPUTER SIMULATION IN PREPARATION OF CONSTRUCTION WORKS CARRIED OUT BY HELICOPTERS

Jozef Gašparík [1], Andrej Bisták [1], Zdenka Hulínová [1], Michal Neštiak [2]

[1] Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Building Technology, Radlinského 11, 810 05 Bratislava, Slovakia
[2] Slovak Hydrometeorological Institute, Jeséniova 17, 833 15 Bratislava, Slovakia

ABSTRACT

When constructing buildings on challenging terrain or in densely built urban areas, the potential of conventional "ground" construction technology is insufficient. In this case, a building can be constructed with the assistance of helicopters. The preparation of construction processes carried out by helicopters must respect the effects of randomly changing construction conditions, mainly weather, as well as specific helicopter working conditions. Weather conditions significantly affect helicopter parameters, especially its most important value in the construction technology – the maximum load capacity. The helicopter load is therefore not constant but it "changes in time". The complexity of this system can be modelled by using simulation models. The built-in model should allow us to investigate the behaviour of construction processes under realistic conditions and to evaluate the proposed structure of the process based on the required criteria. This presented article deals with the conceptual design of the simulation model of the helicopter-aided construction process, including the design of the simulation scheme. The key part of the simulation model, taking into account future weather conditions at the construction site, is designed in several steps with gradual approximation using various numerical weather prediction models. Partial work results suggest that although construction production is characterized by several specific features suitable for the use of simulation methods, to date, the simulation approach, up to a few exceptions, is not used. For this reason, it is the primary objective of this research to verify the suitability of simulation modelling in the preparation of building construction, thereby creating the conditions for eventual use of simulation models in building practice as well. For this verification, processes carried out by helicopters were selected, where the use of other methods show very inaccurate results. The simulation outputs are then applied in pre-construction design processes, in particular in the definition of the necessary time and financial reserves and related impacts on the overall construction organization. Processing this topic belongs to the area of interdisciplinary research, so in the future the presented methodology could be also used outside the construction sector, especially in logistics in general.

Corresponding Author: Andrej Bisták

NATURAL THERMAL LOADS AND THEIR INFLUENCE ON AIRFIELD CONCRETE SLABS

Małgorzata Linek, Patrycja Piotrowska-Nowak

Kielce University of Technology, Tysiąclecia Państwa Polskiego Street 7, 25-314 Kielce, Poland

ABSTRACT

The article presents theoretical aspects of the influence of environmental changes on the extent of the recognized stress in case of airfield concrete slab. Analyses included actual measurement data from 34 weather stations located within the area of Poland. The results obtained between 2000 and 2016 were used to prepare climatic data base of the selected regions. The analyses included maps of typical values taking into consideration daily, monthly and annual variations. In case of exemplary data from Kielce station, the influence of external conditions on the extent of the registered stress and deformations of airfield concrete slab was determined. According to the obtained test results, the significant influence of environmental conditions on changes of concrete slab strains was confirmed. Recommendations aiming at limiting negative influence of environmental conditions on concrete slab strains were suggested in case of the analysed area.

Corresponding Author: Małgorzata Linek

SENSITIVITY OF THE ECONOMIC EFFICIENCY OF THE MODERNIZATION OF RAILWAY CROSSINGS ON THE TRAFFIC MOMENT

Tomáš Funk, Vít Hromádka

Brno University of Technology, Faculty of Civil Engineering, Veveří 331/95, 602 00 Brno, Czech Republic

ABSTRACT

The paper brings partial results of the research project focused on the evaluation of the financial and economic efficiency of investment projects in the area of railway constructions. The general methodology of the evaluation of the financial and economic efficiency and risks of public investment projects is in detail solved in the Guide to Cost-Benefit Analysis of Investment Projects issued by the European Commission in 2014. The evaluation of projects in the transport infrastructure in conditions of the Czech Republic comes out from the mentioned Guide and in detail is solved in the Departmental Guidelines issued by the Ministry of Transport of the Czech Republic in 2017. This Departmental Guidelines deal with the evaluation of key benefits connected with the transport infrastructure. The presented project deals with the detailed evaluation of benefits connected with the increase of the safety and reliability of the railway, what is not included in the Departmental Guidelines. The subject of the paper is to present the results of the research focused on the evaluation of socioeconomic impacts connected with the generation of occurrences on railway crossings. The objective of the research is the calculation of the marginal values of the traffic model of the railway crossing, where it is possible to expect that the increase of its safety will be efficient from the economic point of view. The key output of the paper is the quantification of impacts of projects increasing the level of safety of railway crossings. These impacts include investment costs, costs for maintenance and repairs and benefits from the increase of the safety on railway crossings. Benefits of projects increasing the safety of railway crossings are represented mainly by the decrease of number of victims, injuries and material losses appeared following the occurrence on the railway crossing. Results are consequently related to the traffic moment of the railway crossing and there is assessed the value of “costs of the safety” of the railway crossing. Result of the research are presented on the case study of the variant solution of the security of the railway crossing. At the end of the paper there are described basic conclusions of the research and they are discussed minimal values of the traffic moment of the railway crossing for the assurance of the efficiency of invested resources, separately for regional and state railways.

Corresponding Author: Vít Hromádka

CONSTRUCTION, TRANSPORT, WATERWAY - DIFFERENCES IN CALCULATIONS

Jiří Nowak [1], Zuzana Mrňová [1], Alena Tichá [1], Jan Tichý [2], Marcela Vázlerová [1]

[1] Brno University of Technology, Faculty of Civil Engineering, Institute of Structural Economics and Management, Veveří 331/95, Brno, 602 00, Czech Republic
[2] Czech Technical University in Prague, Department of Logistics and Management of Transport,Konviktská 20, Praha 1, 110 00, Czech Republic

ABSTRACT

This paper presents a method of costs calculation and prices of construction work, road transport, water and sewer rates in the Czech Republic. Costs are important economic category that is closely related to the price. Each business has to master the cost calculation, especially the absorption calculation, which is based in dividing overhead costs to production (outputs, products and services). Absorption calculation is typical for the fact that they must also include indirect costs (or overheads), in addition to direct costs of production, i.e. they must absorb their costs completely. The absorption method is a surcharge calculation. However, the compilation of the calculation formula for the absorption calculation and the procedure for calculating costs and prices has its specificities in various branches of the economy. Differences are visible on samples based on selected case studies. It is a representative costs calculation and prices of construction work on a particular building, costs calculation and prices of road transport, one-component and two-component cost calculation and prices of water and sewer rate. All types of calculations must reflect the economic situation of the company, which presents the new product to the market. Differences between the types of listed products already indicate the needs of different inputs to the calculation and other calculation procedures. Without perfectly mastering the absorption calculation, it is not possible to introduce more specific calculation methods, such as dynamic calculation with a cover contribution or even in the next step introducing the Balance Scorecard. Correct absorption calculations can be checked by summing up all the production costs of the business with the sum of cost accounts from financial accounting. However, cost control is not the subject of this article.

Corresponding Author: Jiří Nowak

CLOSURE SOLUTIONS FOR A NON-COMPLIANT LANDFILL. CASE STUDY: PARȚA NON-COMPLIANT LANDFILL, TIMIȘ COUNTY, ROMANIA

Crețan Ioana-Alina [1], Moscovici Anca[2]

[1] Polytechnic University Timisoara, Hydrotechnical Engineering Department, Spiru Haret Street No. 1A, Timisoara, Romania
[2] Polytechnic University Timisoara, Terrestrial Communications, Foundations and Cadastre Department, Ioan Curea Street No. 1, Timisoara, Romania

ABSTRACT

Non-compliant landfills contain significant amounts of waste accumulated for years, representing significant sources of soil, air and groundwater pollution and population illness. All non-compliant urban landfills have closed storage before the year 2009. The non-compliant urban deposits in Timis County were unfinished and did not meet the conditions for the protection of environmental factors according to the Government Decision no. 349/2005 on waste disposal, Decision transposing Directive no. 1999/31 / EC on the storage of waste, therefore the required closure procedures that were finalized in the year 2015. The paper aims to present closing procedures that were taken to close the Parța non-compliant landfill as part of the Integrated Waste Management System in Timis County, co-financed by the European Regional Development Fund (ERDF), through the Sectoral Operational Program Environment 2007 - 2013, Priority Axis 2, "Development of integrated waste management systems and the rehabilitation of contaminated historical sites "

Corresponding Author: Crețan Ioana-Alina

COMPREHENSIVE EVALUATION OF ECOSYSTEM SERVICE AS AN OBJECT OF PUBLIC INTEREST

Eva Burešová, Vít Hromádka

Brno University of Technology, Veveří 331/95, 602 00 Brno-střed, Czech Republic

ABSTRACT

The subject of ecosystem services and the assessment of their public investment impacts include a myriad of smaller entities that can be explored in more detail. The aim of this paper is to focus on a group of public investments that are related to the restoration of floodplain and biotopes as an object of public interest. Nowadays river floodplains enter the theme of public investment primarily as a possibility of renaturation, adaptation or modernization of the territory so that they can be used as a nature friendly to flood protection, habitat, but it is not forgotten even for social purposes. The impact of the floodplain as a public investment can make a significant contribution to the region in which it is located. Typical examples are river floodplains, which are unable to absorb flood waves in a given area and thus do not bring social benefits for citizens. Although it originates from the above-mentioned principle. Under the condition that the investment is effective and the project is able to continue to work, it will not only provide assistance in times of floods and an attractive position, but also the benefits of financial resources. If the previous sentence were to apply to the subject already mentioned, it would be that citizens would come to the region to visit a river flood that is adapted for tourists (cycling path). While visitors do not pay admissions to the public space, it is assumed that they will use the restaurant, accommodation and other facilities in the region from which the contribution of the state or the region is reversed. Site benefits are not measurable only from a monetary point of view. The output of the contribution is, among other things, a clear definition of elements that should not be neglected, such as safety, ecological, ecosystem, natural, economic, social and educational benefit to the population. Public investments are not only positives. It is also worth mentioning the negative side of the thing, which represents the price that needs to be paid for the implementation and subsequent long-term maintenance of the project.

Corresponding Author: Eva Burešová

LEAN CONSTRUCTION WASTE REDUCTION - OFFICE BUILDING CASE STUDY

Piotr Nowotarski, Jerzy Pasławski, Jędrzej Skwarek

Poznan University of Technology, Plac Marii Skłodowskiej-Curie 5, 60-965 Poznań, Poland

ABSTRACT

The proper organization and planning of building processes plays an increasingly important role in building projects, and proper management is becoming a more frequent problem. Tools used in quality management are very often used in other areas of business, such as automotive, aerospace and production, unfortunately, rarely in the field of construction. The main goal of this article is to show that individual quality management tools and Lean Construction tools can be used in construction, and their use in construction processes brings significant and visible benefits. The authors present their work as an example of implementing these tools for building processes chose three types of works present at the construction of Pixel office buildings in Poznań. Authors present the basic concepts related to quality management and the tools used in the field of Lean Construction as well as assumptions of lean philosophy ie lean management and the main tools used in it, such as Ishikawa Diagram, Pareto Analysis, and the 5 why's method. This aims to introduce the reader to the main concept, assumptions and allows to learn the principles of lean management. The reader needs to be aware, that all company employees and suppliers must be involved in introducing Lean Management to the enterprise, starting with the owner and ending with the employee. It is not possible to implement a lean philosophy into a company, without understanding the basics and purpose for which they were introduced. Practical part of the article is devoted to a detailed analysis construction processes using the well-known Six Sigma cycle DMAIC - an abbreviation of the words: Define - Measure - Analyze - Improve - Control. The analysis was carried out on the basis of own knowledge and interviews with the construction management and employees of subcontracting companies present at the construction site. In the article also achieved results are presented in the form of conclusions. It can be said that using quality management tools(mainly Lean Management principles) visibly improves building processes and allows to achieve better financial and time results on the project.

Corresponding Author: Piotr Nowotarski

BIM TECHNOLOGY AS AN EFFECTIVE TOOL IN CONSTRUCTION PROJECT MANAGEMENT

Katarína Krajníková, Tomáš Mandičák, Marcela Spišáková, Peter Mésároš

Technical University of Košice, Faculty of Civil Engineering, Institute of Construction Technology and Management, Vysokoškolská 4, Košice 042 00, Slovakia

ABSTRACT

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

Corresponding Author: Katarína Krajníková

THE SUPPORT OF BUILDING SUSTAINABILITY THROUGH BUILDING INFORMATION MODELING TOOLS

Jana Smetanková [1], Katarína Krajníková [2], Marcela Spišáková [1], Peter Mesároš [1]

[1] Technical University of Košice, Faculty of Civil Engineering, Department of Construction Technology and Management, Vysokoškolská 4, 042 00 Košice, Slovakia
[2] Technical University of Košice, Faculty of Civil Engineering, Department of Applied Mathematics, Vysokoškolská 4, 042 00 Košice, Slovakia

ABSTRACT

Trends in the construction sector are moving forward very quickly. Building information modelling is used in building sector more and more often and is showed as important in life cycle of building. The result of building information modelling is a model that is filled with graphic and non-graphical information. It allows to analyze the building and to consider the overall design from different perspectives. The main benefit of sustainable construction is to maximize performance with minimal adverse of environmental impacts. A sustainable construction helps to promote economic, social and cultural improvement at local, regional and global level. A sustainable design and building lifecycle management require a new types of building information that building information modeling provides. The contribution deals with the building information modeling potential and displays its tools that help to increase the sustainability of the building, support the overall rationalization of construction with respect to technology innovation, optimization of the planning process and actively help to exploit new aspects supporting so-called green solutions across the building's life cycle.

Corresponding Author: Jana Smetanková

DELAYS ANALYSIS IN CONSTRUCTION PROJETCS – LITERATURE REVIEW

Agnieszka Dziadosz[1], Mariusz Rejment[2], Oleg Kapliński [3]

[1] Faculty of Civil and Environmental Engineering, Poznan University of Technology, Piotrowo 5, 60-965 Poznan, Poland

[2] Faculty of Civil Engineering, Wrocław University of Technology, Wybrzeże Wyspiańskiego 27, 50-370 Wrocław, Poland

[3] Faculty of Architecture, Poznan University of Technology, Piotrowo 5, 60-965 Poznan, Poland

ABSTRACT

Each construction project requires an individual approach due to the specific conditions, such as: the type of a building facility, its cubature, and the scope of construction works, location and the material-technological solutions. These conditions can cause various types of disruptions in construction processes leading to delays in construction projects. The problem of delays in construction projects is readily undertaken by numerous researchers. Such research was carried out in various countries and for various types of construction works and building facilities. However, it is difficult to say, in the case of the cited publications, what types of delays predominate for a given type of building facility or construction works. Do delays (resulting from the legal regulations) result from specific standards applicable in a given country? Does the method of erection of a building facility affect the occurrence of delays? The research results presented in the literature are mainly focused on the identification of important factors generating delays, their hierarchy and the initial assessment of the identified factors. The research focuses mainly on the specificity of construction works in a given country or for a specific construction project. There is a lack of generalizations and clear guidelines for the quantitative measurement of delay (e.g. number of days of delay in relation to the deadline for completing the task). In many scientific publications, there is a noticeable diversity of the used terminology and the freedom to adopt the criteria for classification of factors, which definitely prevents the synthesis of the obtained results. The aim of the authors of the article was to constructive, critical and insightful analysis of literature due to the cited research on the factors/causes of delays in the construction industry. As noted, the results of research carried out in different countries were not the same. The authors have attempted to interpret this discrepancy (i.e. the discrepancy was the result of the size of the research sample adopted, the experience in the industry of the surveyed people, the readability of the terminology used in questions or the method of grouping factors).

Corresponding Author: Agnieszka Dziadosz

DISTURBANCE ANALYSIS AND THEIR IMPACT ON DELAYS IN CONTRUCTION PROCESSES

Wiesław Meszek[1], Agnieszka Dziadosz [1], Mariusz Rejment [2]

[1] Faculty of Civil and Environmental Engineering, Poznan University of Technology, Piotrowo 5, 60-965 Poznan, Poland

[2] Faculty of Civil Engineering, Wrocław University of Technology, Wybrzeże Wyspiańskiego 27, 50-370 Wrocław, Poland

ABSTRACT

Despite the development of: modern technologies, the software supporting the management of construction projects, popularizing of the tools for data analysis and numerous studies on factors interfering the efficient course of the construction process, the delays are still a phenomenon often present in the construction industry. The delays in building processes are influenced by many different factors, including, first and foremost, the conditions of construction work which are specific for each construction project. Each construction project requires an individual approach to its planning and the flexibility in its management. The factors, causing delays in the completion of construction works in relation to the planned dates in the schedule, disturb the correct rhythm of construction works, and as a consequence, they cause that the entire construction project is not completed on time. The delay is also indirectly connected with ineffective supervision over the investment, the lack of analysis, by the management staff, the scale of the delay. This is most often caused by limited time to make decisions during the construction works and difficulties in quantifying the impact of delays on the completion dates of selected construction processes and the entire project. Based on the literature, it should be noted that the main goal of the researchers is to try to rank the factors causing delays in the construction and their classification into groups. Frequently, the classification criterion is the participant's status in the investment process (a designer, a contractor, an investor, etc.); the general macro division into factors related to an investor/a company, a contract, the external environment or the division by resources, i.e. human factors, hardware factors and material factors. The subject of investigations of the authors of this article is to identify the types of disturbances causing delays and their classification depending on the scale and degree of influence on the further implementation of construction processes based on the implementation of a commercial and service building. Analysing the course of the implementation of the construction project, it is possible to indicate those factors that cause the necessity to engage considerable resources and change the sequence of processes to minimize the delay. Therefore, it is important to monitor the processes and control of work progress indicators, enabling early detection of delays and planning alternative solutions.

Corresponding Author: Agnieszka Dziadosz

STUDYING SPECIFIC FEATURES OF MONOLITHIC CONSTRUCTION TECHNOLOGY BASED ON SYSTEMIC ANALYSIS

Dmitriy Topchiy, Alina Bolotova

Federal State Budget Educational Institution of Higher Professional Education “Moscow State University of Civil Engineering”, Russia,

ABSTRACT

A scientific study was conducted, the main goal of which is to improve the quality of monolithic construction by grouping and systematizing the main characteristics of monolithic construction technology, especially those that affect its safety and quality, as well as identifying the most important and unresolved problems affecting the security of monolithic reinforced concrete buildings. and structures using systems analysis. To systematize the monitored quality indicators, a decision tree was developed. Based on the quality monitoring at construction sites, a grouping was carried out according to the nature of the violations and a chart was constructed showing the distribution of violations identified during the construction control of construction organizations. Research and analysis of scientific support of construction sites show that it is possible to obtain reliable results during quality control only by using several methods at the same time. Apart from that, the issue of choosing a method for testing concrete in the winter conditions still remains relevant. Even with the large number of papers being devoted to this issue, it needs further research. The conducted system analysis showed that the main cause of defects in buildings and structures is the inability to provide the necessary characteristics of concrete both during the preparation of the concrete mix and during the construction phase of the finished monolithic structure. The research results allowed: to note the effect of production control on the quality properties of monolithic structures; identified the main causes of defects in buildings and structures at each stage of monolithic construction. Identified and justified the need to develop recommendations and experimental studies to improve production operations, including non-destructive testing methods for the strength of monolithic structures.

Corresponding Author: Dmitriy Topchiy

THE IMPACT OF THE ARCHITECTURE ON CLIMATE CHANGE IN ANTHROPOCENE

Piotr Gradziński

West Pomeranian University of Technology Szczecin, Faculty of Civil Engineering and Architecture, Department of Housing and Fundamentals of Technology and Ecology in Architecture, Żołnierska 50, 71-210 Szczecin, Poland

ABSTRACT

The object of the article is to present the architectural work in the context of climate change in the Anthropocene era. (Bińczyk E., 2019) The holistic model of the state of affairs, which is the good of all beings on Earth, defines the horizon - it would seem - to make moral and ethical decisions and their subsequent consequences of events that are responsible for the condition of life. (Lovelock J., 2000), (Devall B., Sessions G., 1985) It pays attention to the holistically conscious, ethical, pathocentric question of the conscience of 'architecture' in the image of design creation and the place of the 'home' of a human being. The case analysis shows a paradigm shift in architectural creation, for which ecology speaks in a philosophical and practical context. (Fisher S., 2015). Analyzing human and architecture, what should be characterizing the model combining the aspect of Anthropocene by a critical overview and sustainable development ideas. Illustrating the resulting relationship using the analysis of examples of pro-ecological solutions in architecture and the ethical and moral standards pointing of a critical image of the future in the aftermath of climate change. (Rockström J., et.al., 2009). The main aspect will aim what should draw attention to the ever-growing methods of eco-friendly researching the building, such as Life Cycle Analysis and Building Information Modelling, as the future of sustainable, conscious architecture regenerative design in a changing climate. (Gradziński P., 2017, 2019).

BASICS OF INFORMATION AND ANALYTICAL MODEL OF FIRE SAFETY MANAGEMENT AT THE REGIONAL LEVEL: ON THE EXAMPLE OF A RUSSIAN FEDERATION REGION

Tatiana Eremina [1], Mikhail Danilov [2], Mikhail Eremin [3]

[1] Laboratory for Testing Building Materials, Structures and Fire Retardants, Institute of Integrated Safety in Construction of the Research Institute, Moscow State Construction University, Russian Federation
[2] Department of Fire Tactics and Service, Academy of the State Fire Service EMERCOM of Russia, Russian Federation
[3] Faculty of Fire Safety, Academy of the State Fire Service EMERCOM of Russia, Russian Federation

ABSTRACT

The paper analyses the risk factors of the infrastructure that present a threat to public safety, incl. fire safety at the regional level. The problem is analysed on the example of a region of the Russian Federation. Ways to prevent risk and manage risk factors are considered. The basis of the information and analytical model of fire safety management in the region has been proposed. The international regulatory documents governing the risk management of administrative and territorial bodies are analysed. A comparative analysis of the proposed information and analytical model and a risk reduction plan is carried out.

Corresponding Author: Mikhail Danilov

FEATURES OF PROPERTIES OF FIREPROOF PAINT DURING OPERATION

Tatiana Eremina [1], Dmitry Korolchenko [2], Irina Kuznetsova [3]

[1] Laboratory for Testing Building Materials, Structures and Fire Retardants, Institute of Integrated Safety in Construction of the Research Institute, Moscow State Construction University, Russian Federation
[2] Institute of Integrated Safety in Construction of the Research Institute of Moscow State Construction University, Russian Federation
[3] International Scientific Innovative Centre of Construction and Fire Safety LTd, Russian Federation

ABSTRACT

The article is concerned with the problem of cratering of fire-retardant paints. Some aspects of phosphoric acid influence on fire retardant intumescent water-based paint are researched as a means of cratering reduction. Special attention is given to the assessment of compounds using thermal analysis.

Corresponding Author: Dmitry Korolchenko

ANALYSIS OF LOAD BEARING CAPACITY OF CEMENT CONCRETE AIRFIELD PAVEMENT'S CONSTRUCTION IN RELATION TO ITS' CHANGES OF PHYSICO-MECHANICAL PARAMETERS

Mariusz Wesołowski, Krzysztof Blacha, Paweł Iwanowski

Airforce Institute of Technology, ul. Ks. Bolesława 6, 01-494 Warsaw, Poland

ABSTRACT

An airfield pavement is a designated and properly prepared surface of an airfield functional element (AFE) fulfilling a specific task as part of air operations. A structural system of an airfield pavement is a set of layers, the task of which is to safely take over and transfer loads coming from moving aircraft onto the subsoil. The safety of air operations conducted by aircraft over airfield pavements most of all depends on the load-bearing capacity of their structures. The basic type of airfield pavements includes rigid pavements (elastic) made of cement concrete. The load-bearing capacity state of cement concrete airfield pavements are strongly impacted by concrete properties (physical, mechanical, rheological and resistance to environmental factors), as well as the condition and type of the subsoil directly under the evaluated pavement structure. Adopting an appropriate computational model for the evaluated structure, correct identification of the layers comprising the airfield pavement, accuracy of determining the technical parameters of materials sampled from the structure and a correct assessment of the load-bearing parameter of the subsoil directly under the assessed structure make the load-bearing end result expressed by a PCN index or the permissible number of air operations to be similar to actual conditions. The article presents the dependencies showing the impact of varying physico-mechanical parameters of concrete on the end results of the pavement load-bearing capacity.

Corresponding Author: Paweł Iwanowski

VARIANT OF CONSTRUCTION PROJECTS AND THEIR ASSESMENT TAKING INTO ACCOUNT THE IMPACT ON THE ENVIRONMENT

Elżbieta Szafranko

University of Warmia and Mazury in Olsztyn, Faculty of Geodesy Geospatial and Civil Engineering, Institute of Building Engineering, ul. Heweliusza 4, 10-724 Olsztyn, Poland

ABSTRACT

Construction of various types of buildings and engineering structures invariably interferes, although to different degrees, with the surrounding environment. Every development project is executed in a strictly delineated area and under specific conditions. While planning a construction project, the investor is obligated to analyse several variants of its execution, including an assessment of different effects it may have on the environment. The investor can evaluate the impact on the surrounding ecosystems, in its various manifestations, both during the construction works and after a given building or structure has been put to use. Adhering to the latest trends, an assessment of the environmental impact caused by buildings and engineering structures should account for a whole life cycle of an object. Special attention should be paid to the process of obtaining natural resources and manufacturing building materials as well as the time period over which the latter will be used. No less important for the environment is the moment when a building's useful life ends, i.e. how it is demolished and how the construction and demolition waste is recycled or disposed of. The author's studies have demonstrated that assessments of variant solutions made in construction engineering practice are very rarely based on criteria that encompass the whole life cycle of a building. This article presents an analysis of the current situation based on data extracted from reviewed documentation originating from several construction projects.

OPTIMIZATION OF INVENTORY COSTS MANAGEMENT IN THE CONSTRUCTION ENTERPRISE

Lukasz Rzepecki

Faculty of Civil Engineering and Architecture, Lublin University of Technology, ul. Nadbystrzycka 40, 20-618 Lublin, Poland

ABSTRACT

During planning of each construction project, it is necessary to analyze in detail the factors that may affect the project development. Therefore, the execution of construction projects must take into account, among other things, the variability of environmental conditions, the high level of demand for materials, as well as the individual character of the design study. In projects related to the buildings erection and other construction works, there are many logistical tasks in the area of supply in construction products, raw materials, equipment, as well as in the area of financial and information flow. The logistics of construction production also includes land removal from excavations and wastes, handling of the vertical and horizontal transport equipment, internal communication at the construction site, coordination of delivery times and destinations, safety and health protection in logistics processes. Considering the scope of tasks and the great potential for cost reduction, every enterprise operating in the construction industry should pay great attention to the sector of supply logistics. Determination of the size and delivery times of construction products, as well as the transport routes, storage and reloading locations are decision-making problems that are solved by management of both the enterprise and the construction projects. The paper presents a proposal for a methodology, which allows to determination and comparison of the inventory management costs in enterprise conducting parallel works on several construction sites. Mathematical models have been developed which simulate the functioning of supply logistics systems and allow, through their solution, to determination of the minimum logistics costs with optimal arrangements for the supply schedule (delivery volumes in subsequent periods of the project execution process). This is the foundation for the selection of the optimal variant of a supply chain management. The practical application of the methodology proposed is illustrated using an example.

IMPROVING LIVING CONDITIONS IN MASS HOUSING OF PREFABRICATION ERA: THE USER POINT OF VIEW

Anna Ostańska

Lublin University of Technology, Nadbystrzycka 38D, 20-618 Lublin, Poland

ABSTRACT

Maintenance of the housing stock of the mass prefabrication era poses a particular challenge due to the scale of the task. Prefabricated blocks of flats are the home of almost 50% of inhabitants of Polish cities - a home that is still in good technical condition and still desirable (good location, shortage of flats in the market). However, in the light of the present-day performance requirements, this housing stock calls for improvements, necessary to prevent loss of value and increase in maintenance cost. In the course of programming the estate modernization, the planner needs not only to select technically and economically justified measures, but also to assure they are approved by the owners of the apartments. The residents are rarely aware of what is technically possible in terms of retrofitting buildings and the estate infrastructure. Moreover, they may be unaware of what kind of long-term consequences are to be expected if improvements are implemented, and what if they are not. As observed in practice, a constructive dialogue between the housing estate management and the residents occurs rarely. Therefore, in order to examine the user's point of view, the author designed and implemented an extensive survey project. The surveys are intended to be conducted every five years in consultation with the estate manager. They allow not only to passively observe the evolution of user preferences towards particular improvement proposals (changes in preferences caused by changing needs as well as a result of implemented modernization and renovation activities), but also to stimulate interest in upgrading the housing environment (e.g. improving accessibility, switching to renewable energy sources). The article presents the results and conclusions of two cycles of surveys in one of housing estates in Lublin, south-eastern Poland. Such results may provide the estate manager with useful input for retrofitting projects.

CRITERIA FOR EVALUATION AND SELECTION OF THE BEST OFFER FOR THE CONTRACT ENGINEER SERVICE

Beata Grzyl, Magdalena Apollo, Igor Heyducki

Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Gdansk, Poland
[1] DIPRO BUDOWNICTWO Igor Heyducki

ABSTRACT

The purpose of the legal regulations regarding public procurement in EU countries is to ensure effective funds' spending. When assessing and selecting the best offer, the contracting entities have at their disposal many different criteria, including non-price criteria (of a social, innovative, organizational, timely, etc. nature). Their proper selection and application is necessary to ensure the high quality of the ordered product, delivery or service. Making an order for intellectual services, including performed by the Contract Engineer (CE), should be based primarily on the criterion of qualifications and experience. The actions and decisions taken by CE are particularly important for the quality and timeliness of the contract. The purpose of the research presented in the article is to indicate to what scope and extent the awarding entities in Poland use the possibility of a wide selection of different criteria for the evaluation of intellectual services, consisting of performing the CE function (according to FIDIC contract terms). On the basis of selected proceedings, the authors discuss the criteria for evaluation and selection of the best offer applied in practice, classify them, analyze and evaluate them. The results of the conducted research indicate that the price and experience are often used in practice as the CE selection criteria. The authors, however, give numerous examples of other criteria, such as the number of CE presence or members of his team on the construction site, the date of invoice payment, the amount of contractual penalty for delayed performance of tasks under the contract, employment of CE personnel under an employment contract, risk of additional work being carried out during the contract. In many cases, these criteria are difficult to verify at the stage of evaluating offers and enforcing them in practice in the course of works, raising doubts as to their effectiveness, sometimes making it impossible to make a reliable assessment and select the most advantageous offer. The authors indicate that despite many possibilities offered by the legal status in force in Poland, in practice, in some cases, criteria that have a large impact on the increase of the proposed service price, but not reflected in its quality, apply. As a consequence, it results in the lack of effective spending of public funds. Based on the results of the research, analysis and evaluation carried out, the authors draw conclusions and recommendations regarding effective CE procurement criteria.

Corresponding Author: Magdalena Apollo

BUILDING INFORMATION MODELING IN SMALL AND MIDDLE SIZED BUILDINGS – CASE STUDY

Beata Grzyl, Wojciech Migda, Magdalena Apollo

Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Gdansk, Poland

ABSTRACT

Building Information Modeling (BIM) is a technology designed to improve and integrate all engineering aspects in the construction design process. Tools that incorporate the idea of BIM are becoming more advanced and also more popular. Available software solutions have already reached an assumable high level of development, but still are not as widespread and used on nearly as many construction projects as could be expected. Nevertheless, in recent years more and more large construction projects have been designed and implemented with the help of BIM software. The cost efficiency of such approach (using BIM, according to the literature, can help saving up to 30% in the construction process) was often one of the main arguments for implementing BIM. Still for smaller projects, such as single-family house design or small offices or industrial facilities, ranging from as little as 100 sqm up to 1000 sqm, BIM has not been considered as worth the challenge of being implemented in small design offices. Therefore, the aim of this paper is to show the advantages and limitations of BIM by looking at projects of small and middle sized buildings from the conventional (2D) and BIM approach perspective. The study was based on the present projects executed in Poland and first-hand experience. In addition, the paper also presents a literature review and the results of a survey on the level of knowledge and scope of BIM technology application in Pomerania (Poland). The results of the study indicate that, against common opinion, BIM software is not only useful for large investments, but can be also recommended for the design of small and middle sized buildings. Presented case study reveal, that the use of BIM in smaller projects also provides significant advantages, especially in the context of time consumed for the design process.

Corresponding Author: Magdalena Apollo

PROFITABILITY ANALYSIS AND ASSESSMENT OF THE POSSIBILITY OF APPLYING RENOVATION AND MODERNIZATION MEASURES TO IMPROVE THE UTILITY VALUE OF PUBLIC BUILDINGS

Robert Bucoń

Lublin University of Technology, Faculty of Civil Engineering and Architecture, Department of Construction Methods and Management, ul. Nadbystrzycka 40, 20-618 Lublin, Poland

ABSTRACT

Utility building value depends, among other things, on the renovation and modernization activities undertaken at the maintenance stage. They result from a correct assessment of the building condition. Lack of appropriate methods, which in a comprehensive way, taking into account the utility requirements for these buildings, would allow to assess the condition of buildings is one of the main reasons for negligence in the proper maintenance of public buildings. With this in mind, the author carried out a study aimed at an in-depth analysis and assessment of the possibility of applying renovation and modernization measures in relation to the improvement of the utility value of the building and the cost of their implementation. As part of the research, a mathematical model was first developed, which was used to carry out the research. As part of the development of the model, a set of criteria relating to technical-utility, economic and environmental requirements was selected and a method for their evaluation was developed. Next, proposals of renovation and modernization activities were presented, the aim of which is to improve the utility value ratio of the building. For its evaluation the method based on the theory of fuzzy sets was used, which at the stage of inference uses expert knowledge included in the fuzzy rules database. The calculated utility value of the proposed renovation and modernization activities is the basis for further research analyses. Optimization tasks consisting in the selection of an appropriate repair variant are carried out by means of appropriate optimization methods. The adopted optimization objectives concerned both the possibility of improving the assumed increase in utility value and limitations in their financing. The assessment of utility value of public utility buildings, which has not been carried out yet, taking into account the current legal and utility requirements, will allow to determine the impact of renovation and modernization decisions taken on this basis on the adopted determinants determining the quality of the maintenance process, i.e. the increase in utility value and maintenance cost. The results of these studies may be important in expanding existing knowledge and the knowledge gained may contribute to changes in the way decisions are made and the improvement of the quality of building maintenance.

Corresponding Author: Robert Bucoń

CONSTRUCTION PROJECT SCHEDULING TAKING INTO ACCOUNT THE RISK OF TEMPERATURES BELOW –10°C IN POLAND

Magdalena Rogalska[1], Zdzisław Hejducki[2]

[1] Lublin University of Science and Technology, Poland
[2] Wrocław University of Science and Technology, Poland

ABSTRACT

The article attempts to determine the value of the duration of the building process depending on the risk of the occurrence of temperatures below –10°C in Poland. It summarizes he results of measurements of the temperature study over 62 years (from 1950 to 2011) in Poland. The number of days with temperatures below –10°C in future years was forecasted. The method of ARIMA (Autoregressive Integrated Process Average) STATISTICA STAT SOFT was used. Stationarity series was tested using an IDW Durbin Watson integrative statistics and homoscedasticity was tested by the Levene test. The forecast error was verified using autocorrelation and partial autocorrelation residues functions. On the basis of calculations, the risk values for outdoor works in each month in Poland was established. It is a part of BIM 6-D calculation. The calculated risk value (Table 5) can be used for the calculation in Risky Project Professional and in other programs. The proposed risk values and the method of calculation are the upcoming modification product, which has not been reported yet.

Corresponding Author: Magdalena Rogalska

POLISH REQUIREMENTS FOR NEARLY ZERO ENERGY BUILDINGS (NZEB) IN TERMS OF OPTIMAL COSTS

Małgorzata Fedorczak-Cisak [1], Tadeusz Tatara [2], Alicja Kowalska-Koczwara [2], Filip Pachla [2]

[1] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Cracow
[2]Cracow University of Technology, Institute of Structural Mechanics, Warszawska 24, 31-155 Cracow

ABSTRACT

European Union member states are required to implement the "nearly zero energy" building standard from January 1, 2021. The implementation of Directive 2010/31 / EU, which imposes this obligation, are implementing acts in each of the EU countries. EU Member States, including Poland, have committed to defining a nearly zero-energy building (NZEB) building standard. Requirements for NZEB buildings, each country determines based on the optimal solution in terms of costs. The methodology for calculating the cost-optimal level of minimum requirements is regulated by the Commission Delegated Regulation (EU) No 244/2012. Achieving energy independence by EU countries and raising the quality of life as a result of reduction of greenhouse gas emissions is associated with the necessity of using energy from renewable sources and increasing energy efficiency in sectors with the highest energy intensity, such as construction. The article presents Polish requirements for NZEB buildings that will apply to all newly designed buildings in 2021. These requirements are included in the Technical Conditions, which will be in force from 2021 (Since 2019, the regulations are in force for newly designed buildings owned by local governments and their registered office). The authors carried out an analysis of the factors allowing for achieving NZEB requirements for a single-family building. The analyzed building is made in traditional brick technology. Various sources of the building's supply of heat were analyzed, both traditional sources for Poland and the use of Renewable Energy Sources. The results of the analyzes may be guidelines for the design of single-family houses with the "almost zero energy" (NZEB) standard in Poland.

Corresponding Author: Małgorzata Fedorczak-Cisak

OPTIMIZATION OF THE SELECTION OF VIBROACOUSTIC FLOORS IN THE ECONOMIC ASPECT AND ENSURING THE COMFORT OF USE OF THE ROOMS

Małgorzata Fedorczak-Cisak [1], Tadeusz Tatara [2], Alicja Kowalska-Koczwara [2], Filip Pachla [2]

[1] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Cracow
[2]Cracow University of Technology, Institute of Structural Mechanics, Warszawska 24, 31-155 Cracow

ABSTRACT

Buildings with nearly zero energy demand must meet very strict energy efficiency requirements. The requirements for NZEB buildings, which have been developed in the Technical Conditions, do not take into account the requirements for meeting the comfort conditions of use of buildings. The subject of ensuring the comfort of the use of buildings is presented in the standard "ISO 15251, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, Addressing Indoor Air Quality, Thermal Environment, and Lighting and Acoustics. 2007 ". This standard does not include provisions regarding vibration comfort. The authors of the article present a new approach to the design of buildings with almost zero energy demand. The authors attach great importance to the need to ensure the comfort of use in NZEB buildings. Many elements influence the comfort of using NZEB buildings. Among others, these are the technologies from which NZEB buildings were made. In this article, the Authors performed an analysis of the selection of vibroacoustic floors placed between heated and unheated rooms. An analysis was made regarding the use of a floor placed on the ceiling between a heated room located on the first floor and an unheated space, located on the ground floor (technical room). The analysis was carried out taking into account the thermal insulation of the vibroacoustic floor, the cost of making the floor and the comfort of use of the room. The analysis was carried out for various types of floors available on the Polish market. The continuation of the presented article will be "in situ" research carried out in existing buildings with wooden and frame construction.

Corresponding Author: Małgorzata Fedorczak-Cisak

MEASUREMENT AND INTERPRETATION METHODOLOGY FOR DETERMINING COMFORT IN PASSIVE BUILDINGS

Alicja Kowalska-Koczwara, Filip Pachla, Tadeusz Tatara, Małgorzata Fedorczak-Cisak

Cracow University of Technology, Warszawska 24 St., 31-155 Cracow, Poland

ABSTRACT

The article contains good practise recommendations related to the proper performance of measurements of comfort in passive buildings. Passive building is a high-quality building due to impeccable construction in terms of building physics. The passive building is so well insulated that it can only be heated by supplying fresh ventilation air. Such buildings have certain features such as: balanced temperatures, there is no overheating of the rooms in summer due to the high insulation of the partitions, high insolation due to the optimal positioning of the windows, acoustic comfort, reducing pollution in the interior, high quality of thermal comfort, no aeration, high indoor air quality, permanent protection against moisture and fungiculation of partitions, etc. In all the features listed above, there was no vibration comfort, which could be a problem especially in the city centers with extensive transport infrastructure. This kind of comfort is mostly neglected during the design process, not only in the passive buildings. In this article comfort in passive buildings for all its aspects is described. The main emphasis in the article was put on the guidelines relating to the measurement of thermal comfort with the leak test, air quality, etc. and measurements of vibration comfort. The recommendations contain all stages of the measurement process from the preparation of measurements with the local vision and the measurement plan, through the in-situ measurement to pre-processing and analysis of measurement data. All measurement stages are shown on the real example of passive building located in Poland. The good practise guidelines for comfort measurements could be very useful in the diagnosis of passive buildings.

Corresponding Author: Alicja Kowalska-Koczwara

ECONOMIC ASPECTS OF OVERHEATING OF ENERGY-EFFICIENT BUILDINGS

Małgorzata Fedorczak-Cisak [1], Katarzyna Nowak [2]

[1] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Buildings, Poland
[2] Cracow University of Technology, Institute of Materials and Construction Structures

ABSTRACT

The buildings currently under construction in Poland and other European countries meet strict energy efficiency criteria. The dominant criterion for both design and modernization of public and residential buildings is the correct energy performance. In order to reduce the investment costs incurred and later the costs of maintaining the facilities, the undertaken investments are primarily aimed at improving the thermal insulation of partitions, improving the efficiency of heating installations or the use of renewable energy sources. Solar energy is often used in the energy balance by designing large glazing, in particular from the south and west. Such treatment allows the use of free solar energy, but also causes excessive heat gains, which results in overheating. Still, the aspect of overheating in the summer is treated marginally. The aspect of overheating has a significant impact on the costs of cooling, structural damage and lowering the comfort of the rooms' use. The article will present the results of measurements of indoor climate conditions and the assessment of thermal comfort of users carried out in an experimental building. The tests will be carried out in rooms with large glazing. The tests will include the measurement of parameters such as temperature, humidity, thermal radiation, air movement speed and others. The main objective of the conducted analyzes was to determine how material and structural solutions as well as glazing and sun screens applied will affect the building's protection against overheating and to assess the comfort conditions. Comfort assessment will be based on the Fanger methodology. The results will be presented by the PMV comfort factor. On the basis of the conducted research, the possibilities of limiting the internal air temperature in the summer period will be presented. At the same time, it will be advisable to limit the cooling costs for rooms with large glazed areas in Polish climatic conditions, the summer period.

Corresponding Author: Katarzyna Nowak

ECONOMIC ASPECTS OF THE IMPACT OF AIR TIGHTNESS OF THE BUILDING ENVELOPE ON ENERGY EFFICIENCY

Katarzyna Nowak

Cracow University of Technology, Institute of Materials and Construction Structures, Poland

ABSTRACT

Near zero energy buildings (NZEB), which will be a standard in European countries from 2021, are characterized by low heat losses and the use of energy from Renewable Energy Sources. Polish requirements for NZEB buildings are included in the Technical Conditions. In Polish Technical Conditions, requirements for NZEB buildings relate to heat transfer coefficients U [W / (m2K)] for building envelope elements and the non-renewable primary energy ratio EP [kWh / (m2year)]. A very important element to achieve the assumed energy consumption levels is to ensure adequate tightness of the building envelope. All leaks in the building envelope contribute to unnecessary heat loss. Only suggestions are made in the Polish Technical Conditions, not specific requirements relating to the tightness of the building envelope. For buildings with gravitational ventilation, the tightness of the building envelope should be up to 3 replacements per hour, with a tightness test n50, while for buildings with mechanical ventilation - a maximum of 1.5 replacements per hour. The tests carried out show that very often the tightness of the building envelope exceeds the values specified in the Technical Conditions, reaching even four times higher. Leakage in the building envelope adversely affects energy efficiency, cost aspects and comfort. In the article Author made calculations of energy consumption for a building with low energy demand. It was assumed that the building is equipped with a mechanical ventilation system. Then, energy and cost analysis was carried out, assuming different levels of tightness of the housing. The analysis of the impact of building integrity on Primary Energy and Utility Energy was carried out.

ANALYSIS OF THE SPATIAL STRUCTURE OF GREEN BUILDING IN THE ASPECT OF SELECTED ENVIRONMENTAL ISSUES ON THE EXAMPLE OF THE CITY OF KRAKOW

Joanna Bąk, Elżbieta Radziszewska - Zielina, Michał Zielina

Cracow University of Technology, 24 Warszawska Street, 31 – 155 Krakow, Poland

ABSTRACT

In the era of developing cities, it is extremely important to maintain an appropriate level of quality of the surrounding environment or its improvement. Newly built buildings are not without impact on the city's environment. It is important to control and limit their negative impact. Multi-criteria investment assessment systems help with many problems related to urban development. They allow analysis and evaluation of various issues, including those related to the environment. The purpose of the research was to determine the spatial structure of buildings certified in the BREEAM system (Building Research Establishment Environmental Assessment Method) in Krakow by developing a map of their deployment, and then analysing the location of green buildings in terms of selected environmental issues. The selected certification system is one of the most commonly used multi-criteria assessment systems in Poland. The map was developed to assess the current spatial structure of green buildings. On the basis of the map, it is possible to indicate potential areas of the city where it would be advisable to locate a green building that meets specific environmental requirements. In Krakow, it can be noticed that objects with the In-Use certificate are mostly available individually. There are only two small clusters. Analysing buildings with a final certificate, it can be observed that there are both single buildings as well as small and larger clusters (office parks). These facilities are located near or between the beltways. When analysing the distribution of buildings with the certificate obtained at the design stage, it can be observed that most of them are located near bypasses. Two clusters are located in the southern part of the city, but this is due to the expansion of existing office parks. Comparing the developed map with the location of a combined sewerage system in Kraków, it can be seen that the vast majority of certified facilities are within or in close proximity to the combined network. If in these facilities solutions related to the management of rainwater at the place of precipitation were used, each of them represents a significant relief for the sewage system in Kraków. Due to the fact that some of the green buildings in Krakow are present in clusters, their fulfilment of requirements related to the introduction of greenery to the plot (Land Use and Ecology, Surface water run - off and Flood risk categories) may affect the levelling of the urban island heat in the areas where they occur. Most green buildings in Krakow are located along the city's three bypasses. If these buildings have scored points in the category called Transport for specific activities, then in combination with their location it is a value for the city's air quality. Among the requirements for green buildings in multi-criteria assessment systems are those whose fulfilment is a particular value for the city's environment only with a specific location of the building. For this reason, it matters to the city whether the newly constructed buildings are green. The most common positive effects can be expected in the central parts of cities, because that is where the combined sewerage system dominates, there are problems associated with UHI (Urban Heat Island) or urban floods. The presence of several buildings near each other also generates an ecological effect.

Corresponding Author: Elżbieta Radziszewska – Zielina

FLAM VALLEY TMF POND, 40 YEARS OF ACTIVITY AND STILL GOING

Catalin Popescu[1], Radu Sarghiuta[1], Sorin Iiev[2]

[1] Technical University of Civil Engineering, Bucharest, Romania, 124, Lacul Tei Street, Romania
[2] ALUM Tulcea, Romania

ABSTRACT

Flam Valley is a bauxite residue Tailings Management Facility (TMF) valley pond, operating since 1971, located in Romania, just a few meters away from the Danube Delta protected area. It has been since serving Alum Tulcea alumina producing plant through the different stages of its development. Conceived as a frontal tailings dam, Flam Valley is located in a non-permanent torrential stream in a very sensitive environmental protected area. Up to 2006 tailings slurry with 15-20% solids were pumped by pipeline in the TMF, in accordance to the old technology. After the EU directives enforcement in 2005 the plant had to stop all activity until the whole process was upgraded, consequently the TMF was upgraded with the structural frontal dam being reinforced, water diversions constructed, some areas of the residual storage area were ecologically restored and the deposition became a dry stacking process by tailing placement, thus transforming it into a new TMF and avoiding the consequences that would have derived from relocation of the TMF. The presented aspects are aimed at generally portraying the evolution, incidents, the tailing dam behaviour and prospects of capacity enlargement for Flam Valley

Corresponding Author: Catalin Popescu

CONSIDERATIONS ON THE STATUS OF REHABILITATION WORKS FOR LAND IMPROVEMENT ARRANGEMENTS IN TIMIS COUNTY, ROMANIA

Guran (Cojocinescu) Mihaela Ivona, Man Teodor Eugen, Ioana Alina Cretan, Pelea George Narcis, Dorian-Petrica Häusler-Cozma

Polytechnic University of Timisoara, Faculty of Civil Engineering, Hydrotechnical Engineering Department, 1A Spiru Haret Street, 300022, Timisoara, Timis, Romania

ABSTRACT

The paper presents the surface drainage arrangements in Timiş County, Romania, that have been recently rehabilitated or will be rehabilitated in the future. Due to the high length of the existing surface drainage arrangements in Timiş County, Romania and climate changes correlated with a lack of maintenance works over the past 30 years has become necessary to rehabilitate the pumping stations in order to eliminate the water excess from agricultural land and to protect of the localities from flooding. According to the current legislation, with the support of the local farmers, The National Agency for Land Improvement has been carried out maintenance and reparation works on the land improvement infrastructure. The paper aims to present the current situation and proposed rehabilitation works in order to improve the functional parameters of strategically surface drainage pumping stations and surface drainage arrangements, as well as the perspective of further financing from The Romanian Government and European Union funding.

Corresponding Author: Guran (Cojocinescu) Mihaela Ivona

THE TLS METHOD AS AN ELEMENT OF THE BUILDING MANAGEMENT SYSTEM

Jolanta Harasymiuk, Joanna A. Pawłowicz, Elżbieta Szafranko

University of Warmia and Mazury in Olsztyn, Faculty of Geodesy Geospatial and Civil Engineering, Institute of Building Engineering, ul. Heweliusza 4, 10-724 Olsztyn, Poland

ABSTRACT

3D terrestrial laser scanning (TLS) is a modern measurement technique which enables to obtain a large amount of data in short time. The gathered data is very detailed, thus the scope of its use is vast. Therefore, scanners other measurement devices which results in considerable acceleration of stock-taking work. This approach enables to prepare a documentation of a building or to make an assessment of its technical condition using only a 3D cloud of points. Additionally, flexibility of data and advanced computer programmes make it possible to use such data in many sectors, not only in the building trade. The paper presents how to use the data obtained from 3D laser scanner measurements in the management of construction objects. The aim of the presented research was to develop a scheme of systemic approach to the management of used building objects.

Corresponding Author: Jolanta Harasymiuk

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THE INFLUENCE OF THE AMOUNT OF FILLERS ON THE THERMAL RESISTANCE OF BITUMEN SHEETS

Jan Plachý, Jana Vysoká, Radek Vejmelka

Institute of Technology and Business in České Budějovice, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

This paper deals with the analysis of the composition of the bitumen mass for the production of bitumen sheets used for the isolation of concrete bridges. Bitumen sheets play an important role in the building industry as a waterproofing material. The waterproofing function of bitumen sheets is achieved by the using of the bitumen mass - its amount and composition. The significant component of the bitumen mass is represented by the filler. The very important is the fact that an increased amount of the filler decreases the cost of bitumen and thus the cost of complete bitumen sheets. The amount of the bitumen filler is mostly determined by the technological potentialities of the production equipment used in the production of bitumen sheets. However, the amount of the filler can influence some properties of the bitumen mass and hence the bitumen sheets. One of the basic properties influencing an application of bitumen sheets is the flow resistance at elevated temperatures. An increased amount of fillers also makes worse the workability in a site. At the same time, the paper answers for the hypothesis - whether the increased or decreased amount of fillers affects one of the basic thermal-technical properties of bitumen sheets - the flow resistance at elevated temperatures. The authors of this contribution found during the earlier research that the dependence is given both by the type of bitumen mass and by the type of the surface treatment. It has been statistically shown that the important factor is not the amount of the filler but the type of bitumen in the terms of the modification. The aim of this paper is to confirm or confute the hypothesis: Is there any relationship between the flow resistance at elevated temperatures and the composition of the bitumen? Thus, new results can confirm or disprove previous research results. Results were obtained on the basis of the statistical evaluation of data collected from the laboratory measurements whereas the group of samples was expanded and chosen from various manufacturers.

Corresponding Author: Jan Plachý

ENVIRONMENTAL USE OF WASTE MATERIALS AS ADMIXTURES IN CONCRETE

Radimír Novotný, Jiří Šál, Marek Ctibor

The Institute of Technology and Businesses in Ceske Budejovice, Czech Republic

ABSTRACT

Humanity, from prehistoric times, influences the environment in which it lives. Often these are unfortunate negative influences. One of such negative effects is the accumulation of waste. We are an animal species that has always left a lot of waste, food remnants, various tools, remnants of producing these tools, and much more. First, mankind used resources from which waste was minimal and which was moreover degradable. As a result of the development of the company, the need for better, more perfect products developed and hand in hand is associated with more waste and non-decomposable or non-decomposable waste. The more humanity is at the higher level of development, the more waste it produces. However, this behavior conflicts with the sustainability of the environment. Fortunately, they are making bigger efforts to recycle waste, ie re-use of waste materials. Construction is not behind this, and many efforts are being made to use waste materials in building structures. The best known is the recycling of glass for the production of window glass, for example, but there are many examples. Glass has exceptional properties in this respect because it can be recycled to infinity. For many substances, it is not possible to find use other than their primary use. In this article, we are focusing on the re-use of various waste materials as admixtures in concrete. The use of waste materials in concrete is directly available, not only because of the number of concrete structures, but also because of the closure of waste materials in its structure. Some waste materials can be used as fillers, that is to say substitute aggregates, but they are substances which can also be used as a replacement for a part of a binder, in this case a cement. The article summarizes the existing use of waste materials in concrete and provides space for possible detailed research on these concrete.

Corresponding Author: Jiří Šál

USE OF TECHNICAL HEMP FOR CONCRETE - HEMPCRETE

Petra Nováková, Jiří Šál

The Institute of Technology and Businesses in Ceske Budejovice, Czech Republic

ABSTRACT

We live at the time of trying to reduce the carbon footprint, which also involves the production of building insulation. Today's trend is the construction of passive houses with the best insulation and reduced heating costs. By reducing the incineration of non-renewable sources for heating, we will reduce the carbon footprint, but by increasing the classical building thermal insulation, whether based on plastics or minerals. A suitable option is natural materials. This article deals with the use of technical hemp in concrete. Hemp is a historically widely used plant, but its decline has occurred due to its similarity to the THC variety, so this plant is now more known for its narcotic effects. For use in construction, industry, etc., the Cannabis Sativa L. variety, so-called Technical Hemp with negligible THC content, is used. Today, the use of technical cannabis is rediscovered. By adding technical hemp to concrete, we improve the thermal properties of concrete to the detriment of strength properties. The article describes different properties of hemp concrete compared to conventional concrete. In building construction industry is known for use in cannabis insulation, hemp concrete, hemp oils and varnishes, Honeycomb plaster, ropes and strands. The best known are cannabis insulation in the form of mats and hemp ropes, but there is also a widespread use of cannabis, which is this article. By measuring, the compressive strengths of the cannulated concrete was 1.13 MPa, which is comparable to that of lightweight concrete and foam concrete. From this finding, that hemp concrete can be used as a filler material, nickels as a carrier material. This concrete can be used as a binder, both hydraulic lime and cement. However, when using cement, it is necessary to mineralize the shaker, which is a laborious and long-lasting activity.

Corresponding Author: Jiří Šál

FRACTURE ENERGY OF BASALT FIBRE REINFORCED HIGH PERFORMANCE CONCRETE

Piotr Smarzewski

Lublin University of Technology, 40 Nadbystrzycka, 20-618 Lublin, Poland

ABSTRACT

Basalt fibre (BF) is a relatively new high performance non-metallic material made from basalt rock melted at high temperature. It is not expensive material and can be an effective approach to increase plastic shrinkage, toughness and shock resistance of concrete. The BF reinforced concrete has the advantages such as: improve flexural strength and fracture energy, high chemical and corrosion resistance, high abrasion and impact resistance, high frost resistance, good resistance to high temperature, good workability and low cost of production. Basalt fibres could be widely applied as concrete reinforcement in residential and industrial buildings, as well as in bridges. Moreover, they can be very useful to reinforce high performance concrete (HPC) and improve its tensile strength, impact and fire resistance, permeability and frost resistance. It is necessary to conduct further experimental investigations of basalt fibre reinforced HPC, as there are many types of these fibres available on the market produced from different basalt ores and having changed length and geometry. The aim of this research is to establish the fracture energy of HPC containing basalt fibres. The experimental investigation consisted of the tests on cubes, beams and notched prismatic specimens made of plain HPC and fibre reinforced HPC with 0.25, 0.5, 0.75, 1, 1.25, 1.5, 1.75, and 2% of basalt fibres. The water/binder ratio was constant. Compressive, tensile splitting and tensile flexural behaviour, and fracture energy results were determined and analyzed. The fracture energy were evaluated by using two criteria. In the first criterion the fracture energy was calculated by dividing the work of fracture by the initial area according to RILEM TC 50-FCM. While in the second criterion it was computed as the area under the stress-displacement curve. The results show the positive enhancement effect of basalt fibres on fracture energy increase.

DEVELOPMENT OF ADHESIVE FREE ENGINEERED WOOD PRODUCTS FOR ADHESIVE FREE TIMBER BUILDINGS

Zhongwei Guan[1*], Adeayo Sotayo[1], Dan Bradley[1], Marc Oudjene[2], Imane El Houjeyri[2], Annette Harte[3], Sameer Mehra[3], Peer Haller[4], Siavash Namari[4], Ahmed Makradi[5], Salim Belouettar[5], Franscois Deneufbourg[6]

[1] School of Engineering, University of Liverpool, Brownlow Street, Liverpool L69 3GQ, United Kingdom
[2] LERMAB, Université de Lorraine, 27 rue Philippe Séguin 88026 Epinal, France
[3] Department of Civil Engineering, NUI, Galway, Ireland
[4] Technische Universitat Dresden, Germany
[5] Luxembourg Institute of Science and Technology, Esch-sur-Alzette, Luxembourg
[6] Office Economique Wallon du Bois, Belgium

ABSTRACT

Over 5 million m^3 of engineered wood products (EWPs) are produced in the EU annually and the market is rising. However, EWPs have a high degree of petrochemical use in their manufacturing. In addition, throughout the life span of these EWP products from manufacture to disposal, they emit formaldehyde and other volatile organic compounds (VOCs), which make reuse and recycling very difficult. In order to tackle the above problems, an alternative and more environmentally friendly method of connecting wood laminates and joining structural members would be to use compressed wood (CW) dowels and fasteners. This form of connection and joioning systems helps to deliver low impact buildings whilst potentially increasing the market for thousands of hectares of sustainably managed farmgrown timber. There are many other advantages which include: reductions in VOCs during manufacturing and CO_2; easy to reuse, recover and recycle; improved fire resistance due to CW dowels being hidden inside wood; improved joint tightness (due to moisture-dependent swelling and spring-back of compressed wood). Therefore, a consortium with members from six European countries was formed to develop adhesive free engineered wood products (AFEWPs) and connections throughout a joint project supported by the Interreg North-West Europe (NWE) Programme. The aim is to achieve novel use of natural fibre building materials and to tackle sustainability of the fundamental building materials to help deliver sustainable future built infrastructures. The outcomes of the research work will help re-naturing cities with the above benefits and significant added-value to tackle various societal challenges such as climate change, air pollution on human health and resource management. In this paper, experimental work on Adhesive Free Engineered Wood Products is presented, which covers (1) manufacture of compressed wood (CW) dowels, (2) fabrication of adhesive free laminated beams, panels and connections, (3) structural testing of AFEWPs. Also, three adhesive free timber building demonstrators will be constructed in Liverpool, Lorraine and Dresden to show the real applications of the adhesive free timber structures.

Corresponding Author: Zhongwei Guan

EXPERIENTIAL LEARNING FOR SEISMIC PROTECTION USING LIVING LAB APPROACH IN ROMANIA

Daniela Dobre [1], Claudiu Sorin Dragomir [2], Emil-Sever Georgescu [3]

[1] Technical University of Civil Engineering Bucharest, 122-124 Lacul Tei Avenue, District 2, Bucharest, Romania; National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

[2] University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 MarastiBlvd, District 1, Bucharest, Romania; National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

[3] National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

ABSTRACT

The paper is going to present the role of seismic areas as living labs/natural laboratories for studying the behavior of buildings and of people and establishing a relationship between research and training-education, knowledge dissemination and highlighting of results materialized by experiential actions to reduce negative impacts of disasters. Engineering learning from earthquakes, based on a long-term seismic culture, became a continuous activity based on field observation, since more than a century. On the other hand, creating earthquake disaster prevention awareness and disaster preparedness can be achieved nowadays by education and active learning addressed to all levels of population, from elder generation to younger ones, and from usual people to the representatives of authorities. The link between these two approaches is becoming more and more necessary in the context of high local seismicity: the behavior of people, within investigating methods of it, and emerging new technologies (computer-generated imagery, immersive virtual reality etc.), for to obtain an active individual attitude. The general concept of awareness and preparedness tends evolved. We have dedicated programs and theoretical and practical knowledge transfer seminars on preparing to deal with earthquake-related situations, people are taught to take measures to prevent severe earthquakes effects, but we must take a step forward to get closer to a system that includes: research knowledge, innovation, GIS and specialized software, and, more important, the access at all of these, through public and private involvement. The Vrancea seismic zone of Romania, as a natural laboratory, involve us with knowledge and individual perception and attitudes and we have time for improved engineering codes, exploring and experiencing some new learning modalities, refining new policies and regulations from this field, new scenarios for implementation of disaster measures.

Corresponding Author: Claudiu Sorin Dragomir

PROPERTIES OF FINE-GRAINED CONCRETE WITH ADMIXTURE OF DIATOMITE POWDER

Jaroslav Pokorný, Martina Záleská, Milena Pavlíková and Zbyšek Pavlík

Czech Technical University in Prague, Faculty of Civil Engineering, Department of Material Engineering and Chemistry, Prague, Czech Republic

ABSTRACT

The paper reports on the experimental assessment of the physical properties of fine-grained cement-based composites whose composition was enriched with admixture of diatomite powder. Diatomaceous earth, due to its origin and availability, represents highly valuable low cost material that can dispose with high pozzlanic activity. On this account, it can help to mitigate the quantity of used Portland cement, and thus enable to reduce the cost of produced cement-based composites and accordingly decrease harmful environmental impacts of cement production, especially CO_2 emission. In this work, possible use of diatomite powder as partial Portland cement replacement in composite mix was studied. The cement replacement ratio was 5 %, 10 %, 15 %, and 20 % by volume. Reference composite mix was prepared as well. The water/binder ratio was 0.5, and was kept similar for all prepared composite mixtures. For 28 days water cured samples, bulk density, specific density, strength parameters, and thermo-physical properties were tested. Results of experimental analysis showed high pozzolanic activity of diatomite resulting in reduced porosity and increased mechanical resistance of the developed composites. The highly porous structure of diatomite particles helped to decrease heat transport properties, despite of low total open porosity of the tested specimens.

Corresponding Author: Jaroslav Pokorný

CONSTRUCTION FEASIBILITY OF HEAT-TREATED SELF-COMPACTING CONCRETE CONTAINING GROUND-GRANULATED BLAST-FURNACE SLAG

Derabla Riad [1], Fathollah Sajedi [2]

[1] Department of Civil Engineering, University of Skikda, Algeria
[2] Department of Civil Engineering, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran

ABSTRACT

The self-compacting concretes (SCCs) are increasingly used in the field of prefabrication. The final strength of the heat-treated concrete is less than that of reference samples that have been cured in normal conditions. The aim of this work is a contribution to the improvement of the behavior of this kind of heat-treated SCCs. This paper presents the effect of the heat treatment process and the content of 20% and 40% of granulated slag from the blast furnaces of El Hadjar (GGBS) on the physical and mechanical properties of the prepared SCCs at early age (1 day) and at long term (28 and 180 days). They are the study of the characteristics of SCCs at the both fresh and hardened states. The adopted heat-treatment cycle used attained a maximum temperature of 60 °C and a total duration of 24 hours. A comparison is made between the heat-treated SCCs and the control SCC which is made without GGBS and under normal conditions. The results show that in fresh state, the characteristics of SCC are affected by the GGBS content. In the hardened state, a strength gain up to 50% was obtained at early age and a minimal loss in the long term. The content of 20% of GGBS is the optimum in both fresh and hardened states.

Corresponding Author: Derabla Riad

HYGRIC PROPERTIES OF CEMENT-LIME PLASTERS WITH INCORPORATED LIGHTWEIGHT MINERAL ADMIXTURE

Lucie Zemanová, Jaroslav Pokorný, Zbyšek Pavlík, Milena Pavlíková

Department of Material Engineering and Chemistry, Faculty of Civil Engineering, Czech Technical University in Prague, Thákurova 7, 166 29 Prague 6, Czech Republic

ABSTRACT

Cement-lime plasters are among the most often applied materials for surface finishing of interior and exterior surfaces of buildings. In order to improve their properties, especially the thermal insulation performance, common silica filler is often replaced with lightweight filler. The main positive effect of the thermal insulating plaster is reflected primarily in winter, preventing freezing of water in the masonry porous structure. In this paper, novel cement-lime plasters with lightweight aggregate are studied. In plasters composition, silica sand was replaced with perlite. The replacement ratio was 25 %, 50 %, 75 %, and 100 % by volume. The effect of the sand substitution on plasters structural characteristics, such as bulk density, matrix density, and total porosity, was tested. As one of the plasters functional properties is to protect the masonry from the water penetration, i.e., from the moisture related damage, and at the same time the moisture from the structure must be efficiently drained, determination of their moisture transport parameters is of the particular importance. In this respect, the water vapour transmission rate in the developed materials was characterized by water vapour permeability, water vapour diffusion coefficient, and water vapour resistance factor. For the description of the liquid moisture transport in the studied plasters, a 1-D vertical water uptake experiment was performed. Based on this experiment, moisture profiles that characterize moisture distribution along the sample length at the specific time of water suction were determined. Using inverse analysis of moisture profiles, the moisture dependent moisture diffusivity was calculated. Since the admixed lightweight filler increased the moisture diffusivity of the developed plasters, their samples were in the second set of tests provided with a hydrophobic coating based on silicone oil. This improvement helped to reduce the moisture diffusivity of plasters to the value of the reference mixture. In summary, presented experimental analysis of hydrophobised lightweight plasters proved their increased porosity and reduced moisture diffusivity, which can improve plasters thermal performance and prolong the durability of both the plasters themselves and the masonry they cover.

Corresponding Author: Lucie Zemanová

FEASIBILITY STUDY OF USING CLAY BRICK MADE FROM MUNICIPAL SOLID WASTE INCINERATOR (MSWI) FLY ASH

Violeta Voišnienė [1], Olga Kizinievič [2], Viktor Kizinievič [2]

[1] Department of Building Materials and Fire Safety, Vilnius Gediminas Technical University, Sauletekio av. 11, LT-10223 Vilnius, Lithuania
[2] Laboratory of Composite Materials, Institute of Building Materials, Vilnius Gediminas Technical University, Linkmenų g. 28, LT-08217 Vilnius, Lithuania

ABSTRACT

This study deals with the effect of MSWI (municipal solid waste incinerator) fly ash on fired clay bricks. Initially, the MSWI fly ash was characterized by its chemical composition and morphology. Different ratios of the MSWI fly ash (0, 2.5, 5.0 and 7.5 % by mass) were added to the clay brick. Clay brick samples were heated 1000 °C temperatures for 1 h. The clay brick properties of the resultant material then determined, including shrinkage (after drying, after firing), density, water absorption, effective porosity and total open porosity and compressive strength. Toxicity Characteristic Leaching Procedure tests were also conducted. The results indicate that the heavy metal, chloride and sulphate concentrations in the leachates met the current regulatory thresholds (Waste Directive 2003/33/EC). Increasing the amount of MSWI fly ash resulted in a increase in the water absorption and an decrease in the compressive strength of the MSWI fly ash clay bricks. The addition of MSWI fly ash to the mixture reduced the degree of firing shrinkage. The effects of MSWI fly ash addition on the durability (frost resistance) of the clay bricks were investigated. This indicates that MSWI fly ash is indeed suitable for the partial replacement of clay in bricks.

Corresponding Author: Olga Kizinievič

PROPERTIES OF GYPSUM COMPOSITES WITH SHAVINGS

Katarzyna Regulska, Aleksandra Repelewicz

Czestochowa University of Technology, Department of Civil Engineering, Czestochowa ul. Akademicka 3, Poland

Gypsum composites have been gaining increasing interest within last decades. Additionally, the focus on increasing their production in Poland results from the rich, countrywide natural gypsum sources and the growing amounts of synthetic gypsum derived from flue gas desulfurization in domestic power plants. Thermal and sound-proofing properties of those materials are widely known and can be additionally improved by increasing the porosity. This can be achieved by foaming or adding pore-forming organic or non-organic agents. Different fillers can be added to gypsum plaster in order to modify its physical properties. Properly applied additives can improve physical and thermal conductivity (expanded silica gel granules) or reinforce the structure (glass fibers, carbon fibers etc.). Nowadays, the environment-supporting options are regaining more advocates. Thus, organic fillers are back in game. The physical and mechanical properties of gypsum composites with shavings were tested and are described in the paper. The influence of gypsum mixture composition, the water/gypsum ratio and appropriate mineralization on the composite properties were examined. Present study focuses on the durability, thermal properties, natural radioactivity and susceptibility to biological corrosion of the tested materials.

Corresponding Author:

THE EFFECT OF SILICA FUME ON THE COMPRESSIVE STRENGTH OF CONCRETES BASED ON VARIOUS AGGREGATES

Jarosław Strzałkowski, Halina Garbalińska

Department of Building Physics and Building Materials, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology Szczecin, al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

The paper examines the impact of the addition of silica fume on the compressive strength of concretes made from two different aggregates: traditional aggregate made of gravel and crushed basalt aggregate. A total of three formulas were tested, with two based on traditional aggregate. No additives or admixtures were added to the first composition (Ref-0). The second formula (Ref-8) contained silica fume and superplasticizer in the amount of 8% and 0.75% of the cement mass, respectively. While the third formula (Bas-8) contained silica fume and superplasticizer in the same amount as in (Ref-8), coarse crushed basalt was also added. All variants used coarse aggregate of the same fraction (4-8 mm) and the same cement type (CEM I-42.5 R). The W/C ratio was similar in each mixture, amounting to 0.55. Cubic samples of size 10x10x10 cm, prepared for concrete strength and porosimetry tests, were formed out of all the three mixtures. Compressive strength of individual concretes was determined after 7, 14 and 28 days, as well as after 3, 6 and 12 months from the moment of sample formation. This allowed to recreate the variability of this parameter during the first year of maturation. In parallel, the process of technological humidity drying was recorded. Additionally, porosity tests were conducted using mercury porosimetry and optical porosimetry. Mercury porosimetry tests showed that the use of silica fume led to a decrease in the content of pores of size smaller than 0.15 μm compared to the reference concrete without the addition of silica fume. However, tests carried out on basalt-based concrete showed the presence of numerous additional pores with diameters ranging from 0.05 to 300 μm. On the other hand, while the optical porosimetry tests proved the appearance of pores of sizes larger than 70 μm in the basalt aggregate-based concrete, no such effects were observed in concretes based on traditional pebble aggregate. In case of traditional aggregate-based concrete, the addition of silica fume brought about an increase in its compressive strength. In turn, basalt-based concrete exhibited notably lower compressive strength values due to significantly higher porosity within the range of more than 70 μm. Also, the specific porosity structure had its impact on the process of drying of samples of each group which occurred at a significantly faster rate in the basalt-based concrete.

Corresponding Author: Jarosław Strzałkowski

MICROSTRUCTURE OF MATERIALS IN A STATE OF STRESS – DEVELOPMENT OF THE TEST METHOD

Marta Dudek

Chair of Building Materials Engineering, Cracow University of Technology, Warszawska 24, Krakow 31-155, Poland

ABSTRACT

The article contains a description of preliminary results of research aimed at developing a method for observing the microstructure of materials in a state of stress. Ultimately, this method is to be used in self-healing concretes modified with capsules. It will allow to observe changes in concrete and capsules under tension. In addition, it can be useful in determining the moment when the capsule is destroyed and also when the process of closing the crack formed in the damaged concrete started. For this purpose, preliminary examinations were performed using the Zeiss EVO MA 10 scanning microscope equipped with SE, VPSE and BSD detectors and a Bruker EDS XFLASH 6/30 detector and also a Deben MICROTEST tensile stage. This stage enables determination of compressive strength, tensile strength as well as fatigue strength. The working range of the device reaches 200N. The samples used in the tests must have limited dimensions. Their implementation carries with it difficulties due to the high precision and small size. For the pilot tests, elements such as steel wires, fibres as well as resin samples in a shaped of paddle printed in 3D printer were used initially. Preliminary studies have focused on how the material behaves under the tensile strength. This was to learn about the handling and research capabilities of the tensile stage and the assembly of samples in the device's holders. Attaching the samples turned out to be problematic. It presents difficulties with the destruction of the material in the holders or bringing out the samples during stretching. For this purpose, the method of fastening the material must be refined. It is anticipated that similar difficulties will be encountered during other tests that the stress table allows. However, the possibility of working stage and simultaneous observation of the microstructure can lead to interesting research results.

Corresponding Author: Marta Dudek

IMPACT OF DIFFERENTLY PREPARED PAPER PRODUCTION WASTE SLUDGE (PSw) ON CEMENT HYDRATION AND PHYSICAL-MECHANICAL PROPERTIES

Jurgita Malaiskiene, Vilma Baneviciene, Renata Boris, Olga Kizinievic

Laboratory of Composite Materials, Vilnius Gediminas Technical University, Linkmenu str. 28, Vilnius, Lithuania

ABSTRACT

After analysis of calorimetric tests results of the cement mixtures with PSw prepared at different temperatures and SEM, XRD, physical-mechanical properties results of cement stone hardened for 7 and 28 days, it is determined that PSw can be utilized/used for the preparation of cement mixtures by adding up to 5%. Depending on the environmental working conditions, the preparation of PSw can be selected. To slow down cement hydration processes, it is useful to use only dried PSw, which slows down the hydration of the cement due to the high content of cellulose contained in PSw. To accelerate cement hydration, it is expedient to use PSw which is burned at 700 ^{O}C. Dried PSw performs an extended induction hydration period and significantly delays the second heat release time. After the addition of 5% dried PSw, the phase III effect time compared to the control sample is 1.3 h, and after 10% addition, it is extended to 4.4 h. After the addition of 5% burnt PSw, the phase III effect time compared to the control sample is hastened to 1.9 h, after inserting 10% – to 2.4 h. The use of PSw saves the environment, reduces the amount of cement in the mixture and improves the properties of cement materials. Using 5% PSw burned at 700 ^{O}C instead of cement increases the compressive strength of the specimens, and the density as well as ultrasound pulse velocity values are slightly changed compared to the control sample. Thermal analysis of PSw shows two main endo-effects which arise from burning it at 1000ºC temperature. At ~352°C temperature crystallohydrates disintegrate, connected water liberate and sample loses 16% of its mass. At ~765ºC temperature, calcium carbonate decomposes to CaO and CO_2. It is determined that burnt PSw significantly changes mineral composition and structure. The PSw burning temperature is selected to be 700 ^{O}C to avoid the $CaCO_3$ decomposition reaction. It is found that the microstructure of samples without PSw and samples with dried 5% PSw is similar, crystals formed are visible. With a higher (10%) amount of dried PSw, the microstructure of the cement stone differs significantly from the control samples. Larger voids with plenty of etringite are also visible, as well as higher levels of calcite. The microstructure of specimens with burnt PSw is significantly denser. XRD studies show that with a higher amount of PSw burned at 75 ^{O}C, the corresponding peak intensities of crystallohydrates ettringite and portlandite are lower, while the peak intensities of calcite are higher compared to samples without PSw. By increasing the amount of dried PSw in mixtures and reducing the amount of cement, the peak intensities corresponding to CSH and CASH are lower compared to those of the control samples. Using burnt PSw also reduces the peak intensities of ettringite, portlandite, CSH and belite, but significantly increases peak intensities of calcite and CASH.

Corresponding Author: Jurgita Malaiskiene

THE IMPACT OF BITUMEN ROOFING PRODUCTION WASTE (BTw) ON PHYSICAL MECHANICAL PROPERTIES OF CONCRETE

Marija Vaičienė [1], Jurgita Malaiškienė [2], Francesca Tittarelli [3,4]

[1] Vilnius College of Technologies and Design, Civil Engineering Faculty, Department of Civil Engineering, Antakalnio st. 54, LT-10303 Vilnius, Lithuania
[2] Vilnius Gediminas Technical University, Faculty of Civil Engineering, Institute of Building Materials, Laboratory of Composite Materials, Linkmenu st. 28, LT-08217 Vilnius, Lithuania
[3] Department of Materials, Environmental Sciences and Urban Planning (SIMAU), Università Politecnica delle Marche - INSTM Research Unit, via Brecce Bianche 12, 60121, Ancona, Italy
[4] Institute of Atmospheric Sciences and Climate, National Research Council (ISAC-CNR), Via Gobetti 101, 40129, Bologna, Italy

ABSTRACT

This article presents how concrete properties would change if part of a coarse aggregate (granite crushed stone) were replaced with bitumen roofing production waste (BTw). BTw is a huge ecological problem because these wastes are generated in large quantities when replacing old bitumen-based roof tiles. Wastes are also produced during the production of bituminous roof coatings. Usually BTw are stored in landfills or it is attempted to use/dispose them in the production of asphalt concrete. There are very few works which analyse the impact of BTw on the properties of cement materials, although the impact of these waste on the properties of cement materials could be beneficial because BTw consist of aggregate, granules, bitumen and fibers. In order to use BTw, standard concrete samples were first formed, then 5/16 granite fraction was replaced with BTw in amounts of 2%, 4% and 6%. The amounts of limestone Portland cement, fine aggregate (sand), water and superplasticizer in the concrete mixtures were constant. The new generation of superplasticizer based on polycarboxylates was used in mixtures. The following concrete properties were identified and analyzed: density of the mixture, flowability, density of concrete samples, water absorption, compressive strength, forecasted frost resistance, and microstructure studies were conducted as well. The results of the studies showed that BTw can be used in small amounts, i. e. up to 6%, then the density of the samples slightly decreased (by 2.4%) and water absorption increased (by 0.7%). Compressive strength, after replacing 2% granite crushed stone, decreased by 2.4%. However, gradual addition of the amount of BTw resulted in more closed pores that improved the frost resistance of the concrete. When 6% of bulk filler was replaced with BTw, closed porosity, compared to control samples, increased by 54% and forecasted frost resistance - by 26%. Microstructure analysis showed that with 6% BTw a dense cement stone structure was formed, showing the hydrates of portlandite and CSH.

Corresponding Author: Marija Vaičienė

VALIDATION OF ELASTIC - BRITTLE, AND ELASTIC-PLASTIC FEM MODEL OF THE WALL MADE OF CALCIUM SILICATE MASONRY UNITS

Radosław Jasiński

Department of Building Structures, Silesian University of Technology, Akademicka 5, 44-100 Gliwice, Poland

ABSTRACT

Numerous methodologies can be used in numerical analyses of masonry structures. In the engineering applications that allow current design standards linear elastic material models are used. On the other hand, when it comes to the analysis of morphology of crackng and the failure mechanism that form the basis of scientific studies, the choice of use falls on the advanced material models implemented in micro, macro or meso masonry models taking into account the fragile properties of masonry based on the Coulomb's ideas. The Drucker-Prager, Hofman, Willam-Warnke, Barcelona and the Menétrey-Willam (M-W-3) models are used, among others. All advanced material models require the introduction of many mechanical parameters, the determination of which may pose many problems. Many authors use their own test methods, so it is not possible to repeat calculations. The paper presents the author's method of validating numerical masonry models using standard research models and procedures. The elastic - brittle material model (SBeta) and the elastic - plastic model of Menétrey - Willam were used (Jasiński, 2016 - WMCAUS 2016). The basic material parameters of masonry units and interface elements were determined in the tests of specimens of masonry units elements or wall specimens. The validation was carried out in the ATENA FEM system using a 2D model of the wall axially and diagonally compressed. The cracking of the wall, values of elastic modulus and destructive stresses as well as the course of the load-displacement dependence were compared.

USE OF WASTE WINDOW GLASS AS SUBSTITUTE OF NATURAL SAND IN CONCRETE PRODUCTION

Mohammed Seddik Meddah

Dept. of Civil & Architectural Engineering, College of Engineering, Sultan Qaboos University, Al-Khod 123, Oman

ABSTRACT

Nowadays, the use of various waste and recycled materials and by-products is very common in construction. Several recycled materials are used in concrete in different ways and for various purposes. Basically, embedding any waste materials in concrete has two major objectives: reducing the environmental impact of concrete industry and eventually, enhancing some properties of the produced concrete. Glass is a non-biodegradable material and if not recovered and properly recycled, could negatively affect the environment. Cement-based materials offer an opportunity to valorize this type of waste materials in concrete when properly designed. Waste glass from window applications was collected from local workshop, screened and crushed into fine aggregate to be used as a sand substitute in concrete. This research aims to investigate the effect of using this recycled glass as fine aggregate replacement in concrete both at fresh and hardened states. Natural sand was replaced at 10%, 20% and 30% with the crushed window waste glass. Compressive strength of the designed glass-concrete was examined at 1, 3, 7 and 28 days while flexural and splitting tensile strengths were examined at 28 days of wet curing

ASSESSMENT OF CHANGES IN COMPRESSIVE STRENGTH OF DEEP BEAM ELEMENTS MADE BY PUMPING SELF-COMPACTING CONCRETE BOTTOM-UP

Piotr Dybeł

AGH University of Science and Technology, Department of Geomechanics, Civil Engineering and Geotechnics, al. Mickiewicza 30, 30-059 Cracow, Poland

ABSTRACT

This experimental work investigates into the effect of a change in the compressive strength of concrete along the length and height of monolithic deep beams made of high performance self-compacting concrete (HPSCC). In the tests, three different HPSCC mixes were used in which the amount of silica fume differed (0, 5 and 10% by mass of cement). The binder content (550 kg/m^3) and the water-binder ratio (0.32) were fixed. Experimental deep beams, measuring 1.60 m in length, 0.16 m in width and 0.48 m in height, were cast. Two variants of concrete mixture casting were considered in this work: from the top and from the base of the formwork system with a single casting point at one edge. No significant changes to the compressive strength along the element span were observed in the tests, independently of the casting variant or the mixture composition. The compressive strength variation factor of individual layers depending on the mixture composition ranged from 0.8 to 3.9% for the top-down concreting and from 0.9 to 4.4% in the case of the bottom-up concrete casting. However, a tendency was observed for the compressive strength to undergo a reduction with an increasing distance between the samples and the concrete casting point. On the other hand, the tests showed that independently of the concrete casting variant, the mixture composition or the distance to the concrete casting point, in the upper parts of the elements there was a concrete layer of poorer quality and lower compressive strength. The reduction of the compressive strength of the top sample with respect to the bottom one was in the range 6.1 - 15.0% for the top-down concreting and 1.0 - 10.3% for concreting from the bottom of the formwork. The underlying physical mechanism of the compressive strength reduction along the height of the elements is a result of a specific form of segregation related to self-draining of free water. The potential entrapment of bleed water underneath coarse aggregate particles can be expected to increase towards the top of the deep beams. Such bleeding can weaken the interface between the aggregate and cement paste and result in a reduction of compressive strength. Casting the self-compacting mixture from the bottom of the formwork yielded a satisfactory degree of the strength homogeneity in the test element. This variant of casting may be used in practice as an alternative way of laying an self-compacting concrete mix.

NEW GENERATION CONCRETES – PROPERTIES AND APPLICATIONS

Piotr Dybeł, Milena Kucharska

AGH University of Science and Technology, Department of Geomechanics, Civil Engineering and Geotechnics, al. Mickiewicza 30, 30-059 Cracow, Poland

ABSTRACT

Concrete is one of the most commonly used building materials in the world. Its production is increasing year by year, and is associated with harmful emissions of carbon dioxide (CO_2), nitrogen oxides (NO_x) and particulates (PM10) into the environment, as well as the deterioration of natural resources. In accordance with the policy of sustainability, new technologies have being introduced into the civil engineering industry for several decades, for example new generation concrete. Depending on the specific application and innovation needs, they are characterised by different mechanical properties, structure, mix composition or behaviour in comparison to conventional concretes. These changes are intended, among other things, to minimize environmental impact during production, increase the durability and resistance to environmental hazards, prolong the reliability of the structure and reduce the life cycle costs of the structure. Examples of concretes belonging to the group of new generation concretes are above all: high performance concretes (also ultra-high performance concretes), self-compacting concretes, eco-efficient concretes, concrete with fibre reinforcement, self-healing concretes. The paper presents a general outline of the issues related to the new generation concretes. The differences between each new generation concrete and conventional concrete are described. Possible applications of these new generation concretes in civil engineering are presented. An attempt was made to determine the advantages and disadvantages of each of the discussed concretes.

Corresponding Author: Piotr Dybeł

INFLUENCE OF GRAIN SHAPE OF WASTE GLASS AGGREGATE ON THE PROPERTIES OF CEMENT MORTAR

Teresa Rucińska, Katarzyna Skoczylas

Department of Building Physics and Building Materials, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology, Szczecin, al. Piastów 50, 70-310 Szczecin, Poland

ABSTRACT

The rapid civilizational progress forces us care more about the natural environment. A huge population produces innumerable amounts of waste, where an example is constantly increasing amount of waste glass. Therefore, the recycling of waste glass is a challenge that we have to take to preserve the balance in our environment. If we use achievements in the field of nanomaterial technology, it is feasible to obtain cement mortars with comparable and even more beneficial parameters than traditional ones. These two aspects have become an inspiration for research, where waste glass was used along with modern nanomaterial technology. Three groups of mortars, where natural aggregate was replaced by waste glass (100% - WG, 50% - RWG, 0% - R) were prepared. Each group of mortars was modified with nanosilica admixture of 0%, 1% and 3% (by weight of cement). Superplasticizer was incorporated in order to improve the workability of mortars. Subsequently to the preparation the consistency and the density of fresh mortar were tested. After curing of specimens, mechanical properties after 7, 28 and 365 days, freeze-thaw resistance, abrasion resistance were evaluated. The study has shown that, the applicability of waste glass in the construction industry was confirmed, as well as improved mechanical properties of mortars through the content of waste glass and nanosilica. The analysis of the results of the experimental research allowed to determine the influence of grain shape of waste glass aggregate on the properties of cement mortar.

Corresponding Author: Teresa Rucińska

USE OF SUSTAINABLE FINE-GRAIN AGGREGATES IN CEMENT COMPOSITES

Teresa Rucińska

Department of Building Physics and Building Materials, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology, Szczecin, al. Piastów 50, 70-310 Szczecin, Poland

ABSTRACT

Previous research and analyzes from various research centers indicate the usefulness of aggregates obtained from waste in the construction materials technology, although not always their technical parameters are comparable to the properties of traditional materials made on the basis of primary raw materials. However, with a very large variety of expected technical features, these slightly lower parameters may be sufficient for use in engineering facilities. Mortars and concretes are the most popular group of materials, where aggregates obtained from waste can be used without any problems. The presented characteristics of the properties of fine aggregates, which were produced by grinding concrete and ceramic debris, as well as the fragmentation of municipal sewage sludge, in connection with the properties of cement mortars, is a clear example of this. The study has shown, that cement mortars, where natural aggregate was replaced by waste glass with the same granulation, confirmed their usefulness as mortar for building masonry, or underlays for floors. However, we can not skip the fact that it is the most inconvenient to carry out the process of fragmentation of waste to adequately fine granulation on an industrial scale. There are no difficulties to obtain aggregates with larger grains, which are used in hardening unpaved roads or as a concreto component . Obtaining finer grains of recycled aggregate becomes more challenging. Overcoming this obstacle will cause, that fine-grained aggregates obtained through the recycling of waste materials will successfully be an alternative to natural aggregates. This will contribute to the reduction of the extraction of natural sands, and thus contribute to the protection of the natural environment.

Corresponding Author: Teresa Rucińska

ANALYSIS OF THE THERMAL CONDUCTIVITY COEFFICIENT FOR MORTARS OF DIFFERING CEMENT TYPE AND WATER/CEMENT RATIOS

Agata Stolarska, Jarosław Strzałkowski, Piotr Szwejkowski

Department of Building Physics and Building Materials, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology Szczecin, al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

This study examines the thermal conductivity of cement mortars which differ in their cement type and water/cement ratio. As part of this study, the effect of dampness on the thermal conductivity coefficient was tested using nine mortar types. The study consisted of producing nine 25x25x6 cm samples of mortar on the basis of three different types of cements, namely: CEM I 42.5R; CEM II A-S 52.5N, and CEM III A 42.5N. Of each cement type, three samples were additionally produced which differed according to their water/cement ratio. Three values of the w/c ratio were tested: 0.5; 0.55; 0.6. After 28 days from mixing, the surfaces of the obtained samples were evened so that they could fit tightly against the heating and cooling plates of the heat flow meter. Next, the samples were inventoried and dried to constant weight at a temperature of 105^{o}C. Testing was carried out using a stationary method by means of the GHP8302.3 heat flow meter with guarded heating plate. Measures were taken at three temperature levels each time with the difference of 20^{o}C. The tested ranges were: 5-25°C; 10-30°C, and 15-35°C The next stage was soaking the samples and re-testing them using the heat flow meter at the same temperature ranges. The tests performed allowed for determination of the density of samples, absorbability and thermal conductivity in two states: dry and soaked. While the density of dry mortars ranged from 1.97 to 2.06 kg/dm^3, the maximum absorbability measured was 9.3%. The values were used to determine the relationship between the measured parameters for the nine mortars tested. Also, an adverse effect of dampness on the thermal insulation of the studied materials was confirmed. In extreme cases, the increase in thermal conductivity due to material dampness was 81%. In addition, the results demonstrated the effect of the adopted temperature ranges on the obtained values of the thermal conductivity coefficient.

Corresponding Author: Jarosław Strzałkowski

INFLUENCE OF WOOD AND PLASTIC WASTE AS AGGREGATES IN GYPSUM PLASTERS

Manuel Alejandro Pedreño-Rojas, C. Rodríguez-Liñán, M. J. Morales-Conde, F. Pérez-Gálvez, P. Rubio-de-Hita, M. I. Romero-Gómez

Departamento de Construcciones Arquitectónicas 1, Escuela Técnica Superior de Arquitectura, Universidad de Sevilla, 5 Avenida Reina Mercedes, n_ 2, 41012, Sevilla, Spain.

ABSTRACT

Large amounts of waste are generated each day in the world, being a major concern for the EU28, who establish waste management as a priority line of work within the Horizon 2020. Construction sector is one of the largest residues generators. In that sense, architects and civil engineers should give an answer to solve that environmental problem. One of the options is to reuse waste for the generation of new materials and products for construction. In this research, wood waste (sawdust) from demolition works and polycarbonate waste have been used as aggregates to generate new gypsum plasters. Different percentages of additions (5, 10, 20 and 40%) for each type of waste have been conducted to develop the gypsum composites. Physical (density and thermal conductivity) and mechanical (flexural and compressive strength) properties of the new plasters have been measured using the procedure regulated by standards, comparing them with the reference material values (commercial gypsum without aggregates). The results of the tests show that lighter composites have been obtained when the percentage of waste increased for both type of aggregate. This lightening is higher in composites with wood waste than in those with plastic at the same percentage of addition. Furthermore, an improvement in the thermal conductivity of the plasters have been achieved. On the other hand, a decrease on the mechanical properties of the composites, with higher percentages of additions, have been obtained. For all the cases, the minimum strength value required by standards have been achieved. As a conclusion, lighter gypsum composites with enhanced thermal properties have been obtained, achieving in all the cases an acceptable flexural and compressive strength.

Corresponding Author: Manuel Alejandro Pedreño-Rojas

THE INFLUENCE OF METAKAOLINITE AS THE ADDITIVE ON THE EXTENT OF SHRINKAGE DEFORMATIONS IN CASE OF CEMENT CONCRETE INTENDED FOR AIRFIELD PAVEMENTS

Małgorzata Linek

Kielce University of Technology, Tysiąclecia Państwa Polskiego Street 7, 25-314 Kielce, Poland

ABSTRACT

The research paper presents the suggestion of using metakaolinite as concrete additive. The assessment of efficiency of using metakaolinite included the influence thereof on the modification of the registered shrinkage deformations. Cement concrete contains cement CEM I 42,5, granite grit, fine washed aggregate, water and air entraining and plasticizing additive. The influence of the applied metakaolinite on the obtained parameters of concrete mix and hardened concrete was determined. The analyses included concretes curing in standard conditions. Analyses included the assessment of the internal structure of concrete composite in terms of changes of porosity and continuity of contact areas between aggregate grains and cement matrix. Modifications of mechanical and physical parameters and the extent of the registered shrinkage deformations were assessed. Deformation tests were conducted within the period from 1st until 88th day of curing. Reduction of cement quantity and replacement thereof with the suggested metakaolinite allows obtaining the pavement quality concrete of more favourable internal micro structure and distinguished reducing the extent of shrinkage deformations.

INFLUENCE OF LUBRICATING OIL NYCOLUBE 7870 ON THE PARAMETERS OF CEMENT CONCRETE INTENDED FOR AIRFIELD PAVEMENTS

Małgorzata Linek, Piotr Nita, Wojciech Żebrowski, Paweł Wolka

Kielce University of Technology, Tysiąclecia Państwa Polskiego Street 7, 25-314 Kielce, Poland

ABSTRACT

The article presents the influence of the suggested oil on the modification of parameters of cement concrete intended for airfield pavements. Cement concrete contains cement CEM I 42,5, basalt grit, fine washed aggregate, water and air entraining and plasticizing additive. Analyses included the assessment of changes of mechanical (compressive strength, splitting tensile strength and bending strength) and physical parameters (bulk density, weight absorbability and water capillary action) of hardened concrete. Due to the observed changes in case of surface layer, peel strength was also determined. Tests were conducted in diversified (extended to 140 days) curing periods in order to assess the influence of the examined agent on the analysed parameters. The observed changes were associated with the internal structure of concrete composite. Based on the obtained results, negative influence of the applied oil on mechanical parameters of hardened concrete was determined. No negative influence of the analyzed oil on physical parameters of hardened airfield concrete was determined.

Corresponding Author: Małgorzata Linek

OPTIMIZATION OF THE INNOVATIVE HYDRAULIC BINDER COMPOSITION FOR VERSATILE USE IN RECYCLED ROAD BASE LAYER

Grzegorz Mazurek, Marek Iwański

Department of Transportation Engineering, Faculty of Civil Engineering and Architecture, Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland

ABSTRACT

The paper presents the results obtained on the basis of tests carried out using the innovative hydraulic binder intended for the recycled base layer with foamed bitumen. The tested hydraulic binder consisted of three components: cement, hydrated lime and fines. The analysis includes: end of setting time of mortar, volume change of mortar, compressive strength after 7 and 28 days of curing, bending strength after 7 and 28 days of curing. The analysis relied in identifying optimal compositions of innovative binder components in terms of its suitability for pavement recycled base layer. Optimizations considered obtaining a two variant such as: quick-setting and a normal-setting hydraulic binder. The results of the analysis indicate that there are solutions for binder compositions that meet the requirements for normal-setting for hydraulically bound base layer in recycled technology. In the scope of obtaining a quick-setting binder, at least 80% of the cement binder in the innovative hydraulic binder composition is required.

Corresponding Author: Grzegorz Mazurek

EFFECT OF ADHESION BETWEEN EPS GRANULES AND CEMENT MATRIX ON THE CHARACTERISTICS OF LIGHWEIGHT CONCRETES

Maciej Major, Jacek Halbiniak

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka Street 3, 42-200 Częstochowa, Poland

ABSTRACT

Lightweight concretes are characterized by appropriate corrosion resistance and very good insulation, but lightweight aggregates, having low density and high porosity, lead to obtaining concretes with relatively low high mechanical parameters. Despite this fact, lightweight concretes have been increasingly used in civil engineering for many years, with the interest in such concretes growing year by year. By using lightweight aggregate and some kind of modifications, it is possible to obtain structural concretes, which can compete with conventional concrete composites. Due to low density of lightweight concretes, they reduce the loads from the mass of the members, which enables the cross-sections of the members to be reduced, thus allowing larger spans to be achieved. More and more often EPS (expanded polystyrene) granulate is used as an aggregate for lightweight concrete. Individual EPS granulates have a spherical shape, contain about 98% air and 2% polystyrene, and, due to their closed structure, are non-absorbent and ultralight. The paper presents the results of examinations of the effect of modification of EPS granulate on the compressive strength of lightweight concrete composites. EPS granulate was used to volumetrically replace mineral aggregate with the amount of 50% and 75%. Modification of EPS granulate consisted in coating with cement slurry and cement slurry with silica dust. It was found that the coating of the EPS granulate followed by preparation of the concrete mix leads to an increase in adhesion of EPS to the cement matrix. This results in significantly higher compressive strength compared to concrete based on unmodified EPS aggregate. Concrete made with 50% of EPS granules previously coated with cement slurry with silica dust obtained an average compressive strength of 18.3 MPa, which was by 18.1% higher than that of concrete with unmodified EPS.

Corresponding Author: Maciej Major

ANALYSIS OF THE IMPACT OF FILLER IN THE FORM OF SHREDDED CERAMIC WASTE ON SELECTED PROPERTIES OF A HIGH-STRENGTH CONCRETE COMPOSITE

Jacek Halbiniak, Bogdan Langier, Maciej Major

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka Street 3, 42-200 Częstochowa, Poland

ABSTRACT

The production of new-generation concretes involves the need to modify the characteristics of concrete mixes. Concretes modifications are most often associated with a change of its composition, which affects its parameters before and after the curing process. An effective way of modification is the introduction of additives and admixtures to cements and concrete mixes. They can have a very significant impact on the properties of the concrete mix and utility characteristics of concrete. The paper presents the results of research of selected properties of high-strength concrete modified with a filler derived from the recycling of shredded ceramic flowerpots. The concrete features such as: air content in the concrete mix, consistency of the concrete mix, compressive strength and frost resistance were evaluated. Frost resistance tests were carried out by two methods: the first direct method for 150 cycles of freezing and thawing and the second by determining the structure characteristics of concrete porosity using automatic image analysis. Damaged ceramic flowerpots were subjected to a mechanical treatment consisting on grinding them in a mill and then in a disintegrator. Powdered ceramic waste was added in amounts: 10, 20 and 30% of cement mass as a filler, simultaneously the same amount of mineral aggregate was reduced. In concretes made with the addition of shredded waste ceramics, mechanical features have been improved, which leaded to achieving higher average compressive strength compared to the reference concrete without this additive. Concretes with the addition of ceramics was also characterized with greater frost resistance. Frost resistance tests carried out with the help of automatic analysis of pore distribution in concrete proved to be an effective tool for assessing concrete resistance to cyclic freezing and thawing.

Corresponding Author: Maciej Major

STUDY OF DEFLECTION IN INSULATING GLASS UNITS UNDER CLIMATIC LOADS SIMULATION

Izabela Major, Zbigniew Respondek

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka Street 3, 42-200 Częstochowa, Poland

ABSTRACT

Insulating glass unit (IGU) is a commonly used filling element in transparent building partitions. The component glass panes in the unit are connected to each other on the edges by a spacer in such a way, that the space between them forms a tight gap filled with gas. The state of the gas in the gap can be described, with sufficient accuracy, by the law of ideal gases. Periodic changes in external climatic factors, above all atmospheric pressure and temperature, result in deflection of the component glass panes, which generates secondary loads associated with the change of gas pressure in the gap. The static quantities in the glass panes (deflection, stress) are therefore the result of the state of temporary equilibrium between the gas pressure in the gap and the external pressure. Measuring the deflection of component glass panes in operating conditions is time-consuming, because it requires waiting for changes in weather factors - these changes are often unpredictable. The aim of this article is to develop the concept of a test stand allowing the measurement of the deflection of the IGU models under the conditions of climatic loads changes simulation, where these changes can be controlled over time and generated in an orderly manner. The presented project meets these requirements. The stand is built from a massive main frame, which is the basis for the placement of deflection sensors, which is accompanied by a supporting frame, that allows placing glass panes with different thicknesses. The tested model of IGU is equipped with threaded elements, thanks to which it is possible to regulate the gas pressure inside the gap and monitor its temperature. An additional function of the stand is the ability to assess the tightness of the connection of component glass panes with the spacer, which may be an alternative to the standard way of testing this parameter.

Corresponding Author: Izabela Major

CONTEMPORARY METHODS OF MASHING OF CONCRETE SURFACES

Jarosław Kalinowski, Izabela Major

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka Street 3, 42-200 Częstochowa, Poland

ABSTRACT

The article contains an analysis of the process of mashing concrete surfaces using the most commonly used float disc. The quantity of the impact of the disc's working elements in the mashing process on the treated surface was determined by a parameter called geometrical efficiency S_g. The geometrical efficiency is defined as the length of the contact line of the point of the mashing surface with the element which mashing. The geometrical efficiency S_g for float disc depends on the geometry of the working elements and kinematic parameters: velocity of translational V_p and rotary ω motion. The algorithm for calculating the geometric efficiency S_g by numerical simulation is presented. The analytical formulas for calculating the geometrical efficiency S_g for the full and annular disc for uniform rectilinear motion at constant rotary velocity are presented. The possibility of converting the geometry of any shape of the working element to approximate geometry in terms of geometrical efficiency in the form of concentric slices of rings with center in the middle of the disc rotation is presented. The size of the ring slice was determined by a parameter called the fill factor W, defined as the quotient of the area of the ring on which the working element is located with the entire surface of the ring. Such a record allows to calculate the value of the geometrical effectiveness of the disc's impact by the analytical method as the sum of the geometrical efficiency of all the ring slices. The effectiveness of the ring slice is calculated as product of the geometric efficiency of the ring S and the fill factor of the ring W. These dependencies can be presented in the form of the matrix equation $S_g = S \times W$, which is convenient for numerical analysis. The methodology of numerical calculation of the width of the overlap treatment areas for neighboring disc tracks has been presented to ensure the highest homogeneity of treatment. As a function of the target, in optimization of the uniformity of the impact, the minimization of the standard deviation index of the geometrical effectiveness ε_{Sg} was assumed. The geometry of the real working elements most often used for mashing in the aspect of uniformity of treatment was analyzed. The method of geometry optimization at determined kinematic parameters was indicated in order to obtain the best surface treatment quality.

Corresponding Author: Izabela Major

ANALYSIS OF INFLUENCE OF THE DOLOMITE INACTIVE MINERAL FILLER QUANTITY ON PROPERTIES OF DEEP COLD RECYCLED MIXTURES WITH FOAMED BITUMEN

Przemyslaw Buczynski Marek Iwański

Department of Transportation Engineering, Faculty of Civil Engineering and Architecture, Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland

ABSTRACT

The subject of research presented in article was an assessment of the impact of inactive mineral filler content, i.e. dolomite dust, on the recycled cold mix properties with foamed bitumen. The analysis of the impact of dolomite mineral dust was made on the basis of the experiment design type 3^3. It consisted three levels of foamed bitumen factor in the range from 1.2% to 3.6% with a 1.2% step and the amount of mineral dust factor in range from 5% to 20% with a 7.5% step. Dolomite dust is a waste material derived from aggregate mining. Foamed bitumen was obtained from foaming process of the neat bitumen 50/70 at water temperature of 25ºC and its amount of 2.7%. In order to increase the cohesion of the recycled cold mix with foamed bitumen, Portland cement CEM I 32.5 R in amount of 2.0% was used. The assessment of the impact of quantitative variables was carried out in accordance with the adopted plan of the experiment that assumed the determination of physical and mechanical properties such as: resistance to climatic factors, dynamic modulus (E *) and phase angle. Analysis of the test results shown that factors quantity affects the variability of analyzed features. In the entire scope of experiment plan, the obtained free space values met the requirements in required guidelines. The highest sealing of the recycled mixture was observed for the entire dolomite dust dosage but at maximum amount of foamed bitumen amounted to 3.6%. It was also observed that the maximum water resistance (TSR) was obtained for mixtures with a minimum amount of mineral dust (5%) as well as the maximum amount of dust in the recycled cold mix (20%). However, it was depended of the amount of foamed asphalt in a recycled mixture composition. The study also was considered the influence of the amount of dolomite mineral dust on the change in stiffness modulus tested by means of IT-CY and DTC-CY procedure. It was shown that either stiffness modulus measured by IT-CY or DTC-CY are foam bitumen and dust amount dependent. To assess the rheological properties, the direct compression-compression test (DTC-CY) was used. All samples were subjected to a cyclic sinusoidal constant strain with an amplitude of ε_o <25με. The tests were carried out in the temperature range (-7ºC, 5ºC, 13ºC, 25ºC, 40ºC) and loading time (0.1 Hz, 0.3 Hz, 1 Hz, 3 Hz, 10 Hz, 20 Hz). It was found a significant variability of recycled base stiffness depending on loading time and temperature.

Corresponding Author: Przemysław Buczyński

CONSTRUCTION CERAMICS MODIFIED BY THE TECHNOGENIC ISOSTATIC NANOGRAPHITE

Grigory Yakovlev[1], Yuliya Ginchitskaya[1], Olga Smirnova[2]

[1] The Departament of Building Materials, Mechanization and Geotechnics, Kalashnikov Izhevsk State Technical University, Studencheskaya Str., 7, Izhevsk, 426069, Russian Federation
[2] The Department of Constructing Mining Enterprises and Underground Structures, Saint-Petersburg Mining University, 21-st Line V.O., 2, Saint-Petersburg, 199106, Russian Federation

ABSTRACT

In the production of ceramic wall materials based on acid and semi-acid loams, products with low physicotechnical parameters are obtained. To improve the characteristics of building ceramics, it is proposed to modify the raw material with ultra- and nano-dispersed additives based on technogenic isostatic graphite, instead of the traditionally used synthesized carbon nanosystems. The paper investigates the effect of aqueous dispersions of technogenic nanographite, functionalized by surface active additive C-3, on the properties and structure of ceramics. The infrared spectral and differential thermal analysis, together with computed tomography confirmed structural modification of ceramics with the introduction of water dispersion of isostatic graphite with the formation of a more dense and homogeneous structure of the ceramic crock, which, in turn, increases the strength characteristics. It is noted that the addition of ultrafine graphite to 0.005 % of the clay mass gives an increase in compressive strength up to 50 %, which increases the grade of manufactured products. In comparison with carbon nanotubes, technogenic graphite is quite cheap and is not subject to burning out when firing construction ceramics.

Corresponding Author: Grigory Yakovlev

STRUCTURAL AND THERMAL INSULATION MATERIALS BASED ON HIGH-STRENGTH ANHYDRITE BINDER

Grigory Yakovlev [1], Rostislav Drochytka [2], Grigory Pervushin [1], Valery Grahov [1], Darya Kalabina [1], Anastasia Gordina [1], Julia Ginchitskaya [1]

[1] The Departament of Building Materials, Mechanization and Geotechnics, Kalashnikov Izhevsk State Technical University, Studencheskaya Str., 7, Izhevsk, 426069, Russian Federation
[2] Veveri str., 95, Brno, 60200 Czech Republic

ABSTRACT

The properties of a structural and thermal insulation composition based on a high-strength anhydrite binder based on fluoroanhydrite and expanded perlite sand have been studied. Fluoroanhydrite is a waste product of hydrofluoric acid and it is an eco-friendly material. Due to the processing of man-made anhydrite, it is possible to reduce the harm caused to nature in places of raw materials dumps, as well as significantly reduce the cost of producing new construction materials. The use of anhydrite compounds in the manufacture of products is limited with low speed setting and hardening. To activate the structure formation of the anhydrite binder, 3 % aqueous solution of sodium phosphate Na_3PO_4 was used. Expanded perlite sand was used as an ultralight aggregate. As a result of the experiments, it was possible to obtain a lightweight composition possessing high strength. Studies of the microstructure and X-ray microanalysis showed new formations appearing in the interfacial zone at the border of the anhydrite binder and expanded perlite, which is confirmed by the results of the infrared spectroscopy. Also there has been noted the consolidation of the anhydrite binder structure by nanodispersed structures formed in the intercrystallite pores of the anhydrite binder. The developed composition can serve as a cheap substitute for gypsum in the production of warm plaster, gypsum boards, architectural elements by molding, tongue-and-groove slabs, wall blocks, as well as wall thermal insulation during frame construction, including for filling hollow masonry.

Corresponding Author: Grigory Yakovlev

METALLURGICAL SLUDGE AS SAND REPLACEMENT AND CONSTITUENT OF CRUSHED CONCRETE AGGREGATE

Mohamed Alwaeli [1], Jacek Gołaszewski [2], Jan Pizoń [2], Ada Andrzejewska [2], Patryk Szwan [2], Karolina Ceglarz [1], Wojciech Buchta [1], Tomasz Jachnik [1], Jakub Złotoś [1]

[1] Silesian University of Technology, Faculty of Energy and Environmental Engineering, Konarskiego 18, Gliwice, Poland
[2] Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5, Gliwice, Poland

ABSTRACT

Wastes are indispensable part of human existence. In 2017 in Poland, as much as 90.5% (113.8 million Mg) of all wastes were those related to economic activity. Already for years, the largest group of industrial waste are those from the mining, energy and metallurgical industries. Numerous scientific studies have shown possibilities of using metallurgical waste for the production of concrete and aggregates. What's more, their use can significantly reduce the negative impact on the environment, such as acidification, eutrophication, greenhouse effect or photochemical potential of ozone formation. The aim of the following research is to assess the possibility of using mixture of sludges from the metallurgical industry as a partial replacement for natural aggregates in order to reduce the negative impact on the environment as well as reduce the consumption of natural resources in accordance with the Circular Economy concept. Concrete samples containing 33% of dried and ground sludge as a substitute for sand and concrete containing crushed aggregate from concrete containing this sludge as a substitute for natural coarse aggregate in the amount of 25 and 50% and rounded aggregate from recycled concrete mix containing this sludge as a substitute for natural coarse aggregate in quantities 25 and 50%. The tests of air content, consistency and density of concrete mix as well as compressive strength tests after 2, 7 and 28 days of curing, permeability and water absorption after 28 days of curing were carried out. The sludge as partial sand replacement deteriorates the consistency of concrete mixtures, increases the air content and the density of the concrete mix. Use of recycled concrete aggregates containing sludge also deteriorated the consistency and increased the air content, but at the same time slightly reduced the density of the concrete mix. The use of sludge as a substitute for sand or recycled concrete aggregate as a replacement of natural aggregate affected the absorption of concrete. It is impossible to determine the correlation of absorbability and aggregate replacement level.

The use of sludge as a sand replacement has increased the permeability of concrete to the greatest extent. The use of rounded aggregate from recycled concrete mix also but to a lesser extent, and the use of crushed recycled concrete aggregate from did not affect the permeability of concrete. In comparison of compressive strength results of reference concrete, an increase in strength by about 20% for concretes with recycled aggregate and about 40% for concrete with sludge as sand replacement was found. In addition, the conducted research has shown that it is possible to make concrete with the use of metallurgical sludge as a 30% replacement of sand, and then to create aggregate from the resulting composite.

Corresponding Author: Jan Pizoń

EFFICIENCY ASSESMENT OF ACCELERATING ADMIXTURES AND CEMENT KILN DUST WITH COOPERATION WITH DIFFERENT PHASE COMPOSITION SLAG BLENDED CEMENTS

Jan Pizoń, Beata Łaźniewska-Piekarczyk

Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5, Gliwice, Poland

ABSTRACT

Concrete technology involves nowadays several types of chemical admixtures. One of them is set and hardening accelerating admixtures. Main benefits of their usage are enhancement of early compressive strength and shortening of initial setting time. Unfortunately, they may cause decrease of long-term compressive strength and adversely influence durability properties of concrete. Slag blended cements with 30% and 60% of slag content were used. Ground granulated blast furnace slag (GGBFS) that is main non-clinker constituent of those cements is beneficially changing its properties. It favourably affecting long-term compressive strength, consistency and durability properties of concrete. Main drawback of slag blended cements are decrease of early compressive strength and extension of initial setting time. Both accelerating admixtures and ground granulated blast furnace slag have advantages and disadvantages that may be at least partially balanced. Slag blended cements were composed in laboratory conditions of three Portland clinkers, differing in phase composition, anhydrite as set regulating constituent and ground granulated blast furnace slag in amount of 30% and 60% of Portland clinker mass. Cements was modified with accelerating admixtures with crystal seeds and calcium nitrate as active agent and cement kiln dust in amount of 10% of the cements mass. During previous research crystal seeds and calcium nitrate were examined with CEM I, CEM II/B-S and CEM III/A,B, manufactured by one of polish cement plants. Calcium nitrate acts mainly on dicalcium and tricalcium silicate (C_2S and C_3S). Crystal seeds are acting physically on all cements phases by means of acceleration of C-S-H phase formation by faster crystallisation. Their performance may be similar independently on cement phase composition. Aim of this paper is to describe effectiveness of those admixtures in cooperation with CEM II/B and CEM III/A, differing in phase composition. Additionally, cements were modified with Cement Kiln Dust (CKD) and their properties were tested. Such dusts may accelerate setting and hardening of cement because of chloride and carbonate content, which are constituents of accelerating admixtures. In addition, their form of very fine powder may allow them to act similarly to crystal seeds. Initial setting time, consistency and compressive strength of mortars were examined. Tests were conducted in temperature of 20°C. Compressive strength was tested after 12, 24, 48 hours and 7, 28 and 90 days of curing in temperature 20°C in water. In most works those properties are considered separately. In order to determine efficiency of substances mentioned above the multiple-criteria decision analysis (MCDA) was made for every kind of cement. This kind of analysis allows to take examined properties as set of properties and give information about the behaviour of admixture and cement cooperation in more general terms. Criteria were defined on the basis of conducted tests and their weights were evaluated with pair analysis method. Admixture with crystal seeds was most efficient one, while Cement Kiln Dust was the least efficient.

Corresponding Author: Jan Pizoń

MICROSTRUCTURE OF HIGH C3A PORTLAND SLAG CEMENT PASTES, MODIFIED WITH ACCELERATING ADMIXTURES FOR CONCRETE

Jan Pizoń, Beata Łaźniewska-Piekarczyk

Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5, Gliwice, Poland

ABSTRACT

Modern concrete technology includes mineral additives and chemical admixtures usage. It is caused by their beneficial influence on properties of concrete mix and hardened concrete. Accelerating admixtures for concrete are commonly used for shortening of time demanded for demoulding and repeat use of forms in precast facilities. They allow to conduct works during low-temperature season. Main advantage of accelerating admixtures is enhancement of early strength of concrete. Alas they may cause decrease of long-term strength and durability of concrete or increase its shrinkage One of the most popular mineral additives is ground granulated blast furnace slag (GGBFS). It is non-clinker main constituent of CEM II, CEM III and CEM V. GGBFS may be also used as additive with latent hydraulic properties for concrete. GGBFS as constituent of concrete increases consistency, long-term strength and durability, and decreases hydration heat evolution. Early compressive strength of concrete with GGBFS is lower than for Portland cement concrete. Accelerating admixtures and ground granulated blast furnace slag show advantages and disadvantages that can be equalized. In early terms calcium nitrate and crystal seeds enhanced compressive strength. Their efficiency is similar. Cement kiln dust also caused increase of compressive strength but not as much as former ones. Sodium hydroxide caused great increase of compressive strength after 12 hours but not in longer terms. In case of cements rich with C_3A the compressive strength in early stage of hardening is shaped by C-S-H phase and well-developed ettringite crystal skeleton. In spite of minor differences in non-modified and calcium nitrate modified cement pastes microstructure, the compressive strength of calcium nitrate modified mortars is significantly greater in comparison to non-modified ones. The greatest compressive strength was achieved by mortar modified with crystal seeds. Responsible for this increase is more well-developed C-S-H phase. Mortars modified with sodium hydroxide are weaker after 2 days of curing in comparison to non-modified mortar. It is caused by sparse ettringite crystal skeleton. Microstructures of non-modified and modified with cement kiln dust (CKD) cement pastes are similar. It is connected with similarity of chemical composition of CKD and Portland clinker. The compressive strength of CKD modified mortars is slightly greater than non-modified one.

Corresponding Author: Jan Pizoń

NUMERICAL ANALYSIS OF ELECTRODES POSITION FOR DELAMINATION DETECTION USING ELECTRIC RESISTANCE CHANGE METHOD

Andrejs Kovalovs

Riga Technical University, Faculty of Civil Engineering, Institute of Materials and Structures, Kipsalas Street, 6B/6A, LV-1048 Riga, Latvia

ABSTRACT

Modern composite materials, such as carbon-fibre-reinforced polymers [CFRP], are widely used in civil engineering as the construction material and for strengthening of civil structures. However, external mechanical loads, repeated cyclic stresses, and impact lead to damage in laminated composites due to their low delamination resistance. Damage in a structure may cause failure leading to tragic consequences and therefore structural health monitoring and damage detection in civil engineering structures has become one of the most important keys in maintaining the integrity and safety of a structure. Several methods have been developed for the structural health monitoring of composite structures. The electrical resistance change method has been employed by many researchers for detection of internal delamination. This method does not require expensive instruments, and it is applicable to existing structures. The basic idea of this method is that damage such as fibre fracture or delamination between plies will cause a decrease of the electrical conductivity in the damaged region leading to a resistance or voltage change. For the measurement of electrical properties of laminated composites the four-probe methods are employed. Electrical current is passed through the outer probes and induces voltage in the inner probes. Based on the measured voltage and current, the resistance between the voltage contacts is then calculated. In order to measure electrical resistance, many authors used equal distance between electrodes. The present work explores the use of plan of experiment and response surface method to obtain optimal distance between electrodes with maximal value of resistance. 2-D numerical analysis of strip-type specimens of laminated composites with and without damage are considered and numerical investigation is carried out by using the finite element program ANSYS. The surface and oblique resistances are numerically calculated according to the four-probe methods. The present study shows that the resistance percentage change is dependent on the location of electrode pairs used for the resistance measurement with the respect to the location of delamination.

HYSTORY AND EVOLUTION OF FULL BRICKS OF OTHER EUROPEAN COUNTRIES

Jan Fiala[1], Milan Mikoláš[2], Jan Fiala jun[3]

[1] K Potoku 243, Horoušánky 25082, Czech Republic
[2] 17.listopadu 2172/15, Ostrava – Poruba 708 00, Czech Republic
[3] Potoku 243, Horoušánky 25082, Czech Republic

ABSTRACT

In my article I named: History and evolution of full bricks of other European countries. Where I focused on the full brick, which is the main construction material since the year 1964. Since the year 1964 many other products were created. Which replaced brick in some parts of the counstruction progress, but even aftert hat the brick is still part of constructions and buildings. I also named variol types in individual states of Europe. I focused on the progress up to no wadays. The history of brick reaches up to theyear 8300 BC. Duringthe period of 10.000 years the brick has been the main construction material. It made its break through in constructing of vertical constructions. Wars in the medieval times, destruction and burning of woode structures made extréme progress/development among brick buildings and constructions. It made constructional expansit possible from low one story buildings to many story buildings. The brick was also able to unite functionality and esthetic. The brick is able to resist many centuries. It is recycleable, with out any health dangers, anti-alergic, none fire able, chemicaly resistant. The brick be came the basic constructional point since 19th century until now. It has beenused on many vertical buildings which resist to all weather conditions, full fill esthetical and functional work.

Corresponding Author: Jan Fiala

EVALUATION OF THE MODIFICATION EFFICIENCY OF BITUMINOUS BINDERS WITH SBS POLYMER BASED ON CHANGES IN STRAIN ENERGY IN THE DUCTILITY TEST

Paweł Mieczkowski, Bartosz Budziński

West Pomeranian University of Technology Szczecin, al. Piastów 17, 70-310 Szczecin, Poland

ABSTRACT

Road pavement layers in many cases are done of hot mix asphalt (HMA). It is mixture of mineral aggregate and asphalt binder. The content of the bituminous binder is not very significant (several percent). In fact, asphalt binder decides about every properties of hot mix asphalt in significant range. Traffic condition is still changing (traffic is growing and trucks are heavier). It is reason to find better solution to asphalt pavement and improve parameters asphalt binder. One of important attribute is sensitivity for temperature. Searching for a way to improve cohesion, viscosity and adhesion to mineral aggregate is one of the directions research. One of solution is use application of modifier. The most popular are polymers. Most frequently used copolymers to modify asphalt binder are thermoplastic elastomer styrene - butadiene - styrene (SBS). Thermoplastic polymers are used in practice, which soften upon heating and harden during cooling (reversible process), reminding in this respect the behaviour of asphalts. In article, authors have present tests results of modified asphalt binder by SBS polymer. Tests were made on two types of bitumen, one of them was distilled asphalt, second oxidised. Amount of modifier was variable and was from 0% to 6%. Results of test confirmed usefulness SBS polymer to modify asphalt. In every cases noticed increase penetration index (PI) and change structure of bitumen from sol-gel to typical gel. Effect of this is reduce thermal sensitivity. Resistance to changing of temperature is better. After tests and analyses, the authors stated that amount of polymer above 2% clearly changes asphalt parameters both hard and soft.

Corresponding Author: Paweł Mieczkowski

INFLUENCE OF THE TYPE OF HMA AND FREE SPACE CONTENT AND THE THERMAL CONDUCTIVITY COEFFICIENT

Paweł Mieczkowski, Bartosz Budziński

West Pomeranian University of Technology Szczecin, al. Piastów 17, 70-310 Szczecin, Poland

ABSTRACT

The surface temperature is diversified in cross-section and varies with external conditions. The dynamics of these changes depend on the possibility of taking over heat through the top layer and from its further flow to the lower layers of the structure. The heat transfer through pavements takes place due to convective heat exchange with air and radiation. Further heat transfer through the surface layers is due to conduction and is defined by the Fourier equation. The solution to the equation is the method of separating variables in the form of the product of two functions: time and space. The parameter decisive for the heat flow rate into the surface is the thermal conduction coefficient λ. For the purpose or type of HMA the value of this coefficient is not constant, assigned to the layer or type of asphalt mixture. It depends on the type of aggregate (its thermal properties), the volume shares of individual components (asphalt, aggregate), the structure of the material and the content of free spaces. The value of the thermal conductivity coefficient is also influenced by the degree of material moisture and temperature. The article presents the results of tests of the thermal conductivity coefficient of sixteen HMA. They were different due to the type of mixture (asphalt concrete, stone mastic asphalt, porous asphalt, macadam mix), the type of aggregate used (granite, diabase), the volume of free space and the temperature of the designation. The choice of aggregates was dictated by their diversity in terms of origin, acidity and thermal and physical properties. In both cases, they are igneous rocks, where the diabase belongs to the vein group (with a composition similar to basalts), and the granite to the deep-sea ones. They differ from each other in terms of acidity (diabase is a basic rock - alkaline, whereas granite is an example of acidic rock - salic), thermal parameters (thermal conductivity, specific heat and emissivity of radiation) and physical (density). The choice of the type of binder was conditioned by the intended use of the mixture. 50/70 asphalt was used for the abrasive layer, while the binding layer and foundation as well as the 35/50 asphalt macadam mix were used. The content of free spaces in the mixes ranged from 2.0% to 33.8%. The test was carried out at 20 ° C and 50 ° C. The obtained results indicate that concrete-type mixes (AC) are characterized by higher thermal conductivity coefficients than mixtures with an increased grit fraction (SMA, PA, Macadam). The basic parameter influencing the value of the thermal conductivity coefficient was the content of free spaces. With its increase, the heat conductivity decreased.

Corresponding Author: Paweł Mieczkowski

IMPACT OF ASSEMBLY PARAMETERS ON THE RESISTANCE CAPACITY EXPANSION ANCHORS

Daniel Dudek

Building Research Institute, Department of Building Construction Elements, Geotechnical and Concrete, 40-153 Katowice, Poland

ABSTRACT

In the current research practice, there is no documented influence of factors on load-bearing capacity and durability of joints using steel dowel fasteners for fastening structural elements. The basic factors that may affect the load capacity are in particular the various assembly parameters of steel anchors/connectors, the condition of the substrate (possible cracks), the grain size of concrete substrates, additional reinforcement in the form of dispersed admixtures. The work determines changes in the load-bearing capacity of M12 steel anchors, depending on the anchorage depth used and the tightening / installation torque applied. The tests were carried out on scratched and non-cracked C20/25 concrete substrates. As part of the load capacity analysis, the correction coefficients of the load capacity to pull out the steel dowel connectors, which can correct the design loadings for pulling out of concrete substrates in the C20/25 ÷ C50/60 class range and correlations of these capacities, were determined. Three types / structures of steel anchors: ring, segment and bushing diameter M12 were selected for the tests, as commonly used structures of expansion connectors in the construction industry. The article presents the results of tests for specific pull-out resistances of steel anchors installed in concrete. All tests were carried out for the purposes of this paper at normal temperature, without factoring in influence of concrete or air moisture content.

RECLAIMED ASPHALT PAVEMENT IN ITALY: AN UNCERTAIN DESTINY BETWEEN BY-PRODUCTS AND WASTE

Federico Peres

University of Padua, via Leoni 4 – 37121 Verona (VR), Italy

ABSTRACT

The definition of *by-products* was first introduced by the European Directive 2008/98/EC and then transposed into the Italian legislation in 2010, with the introduction of art. 184-bis of Legislative Decree no. 152/2006 (the so-called Environmental Code). Furthermore, in 2012 the national legislator enacted a specific regulation for excavation materials for their management as by-products (Ministerial Decree no. 161/2012, repealed in 2017 with the Presidential Decree no. 120). This normative framework has been applied inconsistently by the jurisprudence with specific regard to the reclaimed asphalt pavement: indeed, while the administrative justice has conceded the possibility to consider the latter as *by-product (*see, among others, the decision of the Council of State no. 4151/2013 and the judgment no. 38/2015 of the Regional Administrative Tribunal for Lazio), the criminal justice has always been clear to exclude such nature, considering the reclaimed asphalt pavement as *waste* (Criminal Court of Cassation, judgment no. 12230 of the 14th march 2014). However, the Ministerial Decree of the 28th march 2018, which has introduced the standards for the recovery of the milled asphalt as *end of waste*, has also indirectly recognized the possibility for it to be managed as a *by-product* (art. 1, para. 1: "*the present regulation does not apply to the bituminous conglomerate pavement qualified as by-product according to article 184-bis of the Legislative Decree no. 152/2006*"). The conclusions of the research, by analysing in a coordinative way the Italian and European legislation and case-law, is to understand the correct discipline of the reclaimed asphalt pavement and to avoid criminal consequences.

FACTORS AFFECTING COMPRESSIVE STRENGTH DEVELOPMENT OF ALKALI ACTIVATED SLAG CONCRETE

Osama Mohamed, Rania Khattab, Waddah Alhawat, Muhammad Saqib

Abu Dhabi University, College of Engineering, Abu Dhabi, United Arab Emirates

ABSTRACT

Studies show that the production and use of ordinary Portland cement (OPC) is responsible for more than 5% of the global CO_2 emission. Alkali-activated slag (AAS) has been studied for decades as potential alternative to OPC. Engineers are interested in understanding and quantifying the fresh properties, mechanical properties, and durability of concrete made used AAS as sole binder. This paper reviews some of the literature highlighting the factors affecting compressive strength development in AAS slag. These include water-binder-ratio, temperature, humidity, and amount of Na_2O, molarity of the alkaline activator solution, and type of alkaline activator. For instance, certain studies reported that AAS concrete activated using sodium silicate solution (water glass) produce higher 7-day and 28-day compressive strength compared to similar concrete that use 100% OPC, concrete activated using sodium hydroxide (NaOH), or concrete activated using potassium hydroxide (KOH). When NaOH is used as activator, mechanical properties of concrete improved with increase in molarity of the alkaline activator solution. Compressive strength of concrete cubes increases with increase in the amount of Na_2O supplied by the activator solution but to an optimum beyond which further increase in Na_2O results in decrease in compressive strength. However, the optimum amount of Na_2O, often reported as percentage of total slag content, varied from one study to another, probably dependent on the type of activator used as well as the water-to-binder (w/b) ratio.

Corresponding Author: Osama Mohamed

IMPACT OF ADDITIVES ON FOAMABILITY OF A ROAD PAVING BITUMEN

Mateusz M. Iwański, Anna Chomicz-Kowalska, Krzysztof Maciejewski

Kielce University of Technology, Al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland

ABSTRACT

Because of the needs for increased efficiency and environmental concerns that now emerge, environmentally friendly techniques are more sought for and more commonly utilized in the road paving industry. Typical asphalt mixes are produced in temperatures exceeding 150˚C depending on the type of asphalt binder used, but new techniques are being developed, permitting decreased production and paving temperatures. One of the most effective techniques that are being studied are the Warm Mix Asphalt and Half Warm Mix Asphalt methods utilizing water based bitumen foaming, that allow production of asphalt mixes at temperatures as low as 100˚C. Due to the extremely low processing temperatures it is often difficult to obtain satisfactory results regarding the physical and mechanical properties of the resulting mixes, specifically the resistance to moisture damage and resistance to permanent deformation being in concern. As these issues were found to be originating in the inadequate coating of aggregates, a surface active agent in amounts of 0,2%-0,6% and synthetic wax in amounts of 1,0%-2,5% were added to 50/70 paving bitumen to improve its foamability and coating potential. Foaming characteristics were established in terms of bitumen foam expansion ratio ER and its half-life HL as a function of foaming water content ranging from 1,5% to 4,0%. It was found that the addition of surface active agent in the amount of 0,6% resulted in the most favorable foaming performance at 2,5% foaming water content, resulting a doubling in expansion ratio and more than a 2,5 times increase in half-life compared to the base bitumen. I is believed that the improved foaming characteristics of the bitumen would significantly benefit the performance of a subsequent warm or half-warm asphalt mix.

Corresponding Author: Mateusz M. Iwański

NON-DESTRUCTIVE METHODS FOR DIAGNOSTICS OF PLASTERS AND HORIZONTAL DAMP-PROOFS IN MASONRY WALLS

Bohdan Stawiski [1], Tomasz Kania [2]

[1] Faculty of Environmental Engineering and Geodesy, Wroclaw University of Environmental and Life Sciences, Grunwaldzki sq. 24, 50-365 Wroclaw, Poland

[2] Faculty of Civil Engineering, Wroclaw University of Science and Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

External walls plasters constitute an exposed surface that is convenient for visual tests, but due to the small thickness it is not very useful for mechanical tests. Visual tests allow to identify such defects as: cracks, chipping, migration of salts, but on the basis of only such features it is difficult to infer all causes of irregularities. One of the methods of inferring plaster strength is the pool off method, which can be used to examine plaster adhered to the substrate. However, scatter of results in this method are large and the assessment criteria are not very precise. Horizontal damp insulations in the walls are extremely inconvenient for qualitative evaluation due to the fact that they are completely hidden in the masonry. The performance of the dampness membrane is indispensable in the walls of old buildings built until the end of the 19th century, and even at the beginning of the 20th century. The problem is presented on the example of research carried out on a modernized building from the 19th century. The dielectric method was used to investigate the humidity of the walls, and the ultrasonic method was used to study its mechanical features. The ultrasonic wave velocity measurements were made with spot heads at a constant length of the measuring path. Wall moisture tests in many areas could be made only by non-destructive method. They were made with a capacitive meter with an active ball probe. In all areas, the humidity at different levels was measured starting from the damp barrier, up to a height of 100 or 120 cm above the ground. In the paper has been shown how by using selected non-destructive methods can be obtained a lot of information about the mechanical properties of plasters and the condition of moisture barriers. The measurements and analysis of the results showed a high usefulness of the non-destructive methods described for the in-depth diagnostics of masonry and plasters forming the top finishing layer. From the comparison of the humidity of the plaster on the external and internal side of the tested walls, opinions were also formulated regarding the condition and quality of the damp barrier made by injection method.

Corresponding Author: Tomasz Kania

THE INFLUENCE OF SELECTED FACTORS ON THE HIGH PERFORMANCE CONCRETE STRENGTH PROPERTIES

Agnieszka Molendowska, Jerzy Wawrzeńczyk, Adam Kłak

Kielce University of Technology, Al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland

ABSTRACT

High Performance Concrete is usually defined as concrete with a characteristic compressive strength value more than 60 MPa determined after 28 days of curing. Due to compressive strength values HPC concretes can be divided into: UHPC > 150MPa, VHPC 100-150MPa, HPC 60-100MPa. Producing the HPC concrete on the construction site gives many advantages and allow to construct high-rise buildings. Using HPC concretes allows limiting the weight of the structure while ensuring the load-bearing capacity of the structural elements. HPC is made of high-quality cement, while maintaining a low water-cement ratio (water to binder ratio) and using effective chemical admixtures, developing rheological properties (plasticizers and superplasticizers), mineral additives, especially silica fume and fibers. Maximum fiber content varies depending on the fiber type and reference mix composition. The high content of steel fiber (1–1.5% volume) has a bearing on the distribution of the mix components or causes fiber clumps or blocks aggregates. The mixes with reduced flow limit and plastic viscosity, i.e. with lower stability, tend to segregate or cause sedimentation. The article presents the research results, which aimed to assess the impact of selected factors related to the composition on the strength properties of HPC. Factors analyzed were: the water-weld ratio (W/S), the sand-to-binder ratio (P/S) and the amount of PVA fibers (Vf). An 18-point experiment plan was applied. The proper proportions of ingredients that allow obtaining the most favorable strength properties (tensile and compressive strength) were investigated in this research.

Corresponding Author: Agnieszka Molendowska

ULTRA-HIGH-PERFORMANCE CONCRETE SHEAR KEYS IN CONCRETE BRIDGE SUPERSTRUCTURES

Elsy Y. Flores, Jordan Varbel, William K. Toledo, Craig M. Newtson, Brad D. Weldon

Civil Engineering Department, New Mexico State University, PO Box 30001,
MSC 3CE Las Cruces, NM 88003; USA

ABSTRACT

Many existing bridges constructed with adjacent precast girders utilize grouted shear keys to transfer loads laterally across the superstructure. Cracking and leaking at the shear key often cause degradation of the shear key and the girders causing loaded members to carry more load than they were designed for, which can reduce the service life of the structure. This work evaluated the potential of using a non-proprietary ultra-high performance concrete (UHPC) produced with local materials as a grouting material to repair the deteriorated shear keys. Slant-shear and direct tension tests were performed to assess bond strength between the substrate and the UHPC grout. These tests were performed on composite specimens with substrate textures that included a formed surface and chipped textures. Texture depths were quantified using ASTM E965. The formed surface was prepared by using a stiff wire brush to dust off loose material and the chipped surfaces were prepared by using an air hammer to chip off the formed surface. Bond strengths from slant-shear were adequate at both seven and 28 days according to recommendations provided by ACI 546.3 even though the texture depths were less than the minimum required texture depth of 6.25 mm. Slant shear and direct tension tests also revealed that bond strength decreased with increased texture. It appears that chipping when texturing the specimens may have caused cracks deeper in the remaining substrate concrete. Direct tension tests on formed surfaces showed adequate seven day strengths. However, 28 day strengths were less than the values recommended by ACI 546.3. Chipped specimens had inadequate strengths at seven days and even smaller values for the 28 day strengths. This was attributed to shrinkage in the UHPC causing some dimensional incompatibility between the UHPC and the substrate. Scanning electron microscopy (SEM) was used to characterize both bonded and fractured surfaces. Results from SEM showed fly ash residue remaining on the substrate after bond failure, indicating that the supplementary cementitious materials produced much of the bond. SEM also showed that there were no apparent flaws or defects at the bonded interface. Assessment of early-age and longer-term shrinkage of the UHPC was conducted to check compatibility of the UHPC overlay and the normal strength concrete substrate. Early-age shrinkage testing resulted in a shrinkage of 1800 μstrain at 24 hours. Although the early-age shrinkage strain seems substantial, approximately 1000 μstrain of it occurred in the plastic state. Longer-term shrinkage tests showed that wet cured specimens had an average shrinkage that plateaued at approximately 443 μstrain and that specimens cured at ambient lab conditions had an average shrinkage that plateaued at approximately 583 μstrain. Full-scale structural testing of UHPC shear keys between adjacent pre-stressed channel girders was also performed. For this testing, UHPC grout and a non-shrink grouting material were compared. In both cases, bond was adequate to transfer shear and moment to an adjacent girder even at full serviceability deflection and no degradation of the shear key was observed.

Corresponding Author: Craig M. Newtson

IMPACT OF ENVIRONMENT CONDITIONS ON POLYMERIZATION PROCESS OF ECO-FRIENDLY GREEN CEMENTS

Maciej R. Król [1], Tomasz Z. Błaszczyński [2],

[1] Technical University of Koszalin, Śniadeckich 2, 75-453 Koszalin,
[2] Technical University of Poznań, Piotrowo 5, 60-965 Poznań,

ABSTRACT

Need of development due to ecological aspect in cement industry is very high. Ordinary, known also as Portland cements in standards for the emission of carbon dioxide started to be noticed as non-ecological materials. Getting into consideration, that concrete is second after sweat water product used by people on our planet and socio-economy development is impossible to be stopped, we cannot deny the need to make the building industry environmentally friendly and ecological. Fortunately, thanks to “new technologies” of cement materials, we can work on reduction of energy consumption and emission of hazardous substances of the biggest branch of construction industry which is cement industry. Unbelievably high production of ordinary cement cannot be stopped. Even worse, it is almost impossible to slightly reduce it. It can only be done by market demands, which cannot be controlled by regulations or authorities. Alumina-silicate cements can change the situation of unhealthy cement industry, and make it more ecological. Unfortunately, today’s technology cannot provide as much substrate of cement production to replace totally ordinary cements. This paper presents the results of research on materials that can be used for the production of green cements. Research has focused on the possibility of developing basic guidelines for the future possibility of use. Two types of fly ash, known as Class F fly ashes and Class C fly ashes, served as cement substrates. The result of the research is the dependence of the ripening temperature on the parameters of the hardened cement mix.

Corresponding Author: Maciej Król

ANALYSIS OF THE EFFECT OF AGGREGATE GRADATION ON THE BOND BETWEEN REINFORCING STEEL AND CONCRETE

Daniel Wałach

AGH University of Science and Technology, al. Mickiewicza 30, Krakow, Poland

ABSTRACT

This paper is focused on verification and evaluation of the influence of the coarse aggregate size used in concrete mix composition on the bond properties between ribbed steel reinforcement and concrete. This problem seems to be ignored in general deliberations on the design of reinforced concrete structural elements. Those considerations only take into account the bond conditions related to the height of the concrete elements and the direction of concreting in relation to the reinforcement arrangement. The mechanism of bond between reinforcing steel and concrete is highly dependent on the mechanical properties of the concrete, such as its tensile strength or splitting, and on the intensity of the "aggregate interlock" phenomenon, which involves the interlocking of concrete particles in the ribbed spaces of reinforcing steel. Given this, the aggregate composition used in the production of a concrete mix can have a significant role to play in the process of transferring loads from steel to concrete and the vice versa. As a part of the study, the bond and the compressive strength of specimens made of three different concrete mixtures were tested. All mixtures had similar strength parameters (hardened concrete class of C30/37) and similar classes of consistency, but they differed in the aggregate composition used for their preparation. The conducted research, together with the interpretation of their results, allowed for drawing conclusions and correlations: a. Concrete mixture made with the finest aggregate was characterised by the greatest scatter of data. What is more, as the average diameter of coarse aggregate increased, an improved repeatability of test results was observed, b. A positive effect of different graininess of the aggregate composition on the value of maximum bond stress was observed. The aggregate composition, high in fractions of various diameters, makes it possible to obtain a mixture with better workability. Such concrete can be placed more efficiently in the mould and its structure will be more homogeneous, c. The bond of the ribbed reinforcing bar with the concrete cover made with coarse natural aggregate is more elastic. An opposite relationship can be observed for anchorages in a mix made on fine aggregate, d. The value of average bond stress increased with the decrease in the average diameter of the coarse aggregate used to compose the concrete mix. The research has shown that the choice of the aggregate composition used in the concrete mixture, depending on the type of ribbing of the main reinforcing bars, may increase the bond strength of the reinforcement to the concrete. Thus, reduce the development length of the reinforcing bars.

IMPURITIES OF RECYCLED CONCRETE AGGREGATE - TYPES, ORIGIN AND THEIR INFLUENCE ON CONCRETE STRENGTH PARAMETERS

Justyna Jaskowska-Lemańska

AGH University of Science and Technology, Department of Geomechanics, Civil Engineering and Geotechnics, al. Mickiewicza 30, 30-059 Cracow, Poland

ABSTRACT

Current development megatrends are aimed at finding a balance between the economy, social and environmental aspects. It is also required that the economic processes that are undertaken should be highly effective in these three dimensions. Both the finite amount of natural resources and the need to manage construction and demolition waste, while the constant demand for concrete mix, makes it necessary to develop knowledge and practice in the field of concrete recycling. One of the main issues in the recovery of concrete aggregate is the presence of impurities. Aggregate treatment is a possible solution, but these are energy consuming and costly processes. Therefore, there is a need to estimate their impact on concrete parameters. Such knowledge is necessary in assessing the need for additional aggregate treatment processes. Harmful aggregate impurities are materials that hinder the curing of concrete, reduce its strength and tightness, cause splinters, violate the anti-corrosion protection of reinforcement. The paper analyses the type of impurities in RCA, as well as its sources and their influence on the technical parameters of concrete. Six concrete mixes with the same content of coarse aggregate and water-cement ratio were prepared for the research. The first mix contained only natural aggregates, while the second mix was replaced in half by recycled aggregates. In subsequent samples, recycled aggregate in 5% by volume was successively replaced with: glass, brick, foamed polystyrene and a mixture of these impurities. Both impurities and recycled aggregate were prepared in 2/8mm fractions. The obtained results were compared with the results presented in the literature.

BOND PROPERTIES BETWEEN STEEL REINFORCEMENT AND NEW GENERATION CONCRETES – A REVIEW

Milena Kucharska, Justyna Jaskowska-Lemańska

AGH University of Science and Technology, Department of Geomechanics, Civil Engineering and Geotechnics, al. Mickiewicza 30, 30-059 Cracow, Poland

ABSTRACT

The constant development of civil engineering led to a creation of new generation concretes. Normal concrete is modified in order to provide plethora of new properties, such as higher mechanical characteristics, better durability and lower environmental impact. Several types of concrete are considered as a new generation concrete, for example high-performance (HPC), self-compacting (SCC) and high-performance self-compacting concrete (HPSCC). This paper presents a literature review of bond behaviour in new generation concretes, in particular high-performance and self-compacting concrete. Specifically, the bond between concrete and steel reinforcement was considered. The bond strength test procedures were given in the paper. The bond-slip models were also described here. The scope of research included, among others, the influence of materials' choice on the bond properties. The effect of mineral additives (such as silica fume, fly ash), admixtures (superplasticizer) as well as different aggregates on concrete bond to steel rebars was described here. What is more, the influence of reinforcing bar geometry and its condition was presented. It is commonly known that the compressive strength of concrete influences the steel – concrete bond. Therefore, the paper also delineated this impact in the case of new generation concretes. Last but not least, the effects of rebars' location along the height and the length of specimens were researched. The study showed several differences in bond behaviour of investigated new generation concretes and normal concrete. Moreover, the current normative guidelines display certain way of bond test procedures which are based on normal concrete performance. However, those methods are not entirely accurate in the case of new generation concretes due to various modification of the material.

Corresponding Author: Milena Kucharska

COMPARISON OF PROTECTIVE PROPERTIES OF CONCRETE WITH LOW ALKALI CEMENT

Zofia Szweda

Department of Building Structures, Silesian University of Technology, Akademicka 5, 44-100 Gliwice, Poland

ABSTRACT

Diffusion process determines the rate of chloride ions penetration in concrete and therefore diffusion coefficient values play a major role in the evaluation of protective properties in concrete with reference to reinforcement. This paper describes tests on protective properties of concrete cover made of ordinary concrete and different types of low alkali cement. We performed tests on four types of concrete mix which differed in a type of used cement. The following types of cement were applied: in concrete C1 - cement CEM I 42.5 R characterised by high heat of hydration, rapid increase in strength and high early strength. In concrete C2 – cement CEM III/A 32.5 N-LH/HSR/NA characterised by high resistance to chemical aggression. In concrete C3 – cement CEM I 42.5 N/SR3/NA with high chemical resistance, particularly to sulphate corrosion, low content of Na2O alkali, tricalcium aluminate C_3A and aluminium oxide Al_2O_3. In concrete C4 - cement CEM IV/B (V) 32.5 R – LH/NA characterised by a stable increase in strength, increased strength during longer stages of concrete curing. Protective properties of concrete cover for reinforcing steel were specified by determining values of chloride diffusion coefficients describing flow rate of chloride ions in wet concrete. Chloride diffusion coefficients were determined on the basis of the thermodynamic model of chloride flow in the electric field. Migration tests in the electric field were used to determine diffusion coefficients. Then, we compared distribution of chloride concentrations in diffusion tests with the forecast distribution of chloride concentrations, taking into account the obtained values of chloride concentrations. Consequently, we determined reliable values of diffusion coefficients. We also specified the forecast durability of concrete structure made of tested types of concrete.

MATERIAL CRAFT: AN APPROACH TO TEACHING BUILDING MATERIALS IN ARCHITECTURAL EDUCATION

Anamika Mishra

Department of Architecture and Design, College of Engineering, Abu Dhabi University, Abu Dhabi, United Arab Emirates

ABSTRACT

Knowledge of building materials is critical for architects in order to integrate material selection and related structural thinking within the design process, rather than considering it as an after-thought. It prepares future architects to work in collaborative ways with engineering professionals and equips them to work in a field where sustainability related mandates will require them to make responsible decisions regarding material choices. However, with a packed curriculum, architecture students have limited time to acquire this knowledge and more importantly to consider how it can be applied. Lecture-based theoretical content has limitations in the way this knowledge is transferred to design, thus curtailing the generation of innovative ideas. This paper has been developed through experience at teaching a first year Building Technology studio for an architectural program at a University. The paper discusses an approach towards generating designs that are informed by knowledge of materials, during the formative years of architectural education. Details regarding the use of a design-based exercise, involving the creation of physical models, which are guided by the possibilities and limitations of the assigned materials, are presented to highlight the benefits of the approach. The use of physical models, experimentation and structural scaling methods promotes the embedding of materials knowledge in design contexts. Underlying educational value of utilizing this approach is explored by discussing the principles on which the exercise was based, the outcomes observed and suggestions for possible improvement. Findings from this paper are expected to be of value to those concerned with architectural education as well as built environment professionals.

PRELIMINARY STUDY OF THE APPLICATION OF NATURAL ZEOLITE TO THE ASPHALT CONCRETE PRODUCED IN FOAMED BITUMEN TECHNOLOGY

Marek Iwański, Anna Chomicz-Kowalska, Justyna Stępień, Mateusz M. Iwański,
Krzysztof Maciejewski, Piotr Ramiączek

[1] Kielce University of Technology, 25-314 Kielce, al. Tysiąclecia P.P. 7, Poland

ABSTRACT

The paper presents result on the assessment of using natural zeolites as a filler substitute for asphalt mixtures produced at reduced temperatures with a water foamed binder. The temperature of the asphalt mixture during its production was about 125˚C, while the temperature during the compaction of the laboratory samples was controlled at 100˚C. The tests were carried out using a mixture of AC 16 asphalt concrete intended for the basecourse layer. In the laboratory tests two mixes with zeolites were tested, one containing 0.4% of a water-modified zeolite (20%) and the second with 1.0% of natural unmodified zeolite. In both mixes, the zeolite substituted the adequate amount of a filler which amounted to 4% of the mineral mix. Its effect on selected physical and mechanical parameters of asphalt mixtures were analyzed, i.e.: air void content, indirect tensile strength in air-dry state and after conditioning with one freeze-thaw cycle as well as the resulting resistance to water and frost damage. In addition, the effect of zeolites on the compaction characteristics of the asphalt mixes using a gyratory compactor was analyzed. The results have shown that the use of zeolites (both modified and unmodified with water) has resulted in increased air void content in the samples. Mechanical properties have also deteriorated as it was observed in the reduced indirect tensile strength, both in the dry state and after the freeze-thaw cycle. The results obtained from the gyratory compactor showed that blends with zeolites proved to be more difficult to compact than hot mix asphalt and the reference foam warm mix asphalt. For all the tested properties, it was observed that the worst performance was exhibited by a blend containing 1.0% unmodified zeolite, followed by a blend with 0.4% wetted zeolite. The second best was the reference foamed warm mix and the best was the reference hot mix. It was found that the temperature of the mixture production was too low, for the zeolite water to significantly improve the workability of the asphalt mixture and help improve its mechanical parameters, while the effect of stiffening the binder occurred.

Corresponding Author: Justyna Stępień

INVESTIGATING THE USE OF MOIST AGGREGATES IN THE PRODUCTION OF LOW TEMPERATURE BITUMINOUS MIXTURES USING FOAMED BITUMEN

Piotr Ramiączek [1], Anna Chomicz-Kowalska [1], Krzysztof Maciejewski [1], Mateusz M. Iwański [2], Justyna Stępień [1]

[1]Department of Transportation Engineering, Faculty of Civil Engineering and Architecture, Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland
[2] Department of Building Engineering Technologies and Organization, Faculty of Civil Engineering and Architecture, Kielce University of Technology, al. Tysiąclecia Państwa Polskiego 7, 25-314 Kielce, Poland

ABSTRACT

The use of moist/wet aggregate fractions in asphalt mixtures with reduced production and compaction temperatures (HWMA - Half Warm Mix Asphalt) with foamed bitumen is aimed at obtaining an additional foaming effect of the binder. The paper presents results of investigations on the possibility of producing asphalt concrete for the upper layers of road pavement at reduced technological temperatures utilizing fine wet aggregates and foamed asphalt in opposition to specific patented solutions. This modification of the production process was evaluated in scope of moisture content in the 0/4 mm aggregates in terms of mixture compactibility using the gyratory compactor and the assessment of related physical and mechanical properties of asphalt mixtures. The analysed moisture contents resulted in a final 1% and 3% water contents in the whole mineral mix. In order to assess the effect of the addition of wet aggregates on the properties of the mixture produced at reduced temperature with foamed bitumen, three identical asphalt concrete AC 16 mixtures in terms of composition were used, hot-mix HMA_{REF} and warm-mix WMA_{REF}, with differences only in technological temperatures of the mix constituents during their preparation and mix compaction, the form of the binder (liquid in HMA_{REF} mixture, foamed with water in WMA_{REF} mixtures) and half-warm mix $HWMA_w$ with foamed bitumen additionally utilizing a portion of fine wet aggregates in the blends. The conducted studies have shown that the presence of the wet aggregates in mixtures with foamed bitumen had a significant impact on the air void contents in the samples formed in the gyratory compactor. In a mixture with foamed bitumen, produced and compacted at a reduced temperature ($HWMA_w$), an improvement in the compaction in relation to the reference mixture WMA_{REF} was found. Based on the results of indirect tensile strength tests and analysis of the ITSR indices, it was found that the use of wet aggregates had major, significant effects on the mechanical properties of samples subjected to water and frost susceptibility testing. The mixture produced with wet aggregates obtained indices for resistance to moisture and frost damage which were unsatisfying for the upper bituminous pavement courses as for Polish climatic conditions (ITSR<70%). This result was attributed to inadequate aggregate coating and reduced adhesion of the binder. It was stated that mixtures resembling $HWMA_w$, produced with moist or wet aggregates at reduced technological temperatures can be utilized in Polish and similarly harsh climatic conditions in lower pavement structural layers, mainly due to their reduced moisture and frost resistance. The application of the tested mixtures to the upper structural layer would require using special treatments, e.g. chemical additives, in order to improve the adhesion of asphalt to aggregate or raise the technological temperature (as for WMA blends) to increase the dynamics of water evaporation from damp aggregates.

Corresponding Author: Piotr Ramiączek

NEW PROTECTING STRUCTURES ON BUILDINGS OF EXPLOSIVE PRODUCTION

Vycheslav Gorev

Department of Comprehensive Safety for construction of Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia

ABSTRACT

The protective structures must be installed in the enclosing structures of explosive production buildings. Protective structures, when an explosion pressure reaches a certain value, caused by the pressure opening, release a square for the expiration of gases from the volume of the room where the explosion occurs. In the proposed work, new protective structures were considered. The process of opening and movement of the panel with the release of the area for depressurization is studied in the process of explosion development. The movement of the panel begins with the destruction of its attachment to the building frame. In this paper, the laws of change in the pressure of the explosion were considered, taking into account the inertia of the movement of the panel.

RESEARCH TO EVALUATE THE EFFECTIVENESS OF THE DIAMOND DISC FOR GRINDING THE GRANITE SURFACE

Marlena Rajczyk, Paweł Rajczyk

Czestochowa University of Technology, Poland

ABSTRACT

The material and geometric design of the diamond disc for grinding granite surfaces is in the aspect of increased global demand for the use of granite slabs for construction industry an important and economically justified task in the development of innovative technologies for surface treatment of building materials. The task undertaken to increase the quality and efficiency of machining processes by increasing the quality parameters of the finishing discs consists in evaluating the geometry of the abrasive segments and a group of materials for making flexible diamond discs formed on synthetic binders. Polyurethane resins modified with copper powders and quartz flour were selected for making the shields. The discs used synthetic MBD diamond powder with a grain size of 40/45 # and a concentration of 25%. In the analysis of structural solutions, the average geometric efficiency index of the active surface of the grinding discs with a diameter of 100 mm was determined, with a kinematic load of n = 366 ÷ 960 rpm, moving with a progressive speed of 0.02 m / s and results of pilot abrasion tests made on experimental samples of circular diamond segments operating at kinematic load n = 660 rpm and pressure on the surface of the 40 N disc.

Corresponding Author: Marlena Rajczyk

INFLUENCE OF AMOUNT OF CALCAREOUS FLY ASH ON HEAT OF HYDRATION OF PORTLAND CEMENT

Jacek Gołaszewski, Zbigniew Giergiczny, Patrycja Miera

Silesian University of Technology, ul. Akademicka 5, 44-100 Gliwice, Poland.

ABSTRACT

For the reason a common strategy to reduce the emitted CO_2 the clinker in the cement is oft replace by supplementary cementitious materials, like blast furnace slag or fly ash. Therefore, it is important to investigate the influence of these materials to the hydration in blended cements. This study is dedicated to the contribution of a calcareous fly ash to the hydration of a blended cement. To assess this contribution five calcareous fly ashes were chosen. The hydration of samples of Portland cement and Portland cement with 10% mass of cement (mc), 20% mc and 30% mc of calcareous fly ash was investigated by means of isothermal heat flow calorimetry. Calorimetric investigations were carried out with a TAM Air heat-flow calorimeter. Tests were conducted in 20°C. Water-binder ratio of cement pastes for hydration heat examinations was equal 0,5. Research had shown that the addition of calcareous fly ash showed a retardation of the hydration reactions and increasing the initial heat period. The induction period of samples of Portland cement with 10%, 20% and 30% mc of calcareous fly ash is retarded compared to the samples of Portland cement. There is no difference in the cumulative heat normalized to the amount of Portland cement with 10% mc of calcareous fly ash compared to the Portland cement after 72 h. When amount of calcareous flay ash increases above 10% mc the cumulative heat is lower.

Corresponding Author: Patrycja Miera

FROST RESISTANCE OF CONCRETES FROM INNOVATIVE AIR-ENTRAINING CEMENTS

Patrycja Miera, Beata Łaźniewska-Piekarczyk

Silesian University of Technology, ul. Akademicka 5, 44-100 Gliwice, Poland.

ABSTRACT

The results of concrete tests on cements with mineral additives indicate that, despite better tightness and higher strength, there are problems with frost resistance of non-aerated concretes, even under conditions of moderate exposure to frost. In order to minimize problems with obtaining frost-resistant concrete, an attempt was made to create air-entraining cement. In this paper are presented frost resistance of concrete with air-entraining cement. The researches were carried for concretes made of multicomponent Portland, metallurgical and multi-component cements additionally differentiated by the type of air-entraining admixture (synthetic and natural) and the method of cement preparation (cement mixed together, common ground cement). There were tested internal frost resistance of concrete and a salt frost scaling of concrete. The study have demonstrated that most of the concrete made with air-entraining cement met the condition of frost resistance.

Corresponding Author: Patrycja Miera

INFLUENCE OF POWDERED CERAMIC, AGLOPORITE AND FIRECLAY ON CHOOSEN PROPERTIES OF MORTARS

Patrycja Miera, Jan Rubin

Silesian University of Technology, ul. Akademicka 5, 44-100 Gliwice, Poland.

ABSTRACT

One of the most successful ways to reduce CO2 emissions associated with cement production has been the increased use of cementitious supplementary materials (SCM), such as granulated blast-furnace slag, fly ash and limestone. In order to use waste generated in construction and reduce CO2 emissions, the aim of this article is to examine the impact of powdered waste on mortar properties. The researches were carried for mortars made of Portland cement with 10% mass of cement (mc) of powdered waste. There were used powder ceramic, powder agloporite and powder fireclay. Among the studied properties were compressive strength, tensile strength, plastic shrinkage and heat of hydration. The tests showed that the mortar with powdered fireclay developed the lowest compressive and tensile strength after seven days of hardening among the tested samples. However, mortar from powdered agloporite is characterized by a lower plastic shrinkage.There is no important difference in the heat of hydration of tested pastes.

Corresponding Author: Patrycja Miera

DYNAMIC EFFECTS AT INTERNAL DEFLAGRATION EXPLOSIONS

Dmitry A. Korolchenko, A.A. Evich, Y.X. Polandov

National Research Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow 129337, Russia

ABSTRACT

The effects of quick pressure balance during deflagration explosions in the test chambers are considered. The experimental records of pressure time dependence obtained from various tests, as well as the results of the explosive combustion numeral modelling have been analysed. The load levels of the explosion-affected structure and equipment elements due to the impulse and vibration actions formed during deflagration in the combustible gas have been assessed. It was demonstrated that the explosive actions formed during deflagration in the combustible gas in field could lead to dangerous loading of the critical equipment elements - sensors, instruments, electronic boards, etc., including the fire system elements of buildings and constructions, sea platforms, vessels and ships, as well as other sophisticated civil and military facilities. The experimental development programs for security systems of such facilities should include deflagration explosion testing with low prime cost and short periods of execution. Such testing cannot be replaced with the development on vibration and shock tables due to specific nature of loading during deflagration emergency explosions.

Corresponding Author: Dmitry Korolchenko

INVESTIGATION OF THE FIRE RESISTANCE OF PANELS OF POROUS PAPERCRETE, CONTAINING EXPANDED POLYSTYRENE GRAVEL

V.M. Cherkina, Dmitry A. Korolchenko

National Research Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow 129337, Russia

ABSTRACT

Papercrete panels are used in low-rise and individual construction intensively with each year. This article is devoted to the study of fire resistance of fragments of wall panels, which made of porous papercrete on wood shreds and containing expanded polystyrene gravel. While maintaining the compressive strength, partial replacement of the crushed stone with polystyrene gravel allowed to reduce the humidity, reduce the average density and increase the thermal resistance of the products. In order to determine the time to the onset of the limiting state of fire resistance of papercrete panels with a modified composition, fire tests were conducted. In the process of fire exposure in the heating zone of the sample, polystyrene was smelted from the volume of papercrete with the formation of voids and microcracks. The results of the study under the effect of fire on the “standard fire” mode for 3.75 hours and 2.5 hours on samples of fragments of wall panels made of porous papercrete containing expanded polystyrene gravel showed that none of the two limiting states was reached. There is a possibility of practical application of the obtained scientific results in questions of increasing the operational reliability of low-rise construction.

Corresponding Author: Dmitry Korolchenko

LOADS IN ROPE ACCESS SYSTEM WHEN WORKING AT HEIGHTS

Dmitry A. Korolchenko, Nam Thanh Pham

National Research Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow 129337, Russia

ABSTRACT

The statistics of injuries in Russian Federation put accidents in heightworks in the first place. Heightworks using rope access (RA) are considered. The purpose of this study was to determine the safety margin of RA anchors when used by specialists for increasing the safety of heightworks. The values of peak loads arising in the anchor during ascending using the two rope clamps technique and when descending using descender are determined. The empirical results of loads in the RA are presented to increase the competence of safety specialists when working at heights. The results showed that the loads in the RA can reach up to 544% of the load created by a specialist in a static position. The loads upon the point exceeded the worker's weight by 5.44 times due to the dynamic nature of the impact of the displacement technique. The values of peak forces at anchor points obtained when performing work using RA should be taken into account by high rise work safety specialists, when drawing up work and rescue plans, planning the method of performing work in rope access systems.

Corresponding Author: Dmitry Korolchenko

MODIFICATION OF THE STRUCTURE AND PROPERTIES OF FINE-GRAINED CONCRETE WITH CARBON BLACK DISPERSION

Grigory Ivanovich Yakovlev[1], Valery Pavlovich Grakhov[1], Rostislav Drochytka [2], Anastasia Fedorovna Gordina[1], Svetlana Vladimirovna Nikitin[3], Ekaterina Vyacheslavovna Begunova[1], Alexander Fedorovich Buriyanov[4], Alexander Anatolievich Repin[1]

[1] Izhev State Technical University named after M.T. Kalashnikov (426000, Izhevsk, Student st., 7), Russia

[2] Technical University of Brno, (Veveri 331/95, 602 00 Brno-střed-Veveri,, Czech Republic

[3] LLC “New House”, TM “Pallzh”, (426053, Udmurtia, Izhevsk, Salyutovskaya St., 31), Russia

[4] National Research Moscow State University of Civil Engineering (129337, Moscow, Russia

ABSTRACT

The study shows that adding carbon black (soot) in the form of an aqueous dispersion into the composition of fine-grained concrete leads to an increase in bending and compressive strength of the samples: at a soot concentration of 0.005% by weight of cement, respectively, to 37.63 and 15.99%, at a concentration of 0.02% up to 26.39 and 26.39% due to compaction of the structure of the cement matrix. An intensification of cement hydration processes has been noted, confirmed by the results of IR-spectral, differential-thermal analyses and studies of the cement matrix microstructure in the composition of fine-grained concrete. On the surface of new formations in the composition of modified soot dispersion, the formation of needle-like crystals has been observed. On their surfaces, structures of spherulites formed with sizes ranging from 100 to 200 nm, which are typical for calcium hydrosulfonic aluminates of $3CaO \cdot Al_2O_3 \cdot 3CaSO_4 \cdot 32H_2O$ type. The formation of spherulites is observed in the pores of the cement matrix, which contributes to additional compaction of the structure of fine-grained concrete. It has been stated that in terms of the degree of modification of the structure of the cement matrix, soot dispersion is comparable to carbon nanotube dispersions, while the cost of soot dispersion is significantly lower than similar carbon nanostructures.

Corresponding Author: Ekaterina Vyacheslavovna Begunova

LIFE CYCLE ASSESSMENT OF WARM MIX ASPHALT WITH RECYCLED CONCRETE AGGREGATE

Daniela L. Vega A. [1], Gilberto Martínez A. [2], João M. O. dos Santos [3]

[1, 2] Department of Civil Engineering – Universidad del Norte, Colombia.
[3] Department of Construction Management and Engineering (CME), University of Twente, The Netherlands

ABSTRACT

Life-cycle assessment (LCA) is a systematic methodology used to assess the potential environmental impacts associated with all the stages of a product or system. Generally, the LCA is performed for all stages of the evaluated product; nevertheless, based on the goal and scope of an LCA study, several phases may be considered, whereas others may be excluded. In this study, an LCA was conducted to evaluate the potential environmental benefits related to the use of recycled concrete aggregates (RCA) as a partial replacement of natural aggregates in the production of Warm Mix Asphalt (WMA). In order to estimate the potential environmental impacts associated with the use of these alternative resources in the construction and rehabilitation of road pavements in Barranquilla, Colombia, primary data were collected in some companies in the region. The SimaPro 8.4.0 software was used for modelling the processes analysed in the case study and all the life cycle inputs and outputs related to the functional unit were characterized during life cycle impact assessment (LCIA) phase into potential impacts according to the impact assessment methodology TRACI v.2.1. The pavement life cycle phases and processes included within the system boundaries were the following: (1) extraction and processing of natural and recycled aggregates and production of asphalt binder, (2) transportation of materials, and (3) production of the asphalt mixtures. Three percentages of RCA replacements were analyzed:15, 30 and 45%. By comparing both asphalt mixtures with different RCA replacements levels, it was shown that RCA use implies an increase in the optimal asphalt content, which in turn, originates higher potential environmental impacts than those stemming from conventional mixtures.

Corresponding Author: Daniela L. Vega A.

POSSIBILITIES OF ENERGY EFFICIENCY EXPERIMENTAL RESEARCH USING MLBE BUILDING'S AUTOMATION AND CONTROL SYSTEM

Anna Romańska-Zapała [1], Marcin Furtak [2], Małgorzata Fedorczak-Cisak [2], Mirosław Dechnik [2, 3], Karina Grzywocz [1]

[1] Cracow University of Technology, Faculty of Electrical and Computer Engineering, Warszawska 24, 31-155 Kraków, Poland
[2] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Kraków, Poland
[3] AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Biomedical Engineering, Mickiewicza 30, 30-059 Kraków, Poland

ABSTRACT

Due to the increasing requirements in the field of buildings' energy saving, impossible to meet only due to the thermal insulation of the building envelope, it is necessary to pay attention to the energy efficiency of technical installations and application of automatic control systems. Computer simulations on the building structure or functioning of its individual installations in the context of limiting its energy consumption, performed by Design Builder – type computer programs, are a very useful tool. However, in the case of simulation studies on the impact of automatic control systems on energy efficiency, the results are often overly optimistic – they are overestimated in comparison to results achieved in actual environments. Therefore the results obtained should be validated in an actual environment. This paper presents the Małopolska Laboratory of Energy Efficient Building (MLBE) of Cracow University of Technology, which provides an opportunity to perform experimental actual scale research of building automation systems to improve buildings energy efficiency and occupants' comfort. This paper includes a detailed description of MLBE's building automation and control system. Furthermore, this paper presents possibilities and an example methodology of energy efficiency's experimental study using BACS system.

Corresponding Author: Anna Romańska-Zapała

EFFECT OF POFA FOAMED CONCRETE BLOCK ON INDOOR AIR TEMPERATURES

Hanizam Awang, Wenny Arminda

School of Housing, Building and Planning, University Sains Malaysia, 11800, Penang, Malaysia

ABSTRACT

Palm oil fuel ash (POFA) is a by-product produced from the combustion of biomass, including palm oil fibre and kernel shell; it is commonly used as an alternative fuel to generate electricity in palm oil mills. The disposal of this ash around the mill is usually uncontrolled, causing environmental problems. To reduce the ash's negative impact on the environment, several studies have sought to incorporate this waste into the production of concrete, mortar and paste. Incorporation of POFA can enhance the mechanical, material and thermal properties of foamed concrete. This study examines the effect of replacing cement with POFA in a lightweight foamed concrete mix with a density of 900 kg/m^3 and cement-to-sand ratio of 1:1.5 on indoor air temperatures. The POFA foamed concrete was cast to produce blocks measuring 100 mm × 200 mm × 500 mm. A single-storey building with a floor area of 20 m^2 and height of 3 m was built and tested, and an actual test of indoor and outdoor temperatures was conducted. Comparison of actual and simulated data using simulation software showed that the indoor air temperature of the POFA foamed concrete block is lower than the outdoor air temperature. Using POFA foamed concrete blocks as a wall material decreased the indoor air temperature by up to 5.69 °C. The average indoor air temperature of a building with POFA foamed concrete blocks was 29.11 °C, which is close to that of a building with clay brick (29.12 °C). These temperatures are lower than those of buildings with normal concrete walls.

Corresponding Author: Hanizam Awang

FIRE EXTINGUISHING EFFICIENCY OF HYDROCARBON AND FLUORINATED FILM-FORMING FOAMING AGENT

Artem Melnikov, Nikolay Vlasov

Moscow State University of Civil Engineering, Yaroslavskoe shosse 26, Moscow, 129337, Russia

ABSTRACT

This article analyzes the fire extinguishing efficiency of hydrocarbon and fluorinated film-forming foaming agent. It was revealed that fluorinated blowing agents have a number of significant advantages over hydrocarbon. The main ones are: ensuring inertness when feeding from foam of various heights and distances, long-term prevention of re-ignition, extinguished petroleum product, the possibility of extinguishing hydrocarbon flames by supplying foam to the base of the tank, directly into the fuel layer

Corresponding Author: Artem Melnikov

FIRE EXTINGUISHING IN WITH POLYDISPERSE FOAM OF HIGH MULTIPLICITY

Artem Melnikov, Nikolay Vlasov

Moscow State University of Civil Engineering, Yaroslavskoe shosse 26, Moscow, 129337, Russia

ABSTRACT

Risk of fire and smoke dangers are greater in high-rise rather than low-rise buildings. Use of high expansion foam delivered through elevator shafts can prevent or reduce smoke and fire damage and injury in high-rise buildings. Injection of foam with high multiplicity due to structural rigidity can accumulate between floors of buildings to prevent the spread of flame and smoke. Reaching an area of high-intensity flame, this foam is destroyed, resulting in the absorption of energy from the upward flow of products of combustion.

Corresponding Author: Artem Melnikov

INVESTIGATION OF CONCRETE ELEMENTS BENDING STRENGTH REINFORCED BY POLYETHYLENE TEREPHTHALATE WASTE

Roman Kinasz [1], Vitaliy Bilozir [2], Roman Shmyh [2], Volodymyr Bilozir [2], Ivanna Bidenko [2]

[1] AGH University of Science and Technology, Faculty of Mining and Geoengineering, al. Mickiewicza 30, 30-059 Krakow, Poland

[2] Department of Building Structures, Lviv National Agrarian University, V. Velikogo 1, 80381 Dublyany, Ukraine

ABSTRACT

Ukrainian enterprises of polyethylene terephthalate (PET) waste recycling are still capable of processing only 1 thousand tons, and more than 10 thousand tons of PET granulate are imported to Ukraine every month. Therefore, the issue of reuse and disposal of used polyethylene terephthalate, especially in construction, is one of paramount importance. The aim of the research is experimental-theoretical study of the strength of bending of prisms, reinforced with fibers and strip reinforcement of used PET bottles. Objectives of the research: the study of the percentage of reinforcing fibers in volume (1% and 1.5%) influence on the flexural strength of concrete reinforced prisms, and the possibility of using ribbon reinforcement from used PET bottles for bending concrete elements, elaboration of proposals for the deformation method of calculation of PET fibrobone bent elements. In this research the experimental methods for determining the bending strength of prisms, reinforced by fibrous, trips and PET waste tapes; methods of materials resistance theory have been used. During the research, two concrete prisms of 400x100x10 mm were constructed and tested for compression together with two concrete prisms of three-point bend for a run of 350 mm, two PET-fibrous concrete prisms for bending with percentages of reinforcement in volume of 1% and 1,5% and two prisms for bending, reinforced with glued PET strips, with 1% reinforcement per section area. As a disperse reinforcement, pre-fabricated PET bottles of 50x3x0.2 mm were used, designed in way that the required length of sealing in the concrete is no longer than half the length of the fibers. Strip fittings are made of 4 fragments of PET bottles of 200x80x0.25 mm in size, glued with cyanacrylate adhesive with each other, and 2 fragments of 120x80x0.2 mm in size, which glued on both ends to 4 glued sheets with a length of 30 mm. Thus, the total length of the reinforcing strip is equal to 380 mm. At the final sections of the tapes, 6 openings with a diameter of 5 mm were punched to improve the anchoring. The reinforcing strips were placed in the forms located 10 mm from the lower edge. According to the results of the tests, the average cubic strength of concrete is 31.21 MPa, of prisms - 23.23 MPa, the initial module of deformation - 28.02 103 MPa. The flexural strength of prisms without a fibre is 58.54 kN cm, with 1% fibers in volume - 64.31 kN cm, with 1.5% fibers in volume - 71.84 kN cm, and of prisms, reinforced with glued PET ribbons - 79,80 kN cm. As a result of the tests, it was demonstrated that the strength of the tapes was not used properly, and the fracture was fragile due to the loss of adhesion to concrete. Analysis of the results of experimental studies allowed us to develop a deformation methodology of calculating PET-fiber-concrete bending elements.

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Corresponding Author: Roman Kinasz

Session Title:

Geotechnics

ANALYSIS OF DISPLACEMENTS AND HORIZONTAL LOAD CAPACITY OF FOUNDATION PILES – ROAD ACOUSTICAL BARRIERS

Piotr Gąska [1], Agnieszka Pękala [2]

[1] Rzeszow University of Technology, Department of Geodesy and Geotechnics, ul.Poznanska 2, 35-959 Rzeszów, Poland
[2] Rzeszow University of Technology, Department of Environmental Engineering and Chemistry, al. Powstanców Warszawy 6, 35-959 Rzeszów, Poland

ABSTRACT

The main objective of the study is the analysis of horizontal displacements of foundation pile heads used in the design of road barriers limiting harmful noise emissions. As part of the work, there were determined extreme values of the horizontal load capacity of piles, extreme values of horizontal displacement of the pile heads and displacement values for forcing horizontal test impacts. The values of horizontal displacements of the pile heads obtained in the field tests for the first stage of forcing impact were lesser (ranging from 0 to 56%) than the values determined by the analytical method. For the other three stages of forcing impacts the horizontal displacement of the pile heads from field tests were similar or higher (ranging from 100 to 208%) than analytical values for the first geotechnical zone and were much higher (between 1200 and 2250%) than analytical values for the second geotechnical zone. According to analytical calculations, the displacements of the pile heads for design useful interactions of noise barriers is from 11% to 12% displacement of heads in the limit state of the horizontal load capacity. The calculation impact of the acoustical barriers on the pile heads is from 1.2% to 1.4% of the extreme horizontal load capacity of piles. The research results obtained in field tests show that both horizontal displacement of pile heads from field tests and displacement values obtained as a result of the analytical calculations are considerably smaller than displacements in the extreme state of side load capacity of piles as well as the permissible value (10 mm).

Corresponding Author: Agnieszka Pękala

UNDERGROUND STRUCTURES ENDANGERED BY EXPLOSION

Petr Prochazka, Dagmar Jandekova, Martin Valek

Czech Technical University in Prague, Civil Engineering, dept Mechanics, Thakurova 7, 166 29 Prague 6, Czech Republic

ABSTRACT

Today's world has a very urbanized structure - more than half the population of 6.8 billion people lives in cities and underground spaces are one of the most prerogative zones for cities of modern civilization. Together with the urbanization, underground spaces have grown along with the risk of terrorism and its organization. Therefore, it is very important to predict the dynamic impacts of explosives in underground spaces and the waves should be additionally transformed into a loading of solid structures. In this paper, the impact of explosions and air shock waves is formulated and solved. The location of the centre of explosion is very relevant. It appears that if the location is at the solid surface, this part can be up to 30% of the total energy (in soft solids). The variables to be calculated are the mass density of gas, the velocity of movements and the internal energy. The latter covers the influence of the gas pressure, being given for the adiabatic state. The air is linearly related to the internal energy of a unit mass of the gas, as is the density, while in the neighbourhood of the source of explosion, the pressure changes nonlinearly with respect to the gas density.

Corresponding Author: Petr Prochazka

NONLINEAR BEHAVIOR OF REINFORCED CONCRETE CIRCULAR TUNNEL UNDER SEISMIC MOTIONS IN CLAYEY SOIL

Ashraf Hamad[1], Ahmed Zidan [1], Akl Adel [2]

[1] Department of Civil Engineering, Faculty of Engineering, Beni-Suef University, Salah Salem Street 62511Beni-Suef, Egypt

[2] Structural Engineering Department, Faculty of Engineering, Cairo University, Giza, Egypt

ABSTRACT

In this paper, nonlinear response of reinforced concrete circular tunnels subjected to seismic loads in clayey soil is presented. A series of two dimensional finite element models were adopted to investigate dynamic behavior of tunnel soil system. The influence of several parameters including ground motion intensity, soil type, tunnel depth and tunnel diameter on the tunnel response was computed. Firstly, 1D equivalent-linear viscoelastic analysis was conducted in the frequency domain to evaluate the profile of Rayleigh damping coefficients. Hence, these profiles were used in order to simulate the 2D fully coupled finite element adopting visco-elasto-plastic effective stress models for the soil. The dynamic behavior of tunnel was presented in terms of internal forces induced in tunnel lining. The analyses indicated that in case of the stiff clay, the results of closed form solution were close enough to the 2D analysis and the earthquake effects are considerable when the tunnel is close to the bed rock. In case of medium clay deposits, the effects vary according to the tunnel dimensions. Furthermore, Soft clay soil yielded when it exposed to earthquakes of greater than 0.5g magnitude. Earthquakes of 0.25g magnitude have a slight effect on the circular tunnels located at any depth in clayey deposit, but if another time domains are used with the same beak ground acceleration value, different effects might appear.

Corresponding Author: Ahmed Zidan

GEOENVIRONMENTAL STUDY OF GROUNDWATER IN THE FUNDÃO ZONE - PORTUGAL

Paulo Eduardo Maia Carvalho, José Luis Andrade Pais, Luís Manuel Ferreira Gomes

Universidade da Beira Interior, Covilhã, Portugal

ABSTRACT

The area of implementation of the Cova da Beira's irrigation system, due to its geographical situation and its sustainable socio-economic development requires the execution of geo-environmental studies, focusing on the behaviour of a set of variables with important ecological significance. This study is aimed to characterize the distribution patterns of variables in groundwater samples and their characterization in terms of chemical quality. Hence, on a primary stage, an exploratory data analysis was performed in order to characterize the overall sample, followed by a stage in which a multivariate analysis was carried out through a dimensionality reduction technique (analysis of main components). During the final phase, we proceeded with the chemical quality characterization of groundwater in regard to its agricultural use. The study of the dynamics of natural processes, anthropic and its influence on the dispersion, fixation and (re)mobilization of chemical elements, has contributed decisively to the optimization of the diagnostic strategy and the environmental management as well.

Corresponding Author: Paulo Carvalho

LABORATORY EXPERIMENT OF VERTICAL DISPLACEMENT MEASUREMENT OF SOIL NEAR AN AXIALLY LOADED PILE

Krzysztof Żarkiewicz

Department of Geotechnical Engineering, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology Szczecin, al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

The paper presents the results of static pile load test in laboratory conditions with additional measurement of vertical displacement of soil surrounding the shallow embedded pile. The main purpose of research to determine the pattern of soil displacement due to axial load of the pile. Although, the dimensions of pile are strongly differing from field pile used in practice, there are some phenomena which are similar to natural conditions. Tests were performed on a small precast concrete pile which was 7 cm in diameter and 25 cm long embedded in cohesionless soil. The measurements of the study were: applied load, resistance under the toe of the pile, settlement of the pile and vertical displacement of chosen points in the soil near to the toe of the pile. Performed test indicated that in small load the displacement in soil increase due to increasing load, but when the load was approaching the value of ultimate load, displacement stopped and at the limit load the direction of displacement vector changed to upward. The shape of the shear failure mechanism took the form of a logarithmic spiral which was widely described in literature. In this study an attempt at mathematical description has been made. In the proposed approach it was assumed that the displacement of the pile influenced the change of the sphere volume under the pile base which affects the displacement of the selected points of the soil. The research allowed to determine the size of ground space which was affected by the studied pile. The other studies indicate that the failure mechanism in deep piles and poorly compacted soils is caused by punching shear failure when only soil displacement down occurs, but in very compacted sands the mechanism of failure would be similar to obtained in laboratory test.

HYDROPEDOLOGICAL DATA NECESSARY FOR COMPUTING DRAIN SPACINGS IN A GLEYSOL

Adia Grozav, Gheorghe Rogobete

Polytechnic University Timisoara, Hydrotechnical Engineering Department, George Enescu 1A, Romania

ABSTRACT

Gleysols comprise soils saturated with groundwater for long enough periods to develop reducing conditions resulting in gleyic properties. Gleysols occupy more than 720 million ha worldwide, on low positions in landscapes with high groundwater table. Evidence of reduction processes with segregation of Fe compounds starting in the first 40 cm of the soil surface. For many glaysols the main obstacle to utilization is the necessity to install a drainage system to lower the groundwater table. With a particle – size distribution clayey – loamy (44.8-42.9% clay), a great bulk density (1.50-1.57g/cm^3), and SAR 12.5, these soils have a poorly natural drainage, from which water is removed very slowly. The volume of all pores, namely porosity, is very small in the second horizon, 38.3%. The primary function of a drainage equation is the computation of drain spacings for drainage design. An analysis reveals the influence of the various factors, as permeability, thickness of the soil layers, depth of drains, discharge rate in surface, effective porosity, drainage intensity etc; namely geohydrological investigations. In order to determine the drain spacing on the Gleysols we have used a similar method with the auger-hole method (1970, van Beers) but with 4 holes. The water was removing from the central auger-hole with a bailer, the time interval was 20 minutes. The analytical data of measurements are in the tables 2 and 3. Knowing the pumped and extracted water volumes from central auger hole which has perforated tube, we have obtained the final values of effective (or drained) porosity (0.0197-0.0208). for the drain space calculation, we recommend to use 0.0208, the finally value.

Corresponding Author: Adia Grozav

THE EFFECT OF RECOGNITION OF GROUND COUNDITIONS ON EXPRESSWAY EMBANKMENT FOUNDATION

Stanislaw Majer

West Pomeranian University of Technology in Szczecin, Poland

ABSTRACT

Proper identification of ground conditions is one of the most important stages of preparing building documentation. This stage becomes even more important when there are organic soils in the building site. The article discusses on the basis of a case study of the foundation change of the embankments of an expressway on the ground in which there were organic soils of considerable thickness. This investment was carried out in the "Design and Build" way. Therefore, the materials made available by the Investor at the stage of preparing the offer determined the method of strengthening the weak substrate by the Contractor. Since the basic criterion for selecting the offer to complete the investment was the price, the choice of the reinforcement method had an impact on the overall cost of execution. This problem concerned about 730 m of an expressway passing through the valley. The height of the embankments was from 3 to 5.5 m, the area of the embankment's base was about 26 500m2 and the average depth of occurrence of weak soils was 10m. The situation was additionally complicated by the bridge object located indirectly by means of prefabricated piles in the middle of the analyzed section. In the described case, the depth of occurrence of the support substrate was determined correctly, inaccuracies occurred when determining the type of organic soils and, above all, determining their state and shear strength. An additional wide range of field and laboratory tests performed during the implementation of the project, commissioned by both the contractor and the contracting party, has changed the method of foundation. The original CMC displacement columns with a diameter of 40 cm in a triangular spacing with a length of over 90,000m have been changed to prefabricated reinforced concrete piles with a 40 x 40 cm cross-section in a square spacing with a total length of more than 57,000m. However, the crowning of the columns - the transmission layer of aggregate and geosynthetics was replaced with a reinforced concrete slab of C30 / 37 concrete 30cm thick.

Corresponding Author: Stanislaw Majer

THE INFLUENCE OF NANOSILICA ON UNCONFINED COMPRESSIVE STRENGTH OF FROST-SUSCEPTIBLE SOIL

Zofia Zięba, Daniel Garlikowski, Jakub Mońka

Wrocław University of Environmental and Life Sciences, Institute of Building Engineering, pl. Grunwaldzki 24, 50-363 Wrocław, Poland

ABSTRACT

In engineering practice there are numerous methods to improve the mechanical properties of subsoil. The paper presents the analysis of changes in the unconfined compressive strength of frost-susceptible soils stabilised with nanosilica (NS). Tests were conducted on samples of fine-grained soil at the maximum dry density (MDD) and optimum moisture content (OMC). Four variants of samples were prepared: soil without additive, soil with 1% NS, soil with 3% NS and soil with 5% NS. Due to the frost-susceptible character of the soil, tests were conducted on non-frozen samples and on samples subjected to ten cycles of freezing and thawing. Cyclic freezing and thawing of soil mixtures allowed for determination of the additive effectiveness in the temperature conditions encountered during the winter season. Based on the research results of unfrozen samples, it was determined that the addition of nanosilica leads to the increase in their unconfined compressive strength. On the other hand, the strength of pure soil samples after ten cycles of freezing and thawing decreased. This is a commonly known trend that results from the soil and soil mixtures freezing. However, in the same conditions, the unconfined compressive strength of samples stabilised with nanosilica demonstrated a significant increase with the increase of the additive content. The highest values were noted for samples stabilised with 5% addition of nanosilica. In order to explain the obtained results, further tests are required. However, the preliminary research has shown the effectiveness of nanosilica as an independent additive stabilising frost-susceptible soils, although it is not commonly used in engineering practice.

Corresponding Author: Zofia Zięba

MODAL ANALYSIS OF SELECTED MEASURING BASES AND THEIR IMPACT ON THE RECORDED LEVEL OF SURFACE GROUND ACCELERATIONS

Krzysztof Czech [1], Adam Tkaczuk [2]

[1] Bialystok University of Technology, 15-351 Bialystok, ul. Wiejska 45A, Poland
[2] Poland, 15-008 Bialystok, ul. Ryska 3A/45, Poland

ABSTRACT

In predicting the impact of vibrations propagated in a ground on newly designed construction objects, it is extremely important to reliably measure the time histories of velocity or acceleration at the site of the planned investment. As some studies show, the method of coupling accelerometers and geophones to the ground can affect not only the level of Peak Particle Accelerations (PPA) or Peak Particle Velocities (PPV) - commonly used in this type of evaluations, but also vibration frequency distribution of recorded signals. This makes it difficult to compare and analyse the results obtained by various research teams. Conclusions based on this type of comparison may be wrong. For this reason, it is extremely important that reliable dynamic measurements related to the propagation of ground surface vibrations should be carried out using not only appropriately selected measuring equipment (with the required sensitivity and measurement ranges - both in the time domain and frequency domain), but also the measurement bases used for mounting various types of sensors and transducers, whose natural frequencies will be outside the frequency range relevant to the possible impact of vibrations on buildings and human beings inside. The paper presents the results of modal analyses carried out with the use of ANSYS engineering simulation software (based on the Finite Element Method) for 4 different types of measuring bases used to coupling accelerometers to the ground. For numerical analyses were selected measuring bases in the form of: a stiff steel spike about 50 cm long of an X-shaped cross section (measuring base No. 1 - in accordance to DIN EN 10056-1), steel spikes of identical length and L-shaped cross-sections (base No. 2 - according to DIN EN 10056-1 and No. 3 - in accordance with UNI 5783-66), as well as stiff steel screw with thread on the entire length of 30 cm and diameter of 11 mm (solution No. 4 – permitted by ISO 4866). As a result of the analyses, it was possible to determine the impact of individual methods of coupling of accelerometers to the ground on the reliability of recorded ground surface accelerations.

Corresponding Author: Krzysztof Czech

VARIATIONS OF GROUND TEMPERATURE IN SHALLOW DEPTHS IN THE SILESIAN REGION

Iwona Pokorska-Silva [1], Marta Kadela [2], Lidia Fedorowicz [3]

[1] Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5 Str., 44-100 Gliwice, Poland
[2] Building Research Institute, Filtrowa 1 Str., 00-611 Warszawa, Poland
[3] Katowice School of Technology, Faculty of Architecture, Civil Engineering and Applied Arts, Rolna 43 Str., 40-555 Katowice, Poland

ABSTRACT

Knowledge of temperature distribution in relation to time and depth is necessary in many applications. These include: designing GSHP (ground source heat pump) and EAHE (earth-air heat exchangers) systems, calculating heat loss in buildings, in determining foundation depth for buildings and structures with consideration of frost penetration depth, designing pavement of roads and airports or designing underground systems of energy transmission. Regular measurements and perfecting models describing temperature in the ground is therefore extremely valuable. This article presents authors' own research on ground temperature changes in time and distribution of temperature at different depths, up to c. 2.0 m beneath ground level. The tests were performed in the Silesia region over a period of 6 months between May and October, using thermistors installed in the ground at various depths. The measurements were compared with temperature of the air, measured at test stations using a meteorological multisensor in order to find a correlation. Aside from readings of temperature over time and profiles of ground temperatures the paper contains selected elements of statistical analysis of the measurements. It was noted that the temperature distribution is closely related to depth below ground level, and the influence of outside temperatures decreases with depth.

Corresponding Author: Iwona Pokorska-Silva

BLAST CHARGE TECHNIQUE AS A METHOD OF SOIL IMPROVING TO LOCATE THE NEW SUPPORTED RUNWAYS

Eligiusz Mieloszyk [1], Anita Milewska [1], Mariusz Wyroslak [2]

[1] Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Department of Rail Transportation and Bridges, ul. Narutowicza 11/12, 80-180 Gdansk, Poland
[2] Gdansk University of Technology, Faculty of Civil and Environmental Engineering, Department of Geotechnics, Geology and Marine Civil Engineering, ul. Narutowicza 11/12, 80-180 Gdansk, Poland

ABSTRACT

Nowadays, localisation of airports including airstrips, airfields also runways temporarily explored in crisis circumstances is predicted less and less often in good geotechnical conditions. It is because of lack of geotechnicaly proper places or because of higher necessity. Frequently, the economic practice and human needs force to locate the transport and communication infrastructure into areas with unstable soil conditions like wetlands, organic soils, anthropogenic banks, industrial waste, old garbage dump. It is very important to dispose a method to quick reconstruction or rebuilt the transport infrastructure after unpredicted situations like natural disasters, random catastrophic events, terrorist attacks. From practical point of view creation of widespread net of airstrips placed on hard-to-reach areas or engineering difficult regions appears as an advantage solution. But construction under time pressure requires effective methods of soil improvement like blasting charge technique where explosive materials are used to quickly regenerate soil consolidation. By this method soil under runways, taxiways, junction roads, railways, railway siding can be strengthen. Design and construction of limited certification airports can be a source of innovative solutions in engineering and geotechnics. But the main idea is to improve the availability of communication and increase the quality of mean of transport for local community. It can be great positive impulse for territorial authority, transportation, shipping and logistic companies especially in touristic branches, medical care services, leisure time activity industry.

Corresponding Author: Mariusz Wyroslak

NUMERICAL ANALYSIS OF SETTLEMENT OF A STRUCTURE SITUATED ON A HETEROGENEOUS LOESS SUBSOIL

Krzysztof Nepelski

Lublin University of Technology, Faculty of Civil Engineering and Architecture, Department of Geotechnical Engineering, Nadbystrzycka 40, 20-618 Lublin, Poland

ABSTRACT

The paper presents FEM numerical analyses of interaction of structures situated on loess subsoil. Static CPT tests on loesses from Lublin, Poland, was used in the process of defining subsoil variability. Fifteen of numerical analyses was carried out in order to illustrate the differences that appear in the absence of differentiation of layers in terms of compressibility. The calculations assumed a variant of weak soil under individual foundation footing. The loess subsoil was modelled with a Modified Cam Clay model. All parameters of the model were assumed to be constant, except for the slope of the virgin consolidation line λ corresponding to the primary constrained modulus M. The constrained modulus was calculated on the basis of cone resistance q_c values recorded in CPT static sounding in the Lublin region. It was shown that variable stiffness of loess subsoil causes heterogeneous settlements of the building, which leads to deformations and affects internal forces within the structure. The calculations show that for a thickness of weaker zones up to 4 m and stresses under foundations under 200 kPa on loess soils of “average variability” (differentiation of average q_c for the layer in the range of 5÷8 MPa), there are deformations that may affect the movement of the structure. For these conditions, the designer should determine whether these deformations will be significant for the movement of the structure. In the case of stresses exceeding 200 kPa, above-average variation of loesses and uneven distribution of stresses under foundations, the possibility of exceeding normal displacements or deformations of the structure should be taken into account.

INVESTIGATION OF THE SOIL-GEOSYNTHETIC INTERACTION USING DIRECT SHEAR TESTING AND FEM METHOD

Jozef Vlcek [1], Veronika Valaskova [2]

[1] Department of Geotechnics, Faculty of Civil Engineering, University of Zilina, Univerzitna 8215/1, 010 26 Zilina, Slovakia
[2] Department of Structural Mechanics and Applied Mathematics, Faculty of Civil Engineering, University of Zilina, Univerzitna 8215/1, 010 26 Zilina, Slovakia

ABSTRACT

Verification of the design of the reinforced earth retaining structures is usually based on the global and internal stability check. Beside the analytical solutions, numerical modelling can simulate the real behaviour of the structure including mutual interaction of the particular elements. Additionally, stress-strain relation is involved in the final verification together with the required stability of the system. Parameters such as reinforcement stiffness or interaction ability with the soil allow to calculate more realistic axial forces acting in the reinforcing elements. Analytical solutions don't take into account the influence of the deformation of the soil mass on the overall and internal stability. Finite Element Method can describe both of these mechanisms which take place simultaneously. Estimation of the interaction parameters is crucial to determine the forces with sufficient accuracy, especially when 2nd limit state is critical for the structure design. The paper is aimed at the laboratory testing and numerical modelling of the interaction of the geosynthetic reinforcement and the soil during the sliding described by the interaction coefficient. A direct shear test was adopted to investigate the actual value of the interaction coefficient which is related to the certain displacement of the reinforcement in the soil. There is a recommendation not to use the interface element at the soil-reinforcement contact when the grid shaped reinforcing elements such as geogrids are used for the numerical simulations. This approach was approved by the study presented in this paper. Reinforcement with the grid structure and rigid joints provides higher level of interaction with the soil environment so reduction of the shear strength at this contact is unrealistic.

Corresponding Author: Jozef Vlcek

Session Title:

Hydromechanics

NUMERICAL SIMULATION OF WAVE LOADS ON PERFORATED BREAKWATERS

Sergey Buruchenko

South Ural State University, 76, Lenin Prospect, Chelyabinsk, Russia

ABSTRACT

Smoothed Particle Hydrodynamics (SPH) and Moving Particle Semi-implicit (MPS) are the meshfree Lagrangian particle methods that are widely used recently to solve engineering problems of hydrodynamics. Both methods are well suited for numerical modeling of fluid motion with large changes in its free surface shape. They use a set of lagrangian particles (points) to replace a real continuous medium that contains information about the state of a continuous medium such as pressure, density, velocity, etc. This approach avoids the use of a computational grid and makes it easy to describe large fluid deformations. In this work, a series of numerical experiments on the simulation of the impact of a liquid wave on a perforated breakwater has been carried out. The DualSPHysics SPH code was used as a tool for numerical simulation. The results obtained in the approximation of a weakly compressible fluid are compared with the previously obtained results on the MPS method. The maximum values of the integral forces acting on the protective device obtained by different methods have a good quantitative match.

Corresponding Author: Sergey Buruchenko

SIMULATION OF HEAT LOSSES OF A DISTRIBUTION NETWORK WITH DIFFERENT TECHNICAL STRUCTURE AND UNDER DIFFERENT OPERATING CONDITIONS FOR A DISTRICT HEATING AND COOLING SYSTEM

Ryszard Zwierzchowski, Olgierd Niemyjski

Department of Heating and Gas Engineering, Faculty of Building Services, Hydro and Environmental Engineering, Warsaw University of Technology, Nowowiejska Str.20, 00-653 Warsaw, Poland

ABSTRACT

The paper presents simulation of heat losses of a distribution network with different technical structure and under different operating conditions for a District Heating and Cooling (DHC) system. The DHC system consists of a Combined Heat and Power (CHP) plant and a Distribution Network (DN) with chambers and heat and cold substations. The different operating conditions of the DHC systems result in the DNs having variable transportation losses. The result of the analysis was used to verify the models and calculation methods of fluid flow and heat losses in the DN, when cold is generated using either absorption or adsorption chillers. Different technical structure of a DN means system of connected underground and aboveground piping with different diameters. DNs in Poland are usually installed as underground, traditionally insulated piping placed in concrete ducts (large diameter main pipelines) or pre-insulated piping placed directly in the ground. The total heat losses of the DN differ according to individual systems and depend on the size of the DHC system, its heating loads and quality of insulation of the piping. This paper presents the results of the numerical calculation of the temperature distribution in the soil around the piping channel using an FDA model. These results were utilized for numerical simulation of water and heat flow through the DN and calculation of heat transportation losses. The numerical simulation of heat losses was performed for the particular system of connected underground and aboveground piping with different diameters. Finally, heat transportation losses of the DN were calculated and compared for analyzed District Heating (DH) system i.e. without cold consumers and for the DHC system, when cold for consumers is generated using either absorption or adsorption chillers.

Corresponding Author: Ryszard Zwierzchowski

METHOD OF IMPROVEMENT OF OPERATIONAL AND TECHNICAL CONDITIONS OF A LARGE COOLING WATER SYSTEM

Ryszard Zwierzchowski, Michał Pachocki

Department of Heating and Gas Engineering, Faculty of Building Services, Hydro and Environmental Engineering, Warsaw University of Technology, Nowowiejska Str.20, 00-653 Warsaw, Poland

ABSTRACT

Increasing the energy efficiency of industrial installations is one of the European Union's priorities for achieving energy policy goals. These goals can be achieved, among others by applying the appropriate methodology for modernization of cooling water distribution pipelines and improving their operation. Water distribution in cooling systems of large industrial installations is associated with significant hydraulic losses due to large flows and spatial spread of these systems. The losses are unavoidable and have a decisive impact on the energy consumption for pumping. Thanks to optimal design solutions, implementation of the repair program and proper operation of cooling water transmission pipelines, it is possible to significantly reduce hydraulic losses and water leakage. This will translate into reduced energy consumption for pumping and, as a result, improved energy efficiency. In the case of existing installations, the system should also be adapted to the required flows. In old plants, these flows may differ significantly from the flows for which the pipelines were originally designed. Abovementioned goals can be achieved by replacing or renovating pipelines. This paper deals with determination of a method and schedule of modernization of cooling water piping systems on the basis of a case study – a large industrial plant. Firstly, evaluation of the existing condition is carried out. Data on flow rate and cooling water pressure in the system is collected and analyzed. A graphical and numerical database of the cooling water system is made, which maps the system in terms of system geometry (lengths, pipe diameters, ordinates) and flow and pressure streams. The hydraulic losses of the cooling water system are simulated. The results of simulation calculations of pressure losses in water distribution system are presented in the form of maps of water pressure distribution in pipelines. Calculations for the pipeline network are performed in the current state for two hydraulic load cases: maximum and average. An assessment of the failure rate is made on the basis of information about the place, time, cause and type of damage. Wall thickness of pipelines in selected locations is measured and samples are taken from pipes in places of failure. The reasons for water pipeline failures are diagnosed. On the basis of the pre-modernization simulation, information on failure rate and forecasts of future water demand, it is proposed which pipeline sections and in what order should be modernized. Depending on the technical condition, pipeline diameter and location in the field, pipe replacement or renovation is recommended. For pipes to be replaced, new diameters, adjusted to the forecasted demand are calculated. For pipes qualified for renovation, different site hardened liners or full wall pipes are recommended depending on pipe condition. Renovation methods, despite the reduction of the internal cross-section, provide similar or lower hydraulic resistance values. After selecting the variants of modernization of distribution pipelines, hydraulic simulations are carried out in the post-modernization condition, taking into account the future demand for cooling water. The presented method can be applied to cooling water systems as well as other industrial water piping systems.

Corresponding Author: Michał Pachocki

MODELING OF WATER QUALITY EVOLUTION WITH ADVANCED HYDROINFORMATIC TOOL: CASE STUDY FROM BEGA CHANNEL SECTOR

Hausler - Cozma Dorian Petrica, Beilicci Erika, Beilicci Robert

Polytechnic University Timisoara, Department of Hydrotechnical Engineering, Address, Spiru Haret str. 1/A, 300022 Timisoara, Romania

ABSTRACT

Water quality evolution modelling is very important to predict the changes in surface water quality for water resources and environmental management in the world. Worldwide, in last decades, hundreds of surface water quality models have been developed. Water quality models based on advanced hydroinformatic tools are efficient way to simulate and predict pollutant transport in water courses, lakes and reservoirs, which can contribute to saving the cost of labors and materials for a large number of sampling and chemical experiments to determine the degree of pollution of water bodies. Surface water quality models are useful tools to simulate and predict the levels, distributions, and risks of chemical pollutants in a given water body, in different scenarios of pollution (point source, distributed source and accidentally pollution). The modeling results from these models are very important components of environmental impact assessment and can provide a basis and technique support for specialists from water resources and environmental management authorities to make right decisions.For case study we are used MIKE11 advanced hydroinformatic tool. MIKE11, part of the DHI software products, is a professional engineering software package for the simulation of flows, water quality and sediment transport in estuaries, rivers, irrigation systems, channels and other water bodies. MIKE11 is a user-friendly, fully dynamic, one-dimensional modelling tool for the detailed analysis, design, management and operation of both simple and complex river and channel systems. The used modules for modeling are Hydrodinamic Module and ECOLab module. The case study was realized on Bega channel sector (city of Timisoara – state border with Serbia), Timis county, Romania.

Corresponding Author: Beilicci Robert

WATER QUALITY EVOLUTION IN GOZNA AND SECU RESERVOIRES, SEMENIC MOUNTAINS, ROMANIA

Armas Andrei, Beilicci Erika, Beilicci Robert

Polytechnic University Timisoara, Department of Hydrotechnical Engineering, Address, Spiru Haret str. 1/A, 300022 Timisoara, Romania

ABSTRACT

Knowing and tracking the evolution of water quality in reservoirs is very important, especially if one of the functions of the reservoir is to provide the water supply to the localities. The chemical, thermal and physical changes which flowing water undergoes when it is stilled through hydrotechnical structures, like dams, can seriously contaminate water from reservoir and the river downstream. The grade of deterioration in water quality is in general related to the retention time of the reservoir, its storage capacity in relation to the amount of water flowing into it. The parameters of water quality determine the treatment technology and, implicit, influence the cost of drinking water. Gozna and Secu reservoirs are located in Semenic Mountains, were built as multi-purpose systems for water management. Their purpose was to produce hydropower, to supply drinking water to Resita city, mitigate flood waves and to be used as recreational areas.In this paper, the evolution of water quality on both reservoirs is analysed based on water samples collected over 11 years' time period (2001 - 2011). The main water quality parameters from these reservoirs are: water transparency, temperature, pH, dissolved oxygen, CBO5, CCOMn/O2, total nitrogen, total phosphorous, density, suspensions. On the base of obtained results from water quality evolution process analysis, the specialists in domain can anticipate the problems, causes of water quality degradation and can establish the adequate measures for water quality conservation and improvement. Today, worldwide, is an increasing interest in reservoir water quality since water resources are not expanding as fast as water demands. Because fresh water becomes more limited (due to pollution, climate change etc.) the quality of the water becomes increasingly important.

Corresponding Author: Beilicci Erika

MODERN SOLUTIONS FOR THE USE OF NEAR SURFACE GEOTERMAL ENERGY IN BANAT

Cristescu Anda, Mircea Visescu, Beilicci Erika, Beilicci Robert

Polytechnic University Timisoara, Department of Hydrotechnical EnginRobert Beiliccieering , Address, Spiru Haret str. 1/A, 300022 Timisoara, Romania

ABSTRACT

The energy feed problem leads us in the future strongly to the mix energy of renewable energy and non-renewable energy. Geothermal energy stored in form of heat under the ground surface is one of the most important renewable energy. The stored heat in the ground results from sunlight and heat flux inside the earth resulting among others from radioactive decay, therefore deep geothermal energy will be used for generating electricity, near-surface geothermal energy serves to produce heat, respectively cold and as battery heat. One particularly advantage of the geothermal energy is the independence toward day periods and unfavorable conditions. The increase sales on geothermal heat pump market proves that evidently. Heat pumps are modern installations that are utilized as alternative to conventional power plants having greater yields from 50 – 70%, and maintenance costs up to 2, 3 times smaller. In the paper we discuss the current solutions by using a near-to surface geothermal energy and its application possibility in Timiș County area. Following this mathematical modeling with the PMWIN program, it can be seen that our thermal pollutant spreads to ground and groundwater and influences both the ground around the wells and adjacent terrain. Influences produced may have major effects on thermal regime of adjacent lands. With the spread of heat, there is a warming/cooling (depending of use case) of the ground and, implicitly, of the groundwater. On the adjacent terrain there will be no heating or cooling installations with heat wells because that area is already used by existing wells. All these effects, which affect not only the proprietor of the well installation, can also attract lower the sale price of the land because of a geothermal change. However, affected neighbours do not have the opportunity to instantly defend themselves because there is currently no adequate legislation regulating these issues.

Corresponding Author: Beilicci Robert

Session Title:

Structural Engineering

DYNAMICAL MODEL FOR DETERMINATION OF HORIZONTAL FORCES ON CRANE RUNWAY DURING MOTION OF THE CRANE

Josef Musílek

Institute of Technology and Business in České Budějovice, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

During a motion of an overhead travelling crane on the crane runway horizontal forces between the crane and the crane runway girder occur. The reason of these forces can be the acceleration or deceleration of the crane and then most significant part of these horizontal forces is skewing of the crane. There are several methods for calculation of these forces. These methods depend mainly on computational model which is chosen. There were made some comparison of these methods in past conference by author of this article. The most significant load caused by motion of crane is the skewing. In the past the cause of the skewing was considered as the different speeds of the endcarriages of the crane which result to the horizontal transverse loads of the crane runway. In present the skewing of crane is defined as the motion of the overhead bridge crane with the constant velocity but with the angle relative to the crane runway. It means that the overhead bridge crane is angled relative to the crane runway and moves in constant velocity. During this motion the crane wheels are angled relative to the rail of the crane runway and the transverse forces occur on crane wheels. But this situation can occur also during the acceleration or deceleration of the crane. Present standards don´t take into account this situation. A dynamical model is presented in this paper which describes motion of the overhead double bridge crane during its acceleration. The dynamical model includes things which can influence the motion of the crane, the forces acting on crane wheels. The model thus describes the behaviour of the crane during acceleration in general and enables to determinate the horizontal transverse forces. The basic assumption of this model is that there is no contact between the rim of the crane wheel and the rail of the crane runway.

CARBON DIOXIDE CONCENTRATION IN THE BEDROOM FOR VARIOUS NATURAL VENTILATION MODES

Petra Nováková, Michal Kraus

Institute of Technology and Business in České Budějovice, Department of Civil Engineering,
Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The concentration of carbon dioxide (CO_2), respectively healthy and suitable hygienic indoor environment is one of the current issues. Residence rooms, excluding rooms in family-run facilities and accommodation units, should be ventilated to comply with a maximum permissible carbon dioxide concentration of 1500 ppm during the stay of persons. Many researches have shown that indoor environmental quality has a significant effect on the incidence of health problems (Sick Building Syndrome, SBS). Nowadays, there are a number of grant programs to support energy-saving buildings, which resulted in massive thermal insulation of all types of buildings. Buildings are almost airtight closed to reduce energy losses, and the owners, under the vision of energy and financial savings, almost do not open the windows. It is almost certain that these buildings are inadequate in terms of air quality. The exception is where the air-conditioning units are installed. The experiment measuring the concentration of carbon dioxide in the bedroom is executed in March within a week. Measuring in the winter months is crucial for the evaluation of results because it is difficult to set up an ideal regime for natural ventilation during the winter. The supply of fresh air is achieved by natural ventilation by tilting window but the result is low temperatures (cold) in the interior. The experiment is carried out in a three-room apartment in České Budějovice with newly installed plastic till & turn windows with insulating double glazing. Window wings also allow opening of the tilting position (tilt) and micro-ventilation. The observed bedroom has a floor area of 14.5 m^2. Two adults live in an apartment. The concentrations of carbon dioxide overnight are assessed under different modes of natural ventilation by tilt & turn window combined with open interior doors to other rooms. The results show a significant effect of ventilation on air quality. Data proves that only natural ventilation through new tight windows in renovated apartment buildings is inadequate.

Corresponding Author: Petra Nováková

BENDING-SHEAR RESISTANCE OF HYBRID I CROS-SECTION STEEL BEAMS

Pavol Juhás, Ingrid Juhásová Šenitková

Institute of Technology and Business in České Budějovice, Department of Civil Engineering,
Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The paper contains original theoretical analysis of the bending-shear resistance of steel beams with compact typical I cross-sections. They are combined from different steels where flanges are from higher strength steels and web is from middle steel. The homogeneous cross-section represents only limit case of the universal cross-section. The ultimate plastic stage is here considered as the perfect plastification of the web in decisive cross-section. The results of the theoretical analysis are equations for the calculation of the ultimate shear load, ultimate bending moment and bending-shear load-carrying capacity for different cross-sections. In accordance with theoretical results the simple interaction formula for hybrid cross-sections is presented.

Corresponding Author: Pavol Juhás

BUCKLING RESISTANCE OF HYBRID COMPRESSED STEEL MEMBERS

Pavol Juhá[1], Ingrid Juhásová Šenitková

Institute of Technology and Business in České Budějovice, Department of Civil Engineering,
Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The paper presents original calculation conception for hybrid compressed steel members having flanges from higher strength steels and webs from usual constructional steels. The web of such elements can be loaded in the elastic-plastic or plastic region. The calculation conception enables to appoint the load carrying capacity of the members taking into consideration the elastic-plastic post critical behavior of thin webs. This conception is based on results of previous experimental-theoretical research. Essential experimental findings and results of static tests of 16 welded I cross-section elements with 2 material combinations and 4 various web slenderness's are applied. The calculation conception extends the concerned calculation method for the homogeneous compressed steel elements used in actual European Standard EN 1993-1-1 and in National Standards ČSN/STN EN 1993-1-1.

Corresponding Author: Pavol Juhás

NUMERICAL ANALYSIS OF CRACKS DISTRIBUTION IN REINFORCED CONCRETE BEAMS WITHOUT SHEAR REINFORCEMENT

Piotr Smarzewski, Marta Słowik, Tomasz Sadowski

Lublin University of Technology, 40 Nadbystrzycka, 20-618 Lublin, Poland

ABSTRACT

The distribution of bending moments and shear forces in flexural concrete members like beams and slabs, effects the stress and strain distribution in the member. As the consequence of it, flexural and inclined cracks form and usually longitudinal and transverse reinforcement is used to carry tensile stresses and to limit cracks widths. In longitudinally reinforced concrete members without transverse reinforcement, the failure is often caused by inclined cracks. This type of failure under combined shear force and bending moment is called the shear failure. The shear failure in reinforced concrete members without transverse reinforcement was investigated experimentally by several researchers. It was found that the character of failure and crack propagation in investigated beams without stirrups changed according to the shear span-to-depth ratio a/d, the size of the member and the reinforcement ratio. In the paper, a numerical simulation concerning crack propagation in longitudinally reinforced concrete beams without shear reinforcement is presented. In particular, a nonlinear method and a smeared crack model have been applied to analyse the propagation of cracks in dependence of a longitudinal reinforcement in short beams. Differences in the evaluation of crack patterns caused by reinforcement ratio and mechanical properties of reinforcing steel have been observed when analysing the trajectories of total stains and numerical images of smeared cracks generated on the basis of FEM calculations. As the result of the performed analysis, the transition from a sectional mode of failure observed in the beams when span-to-depth ratio is a/d = 2.5 to strut and tie model in the short beams when a/d = 1.8. The numerical simulation yields similar results as the experiments and it shows that longitudinal reinforcement influences the shear failure of reinforced concrete beams without transverse reinforcement.

Corresponding Author: Piotr Smarzewski

USE OF PREFABRICATION IN STAIRCASE SOLUTIONS IN MULTI-STOREY APARTMENT BLOCKS BASED ON WOODEN STRUCTURES

Barbora Kovářová

Brno University of Technology, Institute of Technology, Mechanization and Construction Management, Veveří 95, 602 00 Brno, Czech Republic

ABSTRACT

Structural design of the staircase is a separate issue in the design and realization of residential buildings. The design needs to be addressed in terms of static, fire safety, layout requirements and in the case of wood-based apartment buildings, also in terms of acoustics. The paper deals with the design of the staircase in terms of all the above mentioned factors. In addressing this issue, emphasis is placed not only on the design of the staircase, but also on the construction itself. The authors of the solution focused precisely on the area of the prefabrication in the construction solution. The staircase is designed as a separate space cell, which is produced as part of the pre-production preparation of the building, and is then installed as a finished product. This issue is addressed within the MPO TRIO FV10075 “New technology multi-storey energy efficient buildings made of glued sandwich panels with the possibility of foundation based ground screws using the technology of prefabricated housing units” project and the staircase solution is an integral part of this project.

SPECIFICS AND APPLICATION OF WOODEN CONSTRUCTIONS IN THE AGRICULTURAL SECTOR

Jozef Švajlenka [1], Mária Kozlovská [1], Terézia Pošiváková [2]

[1] Technical University of Košice, Faculty of Civil Engineering, Department of Construction Technology and Management, Vysokoškolská 4, 042 00 Košice, Slovak Republic
[2] University of Veterinary Medicine and Pharmacy in Košice, Department of The Environment, Veterinary Legislation and Economy, Komenského 73, 041 81 Košice, Slovak Republic

ABSTRACT

Over recent years farming has undergone fundamental changes and many aspects of the industry, including farm buildings, have been transformed thereby. Modern farm buildings are large and as cheap and maintenance free as possible reflecting the need for better performance and greater efficiency. These modern buildings however are much larger than traditional buildings and are constructed of materials which are not only artificial and 'foreign' to the area but are also very light coloured. As a result, modern economic buildings are characterized by specific features as traditional construction. Response to this trend are the modern methods of construction based on wood offering effective procedures (design and implementation of construction), resulting in a larger volume of products (production), with higher quality and with shorter time of their purchase. The aim of this paper is to present selected aspects of agricultural construction and their application at present.

*Corresponding Author: Jozef Švajlenka

EFFECT OF THE PARTITION WEIGHT ON THE SEISMIC OF REINFORCED CONCRETE BUILDINGS PARTITIONS

Orlando Arroyo [1], José Colombo [2]

[1] Universidad de La Sabana, Campus Universitario Puente del Común, Km 7 Autopista Norte Bogotá – Chía, Colombia
[2] Universidad Diego Portales, Av. Ejército 441, Santiago, Chile

ABSTRACT

Reinforced concrete frame (RCF) buildings are widely used around the world and they are present in most urban areas. This situation has occurred because they are cost-efficient, have good seismic performance and because the materials and technologies required for their construction are available in many countries. One of the decisions during the design stage of new buildings based on this structural system is selecting the type of partitions. So far, in most developing countries the use of masonry brick walls to separate habitational spaces is still the predominant choice for most new projects. This situation stems from the fact that the selection of partition elements is often motivated by architectural, economic and cultural reasons, and because there is lack of information about the potential impact of the weight of partition elements on the seismic performance. This paper presents the evaluation of the effect of the partition weight on the seismic performance of RCF buildings. For this purpose, a six-story building was designed considering three different types of partitions: a) drywall, b) expanded-reinforced polystyrene and c) traditional clay partitions. Each building design was modelled in three-dimensions using fiber elements and subjected to nonlinear analyses. Based on these results, fragility curves were calculated for different seismic performance levels. The results of these evaluations show that seismic performance improves when lighter partitions are used, particularly in the nonlinear range. These buildings showed higher performance at the life-safety and collapse levels. All things considered, the results of this research show that the weight of partitions has a notable impact in seismic performance, and it suggests that it should be given careful consideration to its choice during the design phase of a project, and that cities planners should promote the use of lightweight partitions for new buildings.

Corresponding Author: Orlando Arroyo

EDEN: AN ARTIFICIAL INTELLIGENCE TO IDENTIFY MASONRY BUILDINGS WITH SOFT STORY VULNERABILITY IN URBAN AREAS

Orlando Arroyo, Angie Osorio, Jerson Salazar

Universidad de La Sabana, Campus Universitario Puente del Común, Km 7 Autopista Norte Bogotá – Chía, Colombia

ABSTRACT

One of the key elements for sustainable cities is having resilient infrastructure. One important step towards this goal is the characterization of the building stock and the identification of its vulnerabilities, which serve as input to generate earthquake risk scenarios and formulate policies to improve the resiliency of the cities. Frequently, this task involves conducting field surveys, which can become costly and time consuming for big territorial areas such as urban areas in emerging countries. A large part of the house inventory in these countries is comprised of confined and unconfined masonry, and a high percentage of these homes is the product of incremental construction processes by low-income families. Typically, they start with a first story and more stories are added as economic resources become available. In addition to this, it is frequent that the first floors of these houses are adapted for commercial activities of the owners, leading to a seismic vulnerability know as soft story, which experience in recent earthquakes has shown to contribute up to 70% of the damaged buildings. This paper describes an artificial intelligence that identifies the presence of soft story in masonry buildings. To achieve this goal, a field survey was conducted to collect more than 2000 images of masonry buildings in the Sabana Centro region in Colombia. These served as input information to train a deep neural network using the stochastic gradient descent method, which achieved a 93% accuracy in an image test set. To further validate its benefits, the EDEN network was used in combination with Google Street View to identify soft story in the buildings of the Tabio Municipality, Colombia. The results required eight labour hours, comparing favourably against the field survey, which needed almost 200 labour hours and gave similar results, which are within the error margin of the network. These findings suggest that EDEN is a suitable tool for the rapid assessment of the soft story vulnerability in urban areas. Future work in this topic involves expanding the network capabilities to identify other types of structural vulnerabilities.

Corresponding Author: Orlando Arroyo

A DESIGN OPTIMIZATION METHOD FOR STEEL BUILDINGS WITH TADAS ENERGY DISSIPATION DEVICES BASED ON SPECIAL GENETIC ALGORITHMS

Jesús Villalba [1], Olympia Siso [1], Orlando Arroyo [2]

[1] Pontificia Universidad Javeriana, Carrera 7 # 40 – 62, Bogotá, Colombia
[2] Universidad de La Sabana, Campus Universitario Puente del Común, Km 7 Autopista Norte Bogotá – Chía, Colombia

ABSTRACT

In the past decades, significant research has been carried out testing and developing different types of energy dissipation devices, and the experience during several earthquakes has demonstrated that they are effective to improve the structural response of a building, both for concrete and for steel buildings. Despite these advances, there is still need for more research that sheds light on how to determine the optimal quantity and location of these control devices in a building. This paper proposes a methodology for the optimal design of steel structures with TADAS-type hysteretic metallic energy dissipators (Triangular plate added damping and stiffness) based on special genetic algorithms. Solving this problem required the formulation of a structure and unstructured optimization, where the total cost of the building, including the cost of the TADAS devices was considered as the objective function. The section profiles assigned to beams and columns and to the location and quantity of TADAS devices are considered as the design variables, while the design code requirements and the seismic performance are used as optimization constraints. Two building examples of five and eight stories are used to demonstrate the application of the proposed method. OpenSees was used to evaluate the seismic performance of their design outcome, subjecting the designs to different seismic records. The results show that the proposed method can simultaneously achieve the goals of reducing the weight and and have better seismic performance compared to a traditional building. The reductions obtained in the story displacements varied depending on the seismic records considered, and they were as large as 82% for the eight-story building. All things considered, these findings suggest that the proposed method is a suitable strategy for designing steel buildings with TADAS devices. Future work in this topic involves using the proposed method for other dissipation devices.
Corresponding Author: Orlando Arroyo

INFLUENCE OF STEEL REINFORCEMENT ON ULTRACONIC PULSE VELOCITY MEASUREMENTS IN CONCRETES OF DIFFERENT STRENGTH RANGES

Narmane Fodil [1], Mohamed Chemrouk [1], Amina Ammar [2]

[1] University of Sciences and Technology Houari Boumediene. BP.32 El Alia, Bab Ezzouar, Algiers, Algeria
[2] Université de La Rochelle. 23 avenue Albert Einstein, BP 33060 - 17031 La Rochelle, France

ABSTRACT

The present paper reports on the assessment of concrete strength, using non-destructive testing devices. The study focuses on Ultrasonic Pulse Velocity (UPV) as a non-destructive tool for estimating the compressive strength of concrete in real structures, using a UPV-strength correlation model. The objective is to highlight the steel reinforcement influence on the ultrasound pulse velocity (UPV) measurement as a mean of a non-destructive strength assessment of concrete. UPV-strength correlation models are built on the basis of laboratory plain concrete specimens tested to destruction. However, real life structures contain steel reinforcement which interferes with UPV measurements, resulting in the distortion of these measurements, particularly when the reinforcement bars lie in the wave propagation path. Thus, when assessing the quality of concrete in real structures, it is recommended to avoid reinforcement rebars, which is often difficult, if not impossible to ensure, especially for highly reinforced structural elements. This work proposes an alternative which consists of assessing the influence of steel reinforcement on UPV measurements through a correction factor for UPV readings that will allow the user to take account of the presence of steel reinforcement when assessing the concrete strength of real structures through an ultra-sound pulse velocity testing. In the study, concretes in three different strength rages were targeted; the aim being to assess the role of the concrete density and the manner with which it interacts with reinforcement rebars when measuring UPV in reinforced concrete structures. The strength ranges considered vary from ordinary, to moderate, to high strength concrete. Cylindrical moulds made of concrete from three different strength ranges were cast; some of these moulds were reinforced with different longitudinal steel ratios (low, moderate, high) to simulate real practical cases. These concrete moulds were then subjected to UPV tests in the parallel and perpendicular directions to the rebars disposition in order to study the reinforcement influence on UPV from the two directions. A correction factor was then developed to work out the real ultrasonic pulse velocity of concrete that can be used in the UPV-strength correlation model to determine the compressive strength. For the three concrete strength ranges considered in this study, the presence of steel reinforcement was found to affect the UPV measurements. The results show also that the effect of steel rebars on UPV measurements is more accentuated with a low concrete density, particularly in the presence of a high steel ratio and rebars lying in the parallel direction to the wave propagation path. Indeed, for high performances concrete, which is a higher density concrete, a high steel ratio was found to slightly modify the pulse velocity; moderate and low steel ratios did not affect the pulse velocity. For normal strength concrete however, the three steel ratios (high, moderate and low) had noticeable effects on the UPV measurements, especially in the parallel direction; showing that UPV testing is not only affected by the presence of steel reinforcement in concrete, but it is also related to steel ratio, the rebars disposition, and the concrete density. A correction factor is then necessary for UPV measurements to correlate the strengths of reinforced concrete structures.

Corresponding Author: Narmane Fodil

BUILDING CLADDING USING LINER TRAYS: EXPERIMENTAL AND NUMERICAL APPROACH

Mircea Georgescu [1,2], Viorel Ungureanu [1,2], Aurelian Gruin [3], Andra Floricel [2]

[1] The Romanian Academy-Timisoara Branch, Bd. Mihai Viteazul, nr.24, Timisoara, Romania
[2] The Politehnica University of Timisoara, Dept. CMMC, Str.Ioan Curea 1, Timisoara, Romania
[3] The National Institute for Research and Development (INCD-URBAN-INCERC), Timisoara Division, str. Traian Lalescu, nr.3, Timisoara, Romania

ABSTRACT

Liner trays are large channel-type thin-walled steel sections with two narrow flanges, two webs and one wide flange, very frequently used in practice both to resist perpendicular uniformly distributed loading from wind and create a diaphragm effect at the level of buildings cladding. Such cladding systems are normally built using a required number of horizontally laid inter-connected adjacent liner trays plus an external skin of sinusoidal or trapezoidal sheeting installed perpendicularly to their direction (with vertical corrugations). This results in a stiff metal cellular system (as outer wall of the building) having its inner space filled with thermo insulating material. When trying to evaluate the resistance of such elements by experiment, upper specific constructional details play a major role and create quite complex problems in establishing a correct experimental setup, as close to reality as possible. Testing one single liner trays thus imposes correct simulation of real boundary conditions both on liner support and at mid-span. Global collapse modes are not possible in such liner tray assembly while local modes are expected and impose the final value of experimentally measured resistance to perpendicular load. The correct introduction of real boundary conditions into the experimental setup will thus facilitate a measured value reasonably close to the one determined by numerical simulation or to code provisions. Thus an experimental setup made of three joined liner trays is proposed with adequate detailing to match the real situation of such claddings. The investigation on liner trays is conducted by a joint team belonging to The Romanian Academy (Timisoara Branch), The Politehnica University of Timisoara (CEMSIG Laboratory) and The National Institute for Research and Development (INCD-URBAN-INCERC) –Timisoara Division. Aspects related to the experimental setup, test results (in terms of found collapse modes) experimentally and numerically determined resistances are emphasized. A comparison with code based theoretical results and FE simulation is presented and discussed in the final part.

Corresponding Author: Mircea Georgescu

JUSTIFICATION OF PARAMETERS OF THERMAL PROTECTION OF UNDERGROUND STRUCTURES

Aleksandr F. Galkin, I. V. Kurta

Ukhta State Technical University,169300,13 Pervomayskaya St., Ukhta, Russian Federation

ABSTRACT

The purpose the present article is the development of a method of calculation of thermal insulation parameters for underground structures of the cryolithic zone that would secure a given thermal regime of rocks within the boundaries of the active layer. Considered were underground structures of two types, the tunnel type (cylindrical symmetry) and chamber type (spherical symmetry) whose exploitation duration does not exceed three months. Corresponding problems of thermal exchange of warm air with the frozen rocks in the underground structure in the boundary conditions of the third state were solved. Simple engineering formulas permitting to choose thermal resistance of the thermal insulation were developed for two cases of underground structure uses: a) the use permitting the thawing of frozen rocks up to a given depth and b) the use mode when the thawing of rocks is not permitted for the entire duration of the exploitation of the underground structure. All of the formulas are presented in the criterion (dimensionless) form in the form of dependencies of the Bio (Bi) number from the Fourier (Fo) and Stefan (St.) numbers. Considered are specific examples of calculation of the Bi number and transition from dimensionless parameters to dimensional physical quantities, specifically, to the thermal resistance of the thermal insulation. The main regularities of the flow of thermal processes in thermally isolated mine workings were determined. It is demonstrated that in many cases relevant for practice, thermal insulation secures the protection of rocks from collapse and increases the reliability of exploitation of underground structures. The main examples of the use of the method is to choose the optimal parameters of thermal insulation for protective structures (such as underground shelters) used for the hiding of workers in mines of the cryolithic zone in cases of technical or natural emergency situations. The impact of natural temperature change on the size of thermal resistance of the thermal insulation was assessed. It was established that a prior cooling of the rocks allows to substantially decrease the necessary thermal resistance of thermal insulation layer and thus decrease both capital and exploitation expenses for construction and use of protective structures (shelters). A new kind of thermal insulation for protective structures of the cryolithic zone was proposed and justified. The prospective kind of thermal insulation is based on the light sprayed concrete lining. This method of thermal insulation is technologically efficient because it fulfills two functions at the same time: the function of a lining and a the function of thermal insulation. The results of a special assessment are showing that the use of this sort of lining is economically efficient for all types of underground structures of the cryolithic zone.

Corresponding Author: Aleksandr F. Galkin

BASE ISOLATION COMPOSITE BEARINGS USING RECYCLED RUBBER WITH FIBRE-REINFORCED POLYMER

Pasakorn Sengsri[1, 2], Maria Rosaria Marsico[3], Sakdirat Kaewunruen[1, 2], Andre L. O. de Melo[1, 2]

[1] Department of Civil Engineering, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

[2] Birmingham Centre for Railway Research and Education, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

[3] College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter EX4 4QF, United Kingdom

ABSTRACT

In the past few years, there have been a number of previous researches on the rubber isolators for resisting earthquakes. Generally, base isolation bearings are critical components in bridges as they suppress vibrations and dynamic actions. A typical bearing consists of layers of natural rubber sheets and bonded to steel plates. For an application of using rubber bearings, further isolated buildings have been constructed to resist an earthquake across countries which experience earthquakes over decades. Another application is might be used in bridge structures of railways and highways, in order to attenuate unwanted vibration. The key idea is to use rubber isolators attached beneath the superstructures for attenuating the damage potential of seismic responses. This means that the rubber provides the isolators flexible in horizontal direction and the steel makes them strong in vertical direction. Anyways, most bearings are made of natural rubber or synthetic compound. These materials are costly and cannot be durable over time. This paper aims to develop a new design of bearing using recycled materials and fibre reinforcement. The concept is to design two models as a square and circular shape for the investigation into the static and dynamic behaviour such as stability and mode shapes, respectively. Also, there is a comparison of the performance between the fibre and steel bearing model. A static and dynamic load action will be considered in design and finite element analysis (FEA) will be conducted to evaluate structural response and effectiveness of the novel low-cost bearing. Bearing models from FEA are verified by analytical modelling based on the theory. The overall results show that the fibre-reinforced bearing model is more efficient than the steel-reinforced bearing model. However, the fibre square model is less effective than the fibre circular model. Therefore, the fibre circular model is the best model for this only project. The outcome of this project will help to enable eco-friendlier bearing materials for highway and railway engineers. However, a further study about designing recycled rubber bearings with fibre-reinforced polymer should be conducted with experimental tests, in order to more effectively verify the models created by FEA before being used in practice.

Corresponding Author: Pasakorn Sengsri

INVESTIGATION OF VIBRATION CHARACTERISTICS OF FIBRE-REIN-FORCED FOAMED URETHANE (FFU) COMPOSITE BEAM IN FREE-FREE CONDITION

Pasakorn Sengsri[1, 2], Sakdirat Kaewunruen[1, 2], Andre L. O. de Melo[1, 2]

[1] Department of Civil Engineering, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

[2] Birmingham Centre for Railway Research and Education, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

ABSTRACT

Recently, a new composite material, 'fibre-reinforced foamed urethane (FFU)' has gained a vital momentum for applications in railway industry. As railway bearers in crossings and switches, the FFU elements act as a beam which redistributes the train forces onto track support. This leads to considering as a necessary part in order to underpin the reliable and safe operations of railway crossings and switches. According to the application of FFU sleepers for structural purpose, it is relevant to investigate the free vibration behaviours of FFU composite beams under free vibration. The responses of their behaviours provide modal parameters, for example, natural frequencies, damping loss factors, and mode shapes. One primary factor causing cracking of FFU composite beams and excessive railway track maintenance cost is the free vibration of in FFU sleepers in a railway line structure. This paper presents a sensitivity analysis of free vibration behaviours of an in railway FFU sleepers. Through finite element analysis (FEA), FFU-beam elements were used in the railway FFU composite beam modelling.

The dynamic characteristics of a vibrating structure are also evaluated by FEA. It is vital to note that errors in FEA models are inevitable, whilst the modal data extracted from experimental tests is generally accepted to be accurate. Hence, the correlation of data between FEA modelling and experimental measurement leads to researching this project. This model focuses on the influence of modal parameters of FFU sleepers on the free vibration properties. Furthermore, data on the vibration shape mode shapes indicate the dynamic performance of railway track, as it plays a significant role in the cracking deterioration of FFU composite beams.

Corresponding Author: Pasakorn Sengsri

SEISMIC PERFORMANCE OF GRAVITY LOAD-DESIGNED RC FRAME BUILDINGS IN JORDAN: A PRELUDE INTO THE EFFECT OF MASONRY INFILLS

Hanan Al-Nimry, Nooralddeen Altous

Department of Civil Engineering, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan

ABSTRACT

Fifty four infilled reinforced concrete (RC) frame buildings were selected and designed to represent typical Jordanian low and medium rise buildings designed to resist gravity loads only. Using SAP2000 software, nonlinear static analysis was performed on three dimensional models of the representative buildings. The study parameters included building height; horizontal and vertical irregularities; as well as type and layout of walls. The inverted triangular and Square Root of Sum of Squares (SRSS) lateral load patterns were used for irregular buildings. Analysis results indicated that commonly encountered horizontal and vertical irregularities associated with presence of re-entrant corners and soft stories negatively affects the elastic stiffness, energy dissipation and lateral resisting capacities of the investigated buildings. Analysis results confirmed that using RC walls, rather than masonry walls, in the staircase unit greatly enhances the seismic performance of buildings provided the RC walls followed a symmetrical plan arrangement about one of the principal axes. The majority of the investigated buildings exhibited a maximum inter-story drift ratio below 1.5% at the yielding strength and 3.8-4.8% at ultimate strength indicating that severe structural damage may take place under strong earthquake excitations. Plastic hinge formation signified the use of faulty design concepts violating the traditional strong column-weak beam concept of earthquake-resistant design. Compared with the inverted triangular lateral load pattern, using the SRSS pattern for pushover analysis of irregular buildings had a negligible impact on lateral load resistance but significantly affected stiffness and energy dissipation values.

Corresponding Author: Hanan Al-Nimry

VERTICAL GARDENS IN HIGH-RISE BUILDINGS – MODERN FORM OF GREEN BUILDING TECHNOLOGY

Hanna Golasz-Szolomicka, Jerzy Szolomicki

Wroclaw University of Science and Technology, Wyb. St. Wyspianskiego 27, 50-370 Wroclaw, Poland

ABSTRACT

This paper presents the analysis of vertical gardens in selected high-rise buildings located on different continents as an example of the most popular greenery system in contemporary architecture. High-rise buildings designed in the form of vertical garden, use the urban space more effectively and at the same time create a friendlier environment for their residents. In developing large metropolises, these buildings constitute a very important element in design which compensates for the lack of green areas. The first vertical gardens in the form of a system of green walls in buildings were created in the late 30s of the twentieth century. Their inventor was Stanley Hart White. However, a professor of Landscape Architecture at the University of Illinois. However, in tall buildings, these gardens were begun by Patric Blanc in 1994, and then continued by Stefan Boeri. With the development of green wall technology, two general systems have appeared: green walls and living walls. Many of the studies conducted in the world have shown significant environmental and social benefits from the use of vertical gardens in high-rise buildings, despite their significant economic costs. In the presented paper, the green wall system has been characterized on the example of some high-rise buildings, pointing at the determination of benefits from their occurrence in the urban scale as well in the scale of the building.

Corresponding Author: Jerzy Szolomicki

DETERMINATION OF PROFILED SHEET METAL STRENGTH UNDER STANDARD TESTING LOADS USING NONLINEAR FEA

Todor Vacev, Miloš Milić, Ivan Nešović, Andrija Zorić

Faculty of Civil Engineering and Architecture, University of Niš, A. Medvedeva 14, Niš, Serbia

ABSTRACT

Profiled sheets are widely used in modern steel structures, either as cladding or as casing in composite structures. Their strength calculation represents a complex task because one must deal with thin-walled structures that have complicated cross-section shape. Manufacturer's catalogues provide data about their strength, mostly for continuous surface load. These data are mostly obtained by testing. EUROCODE EN 1993-1-3, i.e., its annex A2, regulates the testing procedures for profiled sheets, allowing two main approaches regarding load application: uniformly distributed load load and equivalent line load (in four locations). In addition, the mentioned code proposes roller supports that simulate pinned joints at the ends, neglecting the fastening conditions, which unavoidably are present with these structures. Aim of this research was to prove if the two proposed load patterns produce identical results, and to reveal how fastening devices affect the structural strength. In this research, the Finite Element Method (FEM) analysis with geometrical and material nonlinearity and contact analysis in the support zones was applied for the strength calculation of one typical profiled steel sheet. The analysis was conducted for ultimate load strength and for max. load at standard deflection of L/200. In order to provide the testing conditions as real as possible, the support conditions were set in two ways: a) with support width B=40 mm and Z=2 fasteners at the support, i.e., one fastener in each outer trough; b) with support width B=200 mm and Z=8 fasteners at the support, i.e., two fasteners per every trough. The first support case is intended to simulate behaviour close to a simply supported beam, and the second should simulate a beam fixed at its ends. The analysis encompassed the two load patterns provided by EUROCODE standard, and the results were compared. The results reveal that the surface load approach gives higher strength values than the four-point-load, both for ultimate load and for max. load at deflection of L/200. This stands for both analysed support conditions. The results of the research indicate that the codes should much more precisely define the testing conditions for such structures and make them closer to reality, for the purpose of more reliable and economic design.

Corresponding Author: Todor Vacev

INFLUENCE OF MULTIPLE FAILURE MODES ON PREDICTION OF DESIGN CAPACITY OF REIFORCED CONCRETE MEMBERS ACCORDING TO GLOBAL SAFETY FORMATS FOR NLFEA

Diego Gino, Paolo Castaldo, Giuseppe Mancini

Department of Structural, Geotechnical and Building Engineering (DISEG), Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129, Turin, Italy

ABSTRACT

The semi-probabilistic and probabilistic safety formats for the non-linear finite elements analysis (i.e., NLFEA) of reinforced concrete structures are of practical interest for structural designers. In order to estimate the design structural resistance, different methodologies based on global structural response have been defined in the literature and by the Codes (i.e., the Model Code 2010 and EN 1992-2). However, guidelines for the correct use of these safety formats for the evaluation of the structural safety through NLFEA are still not present, in particular, when the structures may collapse with different failure modes. The present work aims to compare the outcomes of different safety formats for the estimation of the design strength of five RC beams with and without web openings. The results of the experimental tests performed up to failure on the five beams are known from the literature. The applicability of the safety formats to the results of plane stress non-linear finite elements analyses is discussed in function of the material properties adopted for the simulations (i.e., mean, characteristic and design values) and of the predicted failure mode. Based on the results, a new simplified safety format based on mean values of material properties is proposed. In conclusion, the useful recommendations related to the general applicability of the safety formats for non-linear analysis of R.C. structures are commented.

Corresponding Author: Diego Gino

ASSESSMENT OF AN EXISTING PRESTRESSED CONCRETE BRIDGE ACCORDING TO PARTIAL FACTOR METHOD FOR EXISTING STRUCTURES (*fib* BULLETIN 80)

Diego Gino, Simone Cimetta, Paolo Castaldo, Giuseppe Mancini

Department of Structural, Geotechnical and Building Engineering (DISEG), Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129, Turin, Italy

ABSTRACT

The assessments of existing reinforced concrete structures is a critical aspect for engineers and practitioners. In particular, existing infrastructures, as bridges and viaducts, are extensively exposed to environmental actions, materials aging, degradation and variation of magnitude of traffic loads during their service life. Hence, to perform the assessment according to criteria conceived for design of new structures and infrastructure (i.e. partial factor method – EN 1990) can result to be too conservative and, sometimes, lead to unnecessary and costly structural interventions. The *fib* Bulletin 80 defines a new partial factor method suitable for the assessment of existing reinforced concrete structures and infrastructures accounting for their residual service life, information from in situ and laboratory tests, measurements of variable actions and reduced target reliability levels according to economical and human safety criteria. The methodologies proposed in the *fib* Bulletin 80 has been applied to the assessment of an existing precast box section prestressed concrete bridge built in 90s located in north of Italy. The results are compared to the outcomes from the assessment performed according to EN1990 and, finally, limits and advantages of *fib* Bulletin 80 methodologies are discussed.

Corresponding Author: Diego Gino

PROPOSED METHODS ON ENHANCEMENT OF DYNAMIC RESPONSE OF RC FRAMES AND SOIL STRUCTURE INTERACTION

Dina Abdulaziz [1], Ahmed Zidan [1], Metwally Ahmed [2]

[1] Department of Civil Engineering, Faculty of Engineering, Beni-Suef University, Beni-Suef, 62514, Egypt
[2] Structural Engineering Department, Faculty of Engineering, Cairo University, Giza, Egypt

ABSTRACT

In this paper, proposed methods on enhancement of a nonlinear behavior of reinforced concrete frames subjected to cyclic load. A fully nonlinear dynamic analysis is adapted using three-dimensional finite element analysis by means of ANSYS 16.0 code. All structural elements such as footings, columns and girder are simulated in the numerical model. The concrete is assumed to be nonlinear and isotropic. In addition, some proposed methods are investigated to enhance the performance of RC frames under cyclic loading such as, cross bracing steel at the connections and at girder region as well as additional bent bars at the ends of girder. The results of analyses are presented in terms of envelope capacity, load-displacement relationship, stresses and cracks distribution. The results indicated that the provision of additional reinforcement increased the ultimate lateral capacity, ductility and introduce an additional mechanism for shear stresses for RC frame under cyclic loading. The best performance is observed when the cross-bracing is used at the top and bottom column connections whereas, the lateral capacity and displacement is increased by 12.9 % and 27.63% respectively of that computed for control frame. In case of cross-bracing steel at beam column connections and case of cross-bracing at beam region, the lateral capacity of RC frames is about 1.09 and 1.04 times that of control frame respectively. Furthermore, the dynamic analysis is carried out under considering the foundation soil whereas the Drucker-Prager model is used to define the stress strain behavior of soil. Besides, some significant observations on the performance of RC frames with change of the values of parametric study are presented in this paper.

Corresponding Author: Dina Abdulaziz

CONSIDERATION OF SOIL TEMPERATURE IN THE MODELLING OF EARLY-AGE MASS CONCRETE SLAB

Aneta Żmij [1], Barbara Klemczak [1], Miguel Azenha [2]

[1] Silesian University of Technology, Akademicka 5, 44-100 Gliwice, Poland
[2] Univesity of Minho, Campus de Azurem, 4800-058 Guimarães, Portugal

ABSTRACT

The early-age concrete is the one of the most challenging materials in the process of modelling. To obtain the reasonably accurate model, a number of factors should be taken into account. Considerations should include both external influences as well as the changes occurring in the complex structure itself. The modelling of an early-age concrete massive slab requires the proper assignment of initial conditions, including the initial temperature of the analyzed element and the adjacent structures. The temperature distribution in the subsoil is the factor analyzed in the presented paper. The aim of the study is the determination of temperature distribution in the ground, which is useful in the process related to the acquisition of the most accurate model of the analyzed structure and reflects the actual conditions in the numerical model. For this purpose, the analytical method described in the literature was applied and subsequently evaluated on the basis of numerical calculation. The performed calculations allow the estimation of the depth representing the range of influence of temperature in the ground and the values of temperatures corresponding to successive layers of the subsoil. Moreover, aiming the optimization of the numerical analysis of the massive foundation slab, the legitimacy of such detailed consideration of the temperature development in the underlying subsoil was evaluated by the comparison with the temperature distribution in the slab obtained with the constant soil temperature.

Corresponding Author: Aneta Żmij

MODAL ANALYSIS OF CILINDRICAL TANK

Norbert Jendzelovsky

STU, Faculty of Civil Engineering, Radlinskeho 11, 810 05 Bratislava, Slovakia

ABSTRACT

At present, water management is one of the most important tasks of humanity. For this reason, emphasis is also placed on designing ecological buildings. For ecological constructions we consider water tanks.
These are clean drinking water reservoirs. Secondly, water purification structures. In both cases we use circular reinforced concrete tanks as a construction. This paper deals with a problem of eigenfrequencies of filled cylindrical tank rested on rigid or elastic foundation. In this article we present the calculation of the actual shapes and frequencies of cylindrical tanks using the FEM software. We have used three different theories for modelling the cylindrical tank load. In the first mathematical model we assigned a corresponding mass of water gradually to individual nodes of the mantle. The Housner - Epstein method was the second method used. In this mathematical theory the mass of water is concentrated in the centre of the water tank and is flexibly connected to the walls of the cylindrical tank. In the third mathematical model, the volume of fluid area was modelled using the FLUID elements, which are specifically designed for modelling of the fluid. To take account of the interaction between the structure and the liquid fill, the intermediate contact element was inserted between the elements of the tank walls and the water elements. This intermediate element is a contact element reflecting the influence of FSI (fluid-structures interaction). In this paper, we compared three ways of modelling the tank filling and their effect on the size of natural frequencies. In this analysis, we used solid and flexible base under base plate of the full cylindrical tank. By numerical modelling of the finite elements method, we specified the calculation of natural frequencies of the full cylindrical tank.

SEISMIC ASSESSMENT AND RETROFIT DESIGN OF A SCHOOL BUILDING IN FLORENCE

Gloria Terenzi[1], Caterina Bazzani[1], Iacopo Costoli[2*], Stefano Sorace[2], Paolo Spinelli[1]

[1] Department of Civil Environmental Engineering, University of Florence, 50139 Florence, Italy
[2] Polytechnic Department of Engineering and Architecture, University of Udine, 32100 Udine, Italy

ABSTRACT

The recent earthquakes occurred in Italy highlighted once again the high seismic vulnerability of the national building stock, which led several municipal administrations to undertake extensive performance assessment campaigns of public buildings, among which primarily schools. Within this context, the study proposed in this paper consists in the evaluation of the seismic vulnerability and the design of structural interventions in a school building in Florence, built in the 1970s. The school consists of two main blocks: one used as a classroom building and the other as a gym. The former is characterized by a ground storey with reinforced concrete frame structure, and a first and second storey with steel structure. The gym is a reinforced concrete one storey building. An extensive on-site experimental investigation was developed at a first step of the study, which allowed identifying the mechanical characteristics of the structural materials, and re-drawing the main structural details. Based on these data, a check of seismic response in current conditions was carried out, which highlighted several drawbacks, especially for the steel members. This prompted to design local strengthening measures for the members showing the poorest response capacities, and a global seismic performance improvement of the structural system, by introducing a set of dissipative braces incorporating fluid viscous dampers as protective devices. The non-linear dynamic analysis carried out in retrofitted conditions highlights the effectiveness of the supplemental damping system-based retrofit intervention, which helps reaching an elastic response of the structure up to the maximum considered normative earthquake level.

Corresponding Author: Iacopo Costoli

INFLUENCE OF LONGITUDINAL RIBS ON WARPING AND LOAD-BEARING CAPACITY OF A STEEL I- BEAM

Krzysztof Wierzbicki [1], Maciej Szumigała [2]

[1] Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology, Szczecin, al. Piastów 17, 70-310 Szczecin, Poland
[2] Institute of Structural Engineering, Poznan University of Technology Poznan, Piotrowo 5, 60-965 Poznan, Poland

ABSTRACT

The ribs are frequently used to improve the load-bearing capacity of steel I-beams. They reduce probability of local instability of a thin web and increase the beam resistance to lateral-torsional buckling. Ribs are also used to strengthen the beam in the connection zone with other load-bearing elements or against a point load and many more. Predominatingly ribs connect both flanges with web and are parallel to the cross-section of a beam. It means that their stiffness to bending by warping of a beam is reduced. The previous research proved that blocking the mutual rotation of flanges can improve the load-bearing capacity by even 20%. However, the increase is obtained only while using 5 cm or thicker plates, that are rather uncommon in classic design. This article analyses the influence of ribs connected with the outside part of both flanges only to warping of a beam and – as an effect – to lateral-torsional buckling and load-bearing capacity of the construction. Calculations were conducted using Finite Element Method implemented in ABAQUS CAE environment. Different thicknesses of steel plates used as ribs and different cross-sections of I-beam were taken into account. The load-bearing capacity was calculated and compared between studied solutions. The ribs, which are aligned in parallel to web (perpendicularly to cross-section of the beam) have higher stiffness against bending caused by warping effect than the ones connected to the web. The longitudinal ribs have the highest influence when they are placed in the point of the maximum angle of deflection caused by warping, between the top and bottom flange of I-beam. It is worth noticing that longitudinal ribs are commonly used in I-beams to connect them with other elements, but their positive effect on bearing capacity is ignored. In spite of the fact that this is a conservative way of designing structures, an influence of elements constraining the degree of freedom which governs warping should be considered in further studies.

Corresponding Author: Krzysztof Wierzbicki

EXPERIMENTAL AND NUMERICAL INVESTIGATION OF IN-LINE STANDING CIRCULAR CYLINDERS IN STEADY AND TURBULENT WIND FLOW

Olga Hubova [1], Ivana Veghova [1], Juraj Kralik [2]

[1] Slovak University of Technology, Faculty of Civil Engineering, Radlinského 11, 811 05 Bratislava, Slovak Republic

[2] Academy of Fine Arts and Design, Hviezdoslavovo namestie 175/18, 814 37 Bratislava, Slovak Republic

ABSTRACT

Circular cylinders for example light masts, chimneys, towers, cables, open frames and structural elements or open lattice structures with circular cross section are frequently used in civil engineering structures. The wind pressure distribution on the structures is an important parameter in terms of wind load calculation [Solari, 1993], [Hubova, 2007]. Some wind effects, especially interference effects, are still the subject of research and experimental measurements in wind tunnels, but also in-situ. For the in-line standing circular cylinders EN standard gives only the wind force coefficient that is higher than the wind force for the stand-alone cylinder. The wind flow around in-line standing cylinders is based on distance between cylinders and their roughness and also on local wind velocities and neighboring structures. This paper deals with interference effects of air flow around the group of circular cylindrical structures. In this research, a series of parametric wind tunnel studies was carried out in Boundary Layer Wind Tunnel STU in Bratislava to investigate the interference effects of in line standing cylinders in steady and turbulent wind flow. In a steady flow in the front measurement area, we tested cylinders with a smooth and rough surface at a varying distance and angle of wind direction and ten different wind velocities from 9, 6 – 19, 69 m/s. The graphs of the external wind pressure distribution on the circumference of the cylinder for different wind speeds give us good information about behavior in the row standing cylinders in steady wind flow. In a turbulent wind flow in the rear measurement area in BLWT, we tested three cylinders for different wind velocity and compared results for different position of cylinder. Experimental results of wind pressure around cylinders were compared with numerical analysis and EN 1991-1-4 standard. We chose the finite volume method implemented into program ANSYS Fluent, which offers several turbulence models.

Corresponding Author: Olga Hubova

RESEARCH ON SCREWED LAP CONNECTIONS OF THIN PLATES – EXPERIMENTAL TESTS AND ADVANCED FEM ANALYSIS

Marcin Gryniewicz, Julita Krassowska

Bialystok University of Technology, Bialystok, Wiejska str. 45, 15-351 Poland

ABSTRACT

The results of a research on screwed thin-plate single-lap connections are presented. So far, in many existing regulations concerning thin-walled structures, only simplified calculations of such connections are conducted. The main aim of the paper is to present the experimental results of the shear tests conducted on single-lap connections and the theoretical predictions of their behaviour obtained from the complex three-dimensional FEM model. The experiments follow the Eurocode rules for design-aided by testing and the current European Convention for Constructional Steelwork (ECCS) recommendations. Results of lab failure tests are checked by 3D simulations computed in ANYS software. Advanced methods were used to build parametric models taking into account screw thread and EPDM washer. The most difficult issue in modelling was the screw-plate contact. Various techniques are described in technical literature for the threaded connection modelling with the FEM software. A kind of known solution is applied in this analysis where a spiral thread is substituted by simple horizontal rings. Such simplification allows using symmetry in a static system, which is particularly desirable for large models like the prepared for this paper. In contrast to the mentioned known solutions, the thread model presented here has a triangular cross-section corresponding to the real screws geometry. Numerical results correspond reasonably well to measurements from the lab experiments. The statistical evaluation of obtained data from tests have allowed to build the proposal of the multilinear force-displacements design curves of tested connections. Plates of different thicknesses have been used to allow an appropriate variability in the results. Such curves could be effectively used i.e. for designs where the stressed skin diaphragm action is involved. It usually requires input values describing connections behaviour which can be acquired from the presented sets of data. These could be useful in an advanced design where a static analysis is combined with the capacity assessment of the connections in a structural system. When steel sheeting is utilised as a structural in-plane shear diaphragm it is also required to take into consideration the important interactions between covering parts and covering with structure elements. Proper connections models are one of the most important cases to solve in such analyses.

Corresponding Author: Marcin Gryniewicz

DAMAGE DEGRADATION IN REINFORCED CONCRETE BEAMS TROUGH ACOUSTIC EMISSION

Parvinder Singh [1], M. H. Prashanth [2], J. M. Chandra Kishen [1]

[1] Dept. of Civil Engineering, Indian Institute of Science, Bangalore, India
[2] Dept. of Civil Engineering, National Institute of Technology, Surathkal, India

ABSTRACT

Concrete which is one of the most widely used construction material, is treated as homogeneous from a design perspective. However, on a close meso level examination it is observed that the internal structure is heterogeneous, consisting of coarse aggregates embedded in cement matrix. Fracture in concrete occurs at pre-existing crack tips upon the formation of a fracture process zone (FPZ) wherein several toughening mechanisms such as micro-cracking, aggregate bridging, crack branching etc., take place resulting in energy dissipation. This fracture process zone is responsible for the post-peak softening response of concrete under tensile loads and also the size effect. When concrete is reinforced with steel bars, the major failure mechanisms observed are microcracking in concrete and yielding of steel. In this work, the role of steel reinforcement in fracture of reinforced concrete beams are studied using the acoustic emission technique. The complete stiffness degradation due to the evolution of microcracks and yielding of steel is captured through acoustic events and acoustic energy. Different parameters including the size of beams and the percentage of steel reinforcement is studied to understand the complete failure and damage mechanisms in reinforced concrete beams. It is seen that the spread of acoustic emission events and its distribution in the beams help in understanding the fracture processes taking place including the sequence of mechanisms such as micro-cracking, coalescence of microcracks to form macrocracks, increased width of microcracking and final fracture in reinforced concrete beams. Furthermore, it is also seen that the effect of higher reinforcement is to spread the damage in the form of microcracks to larger widths of the beam.

Corresponding Author: J. M. Chandra Kishen

ACCUMULATED DAMAGE-BASED EXPERIMENTAL STUDY ON SEISMIC PERFORMANCE OF HRBF500 REBAR REINFORCED RC BRIDGE COLUMNS

Qian Fu [1], Xuerong Wang [1], Shuting Liang [2]

[1] School of Information Engineering, Nanjing Audit University, Nanjing 211815, China
[2] School of Civil Engineering, Southeast University, Nanjing 210018, China

ABSTRACT

The evolution of the damage and seismic behavior of the reinforcement concrete (RC) bridge columns reinforced with HRBF500 rebar was investigated in this paper. Nine pile head specimens with various strengths of longitudinal reinforcement, reinforcement ratios, axial compression ratios and stirrup ratios were tested under horizontal cyclic loading. The influences of the designed parameters of the mechanical properties such as failure mode, loading-displacement curve, skeleton curve, strength and stiffness degradation and energy dissipation were analyzed in the view of damage. There are four conclusions brought by the tested results. The damage process of specimens could be divided into turn-crack development stage, damage accumulation stage and failure stage. The damage will accumulate gradually and the strength and stiffness will also be degenerated, resulting in lower ductility and energy dissipation capacity of the specimens, as the displacement amplitude increases. The failure modes are similar, with plastic hinges occurrence varying from 30 to 260 mm above the concrete bases, accompanied by the steel buckling, fractured and the concrete local crushing. The good ductility and energy dissipation capacity of the HRBF500 reinforced concrete bridge columns are illustrated by the relatively plumper shuttle-shaped hysteresis curves obtained. The damage development was faster and energy was comparably larger of the specimens under the variation of displacement amplitude cycle loading, comparing with the constant displacement amplitude cycle loading. The bearing capacity of the specimens will be certain influenced by the increased reinforcement ratios and the larger energy dissipation capacity, with more longitudinal bars. The axial compression ratio also has an important influence on the damage development of the specimens. There are not considerable increments of bearing capacity, with the increment of reinforcement ratio, however, the ductility and energy dissipation ability will be improved obviously. The laws of damage development analyzed by the experimental results were shown in this paper. The seismic damage assessement and seismic damage model of this kind of structural members were established by the experimental results above.

Corresponding Author: Xuerong Wang

LABORATORY TESTS ON COMPOSITE BEAM - ACCURACY OF MODAL ANALYSIS RESULTS

Milan Sokol, Zuzana Šišmišová

Slovak University of Technology in Bratislava, Faculty of Civil Engineering, Department of Structural Mechanics, Radlinského 11, SK-810 05 Bratislava, Slovakia

ABSTRACT

The primary aim of this research was to verify accuracy of results of the modal analysis on the composite beam. The research is based on the identification technique, which determine structural characteristics from the measured values of dynamic response. Further use of the matrix adjustment method is assumed. The method uses measured data to optimal update of the stiffness matrix to get numerical model that will match with measured data. This can be used for further calculations to determine the effect of damage to the stiffness of the beam. The experimental beam was made of wooden boards and plasterboards, which were attached to each other by a lot of screws. It was simply supported beam of total length 4m. The stiffness characteristic of beam was determined from experimental measurement of the beam deflection from a particular load. A total of 24 accelerometers were placed along of the beam. Accelerometers were recording vertical acceleration and the acceleration measurement record lasted for 60s. We gained amplitude spectrum of acceleration from the measured acceleration values by using the fast Fourier transform (FFT). The first eigenfrequencies were determined from the amplitude spectrum. The measured value of first frequency was f1 = 11.7Hz while the calculated value of first frequency was f1 = 11.6Hz. Other frequencies and shapes were also calculated and measured. When comparing them we need to be careful. The spacing of the transducers very well describes the vertical bending shapes while there is little information about torsional vibration shapes. We are planning extend these results by measurement with a pair of accelerometers located along the beam to verify torsional mode-shapes too. The conclusions and results of this experiment are used in calculations for system identification and determination the change in stiffness of the structure damage by using matrix adjustment method. The stiffness matrix is adjusted based on measured values of the damaged beam. The beam will be corrupted by removing the screws from the beam, that will change the stiffness properties of the beam. This change will be reflected in the stiffness matrix.

Corresponding Author: Zuzana Šišmišová

OPTIMISATION OF SURFACE FINISHES FOR ORIENTED STRAND BOARD IN ORDER TO INCREASE ITS MOISTURE RESISTANCE

Erika Kratochvílová, Jiří Patloka, Jiří Šlanhof

Brno University of Technology, Faculty of Civil Engineering, Institute of Technology, Mechanization and Construction Management, Brno, Czech Republic

ABSTRACT

The purpose of the research is the optimisation of surface finishes for application to oriented strand board (OSB) in order to increase its moisture resistance. The aim of the research is to compare test specimens with different types of coating, spray, primer and waterproofing under predefined conditions and different forms of moisture exposure. The paper contains a definition of the basic material, test specimens and test methods, and covers 8 different types of surface finish materials selected for application to the test specimens. The results include graphs showing growth in humidity over time, specifically graphs showing the causal relationship between increases in weight and moisture absorption, as well as graphs depicting swelling in thickness. The results are also discussed. In the conclusion the results are evaluated and an outline of the next steps to take with regard to further research is formulated. The results are of benefit to all subjects concerned with wooden structures in which OSB is used, both at the design stage and at the stage of the preparation and execution of construction with respect to unpredictable weather conditions that can irreparably damage unprotected structures. In addition, these are results which are important for the operation of buildings during which a suitable surface finish can alleviate the consequences of later accidents and defects. They may also be beneficial during the construction of buildings from structural insulated panels whose facing most often consists of OSB. Construction periods tend to be adversely affected by changes in the weather. The application of suitable surface finishes to OSB immediately during the prefabrication stage could eliminate this issue.

Corresponding Author: Erika Kratochvílová

EVALUATION OF THE WORK OF A SINGLE-SPAN BEAM IN THE CRACKED SECTION – CALCULATION EXAMPLE

Beata Ordon-Beska, Maciej Major

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka Street 3, 42-200 Częstochowa, Poland

ABSTRACT

In Poland, in the last 20 years there have been large and often far-reaching changes in designing of construction works, including changes in normative regulations. Polish standards were gradually adapted to European eurocodes obligatory in European Union Member States, to be eventually replaced by publication of an identical text or by endorsement. Currently valid in Poland for the design of reinforced concrete structures Eurocode 2, part 1-1 was approved by the Polish Committee for Standardization in 2008 and eventually replaced the conflicting national standards in 2010. According to the information contained in the general provisions, it is intended to prove compliance of buildings and engineering structures with the requirements of Council Directive 89/106/EEC concerning, among other things, resistance and stability, applicable to new, designed structures. Part 1-1 EC2 concerns the design of reinforced concrete structures with the exception of plain surface bars previously used quite commonly in structural elements working under average values of loads: floor slabs or secondary beams for example. On the other hand, in point 7.3.4 of the mentioned code, containing the rules of calculations of crack width, there is a coefficient k_1 taking account of the bond properties of the bonded reinforcement, permitting both ribbed and with an effectively plain surface bars. Therefore, in the presented article it was made an attempt to analytically assess the crack phenomenon of the beam with plain surface reinforcement and compare this with the results of experimental research. The calculations were made for a single-span beam with one-side tensile reinforcement only, loaded with two concentrated forces of equal values, placed symmetrically in relation to the half of the span. The presented assessment includes of the cracking moment, calculations of the spacing of cracks and the width of cracks at various load levels. The obtained results were compared with the results of experimental investigations of two beams made of the same concrete and the same rebars.

Corresponding Author: Maciej Major

STRENGTH OF UNREINFORCED JOINTS OF MASONRY WALLS MADE OF AAC MASONRY UNITS

Radosław Jasiński [1], Iwona Galman [2]

[1] Silesian University of Technology, Department of Building Structures, ul. Akademicka 5, 44-100 Gliwice, Poland
[2] Silesian University of Technology, Department of Structural Engineering, ul. Akademicka 5, 44-100 Gliwice, Poland

ABSTRACT

The paper presents the results of experimental tests performed on six wall joints. The tests were performed on the models made of AAC blocks with thin joints and unfilled head joints. The joints were constructed as traditional masonry joints. The tests were performed in a dedicated test stand in which force was transferred linearly along the whole height of the wall. Specimens were loaded in one cycle until failure. The paper discusses the mode, morphology and mechanism of failure, and analyses the load–displacement relationships which allowed to define the phases of work of the joint. By applying code procedures, authors provide the parameters required for the design of the joints. Using the values of cracking and failure forces obtained in experimental tests characteristic strengths at the moment of cracking and failure were determined. The obtained shear strengths were compared with the code values specified by Eurocode 6.

Corresponding Author: Iwona Galman

HYBRID NUMERICAL AND EXPERIMENTAL APPROACH TO AN INTEGRATED DETERIORATION MODEL OF A RAILWAY TRACK IN-SERVICE: A CONCEPTUAL DESIGN

Andre L. O. de Melo[1, 3], Sakdirat Kaewunruen[1, 3], Mayorkinos Papaelias[2, 3], and Pasakorn Sengsri[1, 3]

[1] Department of Civil Engineering, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom
[2] School of Metallurgy and Materials, University of Birmingham, Birmingham B15 2TT, United Kingdom
[3] Birmingham Centre for Railway Research and Education, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

ABSTRACT

The track supports the loads of the railway vehicles and guides their movements. Its excellence determines the permissible wheel load, speed, safety and reliability of the rail operation. None railway can expect to survive in a competitive economy if its track is an obstacle to safety, reliability and proper service. The effects of all adverse features on the track are cumulative and track components require a routine of attention and renewal at frequent intervals. If the permanent way is not perfectly levelled and aligned, irregularities cause oscillations or vibrations of the train, which can cause discomfort to the passenger and damage to the freight, and the worst: a catastrophic accident. In planning a new track or improving one in-service, it is important to be able to predict the probable rate of asset deterioration as a function of the variables related to the train and its periodicity. This makes it possible to contribute significantly in planning, engineering, operational, and maintenance activities. The aim of this paper is to present a conceptual design of the Railway Track System (RTS) as a hybrid numerical and experimental approach to an integrated deterioration model of the track in a railway in-service based on empirical-mechanistic and probabilistic theories.

Corresponding Author: Andre L. O. de Melo

PARAMETERS AND BOUNDARY CONDITIONS IN MODELLING THE TRACK DETERIORATION IN A RAILWAY SYSTEM

Andre L. O. de Melo[1, 3], Sakdirat Kaewunruen[1, 3], Mayorkinos Papaelias[2, 3], and Pasakorn Sengsri[1, 3]

[1] Department of Civil Engineering, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom
[2] School of Metallurgy and Materials, University of Birmingham, Birmingham B15 2TT, United Kingdom
[3] Birmingham Centre for Railway Research and Education, School of Engineering, University of Birmingham, Birmingham B15 2TT, United Kingdom

ABSTRACT

The main function of the railway track is to support the loads of the railway vehicles and to guide their movements. To investigate the effect of a specific load on the track, the evaluation of the functions of the different parts of the sub-system is necessary. Each track component has its own mechanical parameters, which in most case cannot be restored without parts replacements. The development of the track structure has some properties of the components more important than others. With Finite Element Model (FEM) software packages available, the use of them for simulation and analysis of track components has become an accurate tool when supported by a hybrid numerical and experimental approach. In FEM, special attention needs to be given to the boundary conditions and linear or nonlinear interactions between components of the track. The aim of this paper is to present, in applying to model the track deterioration in a railway system, the mapping of both track parameters and boundary conditions, their descriptions, properties, interfaces and how these occur in a railway track in-service.

Corresponding Author: Andre L. O. de Melo

OPERATIONAL PROBLEMS OF STRUCTURAL NODES IN REINFORCED CONCRETE CONSTRUCTIONS

Anna Szymczak-Graczyk[1], Barbara Ksit [2], Ireneusz Laks[1]

[1] Poznań University of Life Sciences, Piątkowska 94E, 60-649 Poznań, Poland
[2] Poznań University of Technology, Piotrowo 5, 60-965 Poznań, Poland

ABSTRACT

Reinforced concrete structures are frequently designed and executed in such facilities as: halls, warehouses, factories, multi-family buildings, single-family buildings, tanks, silos and many others. In this type of structures, it is particularly important to provide an appropriate thickness of concrete lagging, which aims i.a. to protect the reinforcement against corrosion and to design it with appropriate spacing allowing the in-between space to be filled with a concrete mix. A frequent problem met while making reinforced concrete structures is such a density of reinforcing bars, especially within structural nodes, that there is no possibility of filling the space between them with a concrete mix or it is not possible to vibrate the concrete mix in order to prevent segregation of mixture components. Structural nodes are points where special attention should be paid to careful compaction of concrete mixes and application of measures that prevent concrete from adhering to moulds. The article presents the most common problems and operational errors that may occur during concreting structural nodes. The case study illustrates two structural nodes connecting a pillar with a bolt, located in a wall with a mullion-transom structure. During the modernisation works carried out in the production hall there were exposed two structural nodes completely unfilled with a concrete mix and with visible reinforcing bars that showed little buckling and the onset of corrosion. The pillars, due to their location in the general static scheme of the wall, were subjected to compression or locally compressed and affected by bending. Particularly unfavourable was the fact that the pillars did not feature the concrete lagging in the compression zone of the element. Removal of concrete lagging in the compression zone always results in decrease in the bearing capacity of a structure. It can be concluded that due to faulty workmanship the pillars had a lower load bearing capacity than anticipated in the building permit design. The paper provides software for repairing reinforced concrete pillars so as to obtain the value of load bearing capacity equal or higher than expected in the design and on the assumption that repair works would be carried out on pillars subjected to loading.

Corresponding Author: Anna Szymczak-Graczyk

INVESTIGATION OF THE BOTDA TECHNOLOGY FOR STRUCTURAL CONDITION MONITORING OF URBAN TUNNEL

Hu Li [1,2], Yang Liu [2], Jianxin Cao [2], Pengyu Shu [2]

[1] School of Transportation Science and Engineering, Harbin Institute of Technology, Harbin, China, 150090
[2] Jinan Rail Transit Group CO., LTD, Jinan, China, 250000

ABSTRACT

Structural condition monitoring of actual tunnels always needs many measured points of structural response as much as possible. The Brillouin optical time domain analysis (BOTDA) technology has obvious advantages in supplying amounts of measured points of strain along the sensing optical fibre. Therefore, the application of BOTDA technique for structural health monitoring (SHM) of an actual urban tunnel was investigated in this study. The SHM system based on BOTDA technique is designed for an actual tunnel, so this system realizes the long-distance and high spatial resolution of measured strain and temperature field of tunnel structure. And then the placement of long-distance sensing optical fibre of the actual tunnel was introduced in detail. The software system is described in the following aspects such as the function of collection, display and security diagnosis and early warning. Finally, the effectiveness of the BOTDA technique for condition monitoring of actual tunnel is discussed.

Corresponding Author: Yang Liu

BEHAVIOUR OF GLULAM BEAMS STRENGHTENED WITH BFRP BARS

Marlena Rajczyk, Damian Jończyk

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka 3, 42-218 Czestochowa, Poland

ABSTRACT

Currently, FRP fiber composites are increasingly used in construction. They can be used in the form of: tapes, mats and bars. Composite rods are already widely used in reinforced concrete structures as replacements for steel rods. They are also used as elements for repairing various types of structures: reinforced concrete, timber, steel and masonry. It is much less popular to use composite rods as reinforcement elements for laminated timber beams at the production stage. The paper presents the results of experimental and numerical analysis of glued laminated timber beams, reinforced with BFRP basalt-epoxy rods to determine the effect of the distribution of composite reinforcement on the load-bearing capacity of reinforced joists. The tested elements were reinforced with bars of various diameters arranged in a different arrangement in the cross-section. The beams were made of GL24h wood, while basalt-epoxy bars with a diameter of 7 and 9 mm were used to strengthen the beams. During the experimental investigations the deflection of beams, the value of the destructive force and the form of destruction were investigated. Computer calculations based on the Finite Element Method (FEA) were also obtained, achieving good consistency of displacement results. In numerical studies, wood and composite rods have been modeled as an orthotropic material. The numerical analysis was carried out in the elastic range. In experimental studies, significant differences in the values of deflections and destructive forces in the scope of one research series were observed, which may be due to the inaccuracy of execution. Values of destructive forces in experimental studies were not directly related to the value of reinforcement percentage of different series of beams.

Corresponding Author: Damian Jończyk

EVALUATION OF TIME DEPENDENT PRESTRESS LOSSES IN PRETENSIONED CONCRETE MEMBER WITH TOP AND BOTTOM TENDONS

Vadzim Parkhats, Rafał Krzywoń, Jan Kubica

Silesian University of Technology, Faculty of Civil Engineering, Department of Structural Engineering, Akademicka 5, 44-100 Gliwice, Poland

ABSTRACT

Prestress losses in a pretensioned concrete member are divided into two groups: immediate and time dependent. The immediate losses include losses due to elastic deformation of concrete, short term relaxation of prestressing tendons, friction at the bends, and seating of the anchoring devices. The time dependent losses are losses due to relaxation of prestressing steel and creep and shrinkage of concrete. Accurate evaluation of prestress losses in a pretensioned concrete member is highly important, since the incorrect results can lead to immoderate deflection and cracking of a prestressed structure. It should be noted that both underestimation and overestimation of prestress losses are almost equally harmful. Prediction methods to estimate prestress losses were developed long ago, nevertheless there is still some uncertainty about this issue. The problem of evaluation of the time dependent prestress losses separately for top and bottom tendons of a pretensioned concrete member is omitted from the widely available literature. The approach consisted in reduction of prestressing reinforcement to a common substitute cross-section seems objectionable, since results in overestimation of the prestress losses in the top tendons and the underestimation in the bottom ones. In this paper, equations to estimate the time dependent prestress losses separately for the top and bottom tendons are deduced. Additionally, the time dependent prestress losses are calculated for pretensioned concrete members with different ratios of top and bottom tendons to analyse an error between the results according to the deduced equations and those obtained by the equation from Eurocode 2 for a common substitute cross-section of prestressing reinforcement.

Corresponding Author: Vadzim Parkhats

MEASUREMENT-INTERPERATION METHODOLOGY FOR THE ASSESSMENT OF HUMAN PERCEPTION OF VIBRATION IN BUILDINGS

Alicja Kowalska-Koczwara

Cracow University of Technology, Warszawska 24 St., 31-155 Cracow, Poland

ABSTRACT

The article contains guidelines related to the proper performance and analysis of measurements of human perception of vibration in buildings. The recommendations apply to both hardware requirements and the selection of measurement points as well as the analysis of the recorded signal. The buildings located in the so-called dynamic impact zone are subject of the analysis of the influence of vibrations on people in buildings. In this article the range of dynamic impact zones from different dynamic excitation is listed. An extremely important aspect of the measurements of the human perception of vibrations in buildings is the selection of the location of measurement points. In different national standards there are different guidelines which are compared in the article. The most proper locations are investigated. A separate issue is the selection of the measuring range and the selection of corrective filters for the analysis. New trends in this matter are shown and requirements according to different standards are compared. A separate problem is determining the duration time of vibrations, which should be taken into analysis. It is worth noticed that the choice of duration can have significant influence on whole results of analysis of human perception of vibration in buildings and many standards do not give recommendation in this subject. The last problem of methodology of measurements of human perception of vibrations is associated with the analysis of measurement data is the sampling frequency of the recorded signal. The so-called N-qyst frequency has been shown in the paper and explained in a specific example.

NUMERICAL ANALYSIS OF REINFORCED CONCRETE SLAB WITH OPENING STRENGTHENED USING CARBON FIBER REINFORCED POLYMER STRIPS

Osama Mohamed[1], Rania Khattab[1], Nader Okasha[2]

[1]College of Engineering, Abu Dhabi University, PO Box 59911, Abu Dhabi, United Arab Emirates
[2]College of Engineering, Abu Dhabi University, PO Box 1790, Al Ain, United Arab Emirates

ABSTRACT

Openings in reinforced concrete (RC) structural floor slabs are sometimes created as a result of alterations in architectural layout or structural upgrades, amongst other reasons. Architectural reasons for making openings may include change-of-usage, or improvement in air circulation, and lighting. Openings in structural slabs may reduce strength and stiffness of structural floor, or may transform the original failure mode of the slab. In the past decades, externally bonded fiber reinforced polymer (FRP) sheets have become popular for strengthening or rehabilitating RC structures against traditional force actions such as flexural, shear, or torsion. Strengthening and rehabilitation of beams, floor slabs, and columns may be necessary for seismic or non-seismic applications. This paper reports the results of a numerical study to evaluate the effectiveness of strengthening two-way RC slabs with openings, using carbon FRP (CFRP) composite sheets. Ten numerical models were created, consisting of a reference model with the slab having an opening but not strengthened, and nine models with an opening and CFRP laminates applied to the tension face of the slab. The strengthening laminates varied in thickness and width. The results indicate that CFRP laminates significantly enhance the overall stiffness and flexural capacity of the RC slab containing openings. Increasing the thickness of CFRP laminates decreases mid-span deflection. Load-deflection curves were generated, and ultimate load, and ductility indices were discussed.

Corresponding Author: Osama Mohamed

INTEGRATION OF A HYBRID METHOD INTO AN EFFICIENT RELIABILITY-BASED DESIGN OPTIMIZATION TECHNIQUE FOR LARGE STRUCTURES

Nader M. Okasha [1], Osama Ahmed Mohamed [2]

[1] Abu Dhabi University, P.O. Box 1790, Al Ain, UAE
[2] Abu Dhabi University, P.O. Box 59911, Abu Dhabi, UAE

ABSTRACT

The computational burden imposed by the repetitive and lengthy nature of the structural analyses of large structures has lead researches to continuously devise efficient methods for conducting their reliability analysis in addition to powerful methods for solving the design optimization problem. The presence of a considerably large number of random variables in the reliability analyses of large structure is another issue that tends to slow down the design optimization problem. In this paper, a hybrid method that was recently presented by the first author will be integrated into a structural reliability-based design optimization technique for large structures. In this technique, modified concepts of the weighted average simulation method are used to determine the most probable point of failure in a computationally efficient manner. The most probable point of failure is then transferred into the standard normal space, where the reliability index is calculated in closed-form. The firefly algorithm will be (since next sentences presume the analysis is not done yet) used for solving the optimization problem. It will be shown that the integrated approach significantly reduces the computational resources required for solving the design problem. The technique will be tested on a truss bridge. The results will show the efficiency of the proposed technique in solving reliability-based design optimization problems.

Corresponding Author: Nader M. Okasha

IMPACT RESPONSES OF HIGHSPEED RAILWAY TRACK SLABS

Nhlanganiso Mlilo[1,2], Sakdirat Kaewunruen [1,2]

[1] Department of Civil Engineering, The University of Birmingham, U.K.
[2] Birmingham Centre for Railway Research and Education, The University of Birmingham, U.K

ABSTRACT

Recently precast steel-concrete composite slabs have been considered as a viable alternative replacement for timber sleepers on highspeed railway tracks and bridges. However, due to their nature, their behaviour is usually complex and current studies on their behaviour when subjected to rail loading which can either be static, dynamic or impact in nature is limited. Impact loads pose a lot of hazards including causing severe damage to both railcars and rail track components for example cracking of slabs or sleepers. Impact loads can be as a result of several factors including flat spots on rail wheels attributed to train braking, dipped rails, rail squats, corrugation, crossing transfers, etc. Impact loads are often over a short duration but of very high magnitude. For instance, the typical loading duration produced by wheel flats is about 1-10 milliseconds, while the force magnitude can be over 400 KN per rail seat. This paper highlights an investigation into the behaviour of precast steel-concrete composite slab subjected to impact loading. A parametric study has been carried out using finite element analysis software, Strand7 to investigate the behaviour of precast steel-concrete composite slabs under the action of impact loading conditions. The outcome of this study will potentially lead to a better understanding and hence design of precast steel-concrete composite slabs in highspeed railway tracks subjected to impact loading.

Corresponding Author: Nhlanganiso Mlilo

EFFECT OF COUPLING VERTICAL AND LATERAL FORCES ON THE BEHAVIOUR OF HIGHSPEED RAILWAY TRACK SLABS

Nhlanganiso Mlilo[1,2], Sakdirat Kaewunruen [1,2]

[1] Department of Civil Engineering, The University of Birmingham, U.K.
[2] Birmingham Centre for Railway Research and Education, The University of Birmingham, U.K

ABSTRACT

The steel-concrete composite slab track which is a form of ballast-less track and an evolvement of the tradition slab track has increasingly become an attractive alternative to timber sleepers. In addition to the normal vertical train loading, the slab track and other railway track components have to also resist horizontal lateral forces as a result of centrifugal forces on curves as well cross winds. This paper highlights a study which was undertaken to investigate the behaviour of steel-concrete composite slabs under the effect of vertical and lateral loading in a highspeed railway track system. A parametric study has been conducted using finite element analysis software, Strand7 to investigate the effect of coupling vertical and lateral forces on the precast steel-concrete composite slabs on highspeed railway tracks. The outcome of this study will potentially lead to a better understanding and hence design of precast steel-concrete composite slabs subjected to different loading conditions in highspeed railway tracks.

Corresponding Author: Nhlanganiso Mlilo

FEM ANALYSIS OF WELDED STEEL K- JOINTS MADE OF RHS SECTIONS

Agnieszka Jablonska-Krysiewcz

Faculty of Civil and Environmental Engineering, Bialystok University of Technology, Bialystok, Poland

ABSTRACT

The series of tests on the load capacity of joints made of RHS sections allowed for the development of design guidelines included in the Eurocode 3 standard. The advent of advanced programs for finite element analysis now allows verification of destruction models without the need for costly experimental research. The aim of this article is finite element method analysis of steel welded K-joints made of RHS sections. For calculation, truss connections between SHS250x5 chord and SHS120x5 and SHS90x5 brace elements were selected. The value of overlap for narrower brace member was 100 mm. The elements of the truss joints were designed from steel grade S235. All elements were welded with 5 mm fillet welds. According to rules described in Eurocode 3 the resistances of joints were calculated. FEM models of hollow section truss connections were generated by using the FEM software package ANSYS. Numerical elastic-plastic 3D finite element models were performed in order to establish the Huber-von Mises stresses maps and deformations in elements of connections. The chords and braces in joints were loaded with a system of forces obtained from the static and strength analysis of the the steel frame structure with truss. FEM analysis results were shown that in K-joints designed according to Eurocode 3 have occurred the zones in which the stresses are larger than yield stress, especially in chord flange and brace members for connection without reinforcing plate and in brace members for joint with flange reinforcing plate. FEM analyses for reinforced joint and joint without flange reinforcing plate have done results in which we could observed that using flange reinforcing plate had positive influence on resistance and lead to decreasing in stresses and deformations in joint elements.

THE NUMERICAL EVALUATION OF THE DEFORMATION IN THE LIGHT-WOOD PREFABRICATED MODULAR BUILDING

Jaroslaw Malesza

Bialystok University of Technology, ul. Wiejska 45A, 15-351 Bialystok, Poland

ABSTRACT

One of the most developed technology applied in construction of residential buildings is the light wood technology. This kind of buildings are mostly constructed up to four-story. These structures are based on large panel or modular technology, where elements in the form of wall panels and floor diaphragms or 3D spatial modules are constructed in the industrial plants. Each element like wall, floor, roof diaphragm is constructed on specialized production lines and then completed and assembled to the form of 3D module. Usually dimensions of the module do not exceed 4850 mm in width, 3700 mm in height and up to 19500 mm in length. The fully finished modules are being dispatched to the site. Elements transported to the site are then assembled by cranes directly from conveying vehicle. Considering modern stages of construction commenced in the prefabrication plants, process of construction decreases to 40% comparing to assembly time of traditional building on site. Within last decades required minimization of defects brought construction towards modular structures when almost 80% of connections are accomplished in factory where these elements are completely finished. Modular building structures guarantee the highest standard of construction and their element quality. Moreover, the aspects like ecology, energy saving, and labor cost reduction strongly decide on popularity of these technology. Process of prefabrication, wide assortment and variety of factory production does not require time consuming processes and complicated moulds or shuttering indispensable in precast RC structural elements. The light-wood structure must fulfil requirements which are not recognized in masonry or rc buildings. The influence of the lateral loading on the wood-framed building covers the main part of designing process. The spatial stiffness of entire building depends on stiffness of the walls and their interconnections. At the beginning, the paper presents the resistance evaluation of the wall without and with openings. Furthermore, the numerical model of 3D module taking into account all structural elements is being described. The FEM analysis results of displacements are compared to these obtaining in analytical evaluation.

Corresponding Author: Jaroslaw Malesza

RECTIFICATION OF WALLS OF THE HISTORICAL BRICK BARRACK ON THE SITE OF THE FORMER GERMAN NAZI CONCENTRATION AND EXTERMINATION CAMP KL AUSCHWITZ - BIRKENAU

Krzysztof Gromysz[1], Łukasz Szoblik[2], Ewa Cyrulik[2], Agnieszka Tanistra-Różanowska[2], Zofia Drabczyk[2] and Szymon Jancia[2]

[1] Silesian University of Technology, Faculty of Civil Engineering, 44-100 Gliwice, ul. Akademicka 5, Poland
[2] Auschwitz-Birkenau State Museum, Global Maintenance Plan, ul. 32-603 Więźniów Oświęcimia 20, Poland

ABSTRACT

The construction of the German Nazi concentration and extermination camp Auschwitz II - Birkenau started at the end of 1941. A barrack with the current inventory no. B-123, situated at the section BI, was then erected. The barrack has documentary and historical value. The barrack walls are characterised by low stiffness, because with the building's plan of 36.17 m × 11.39 m, the walls are only 0.12 m thick. All the outer walls have been substantially deformed or vertically deflected. Up to 100 mm wide gaps have formed between the deformed and deflected external walls and contiguous walls as a result. The stability of the walls was at risk, because a bad-quality wall was loaded with horizontal and vertical forces transmitted from the roof on the eccentricity reaching 100 mm. Deformations were progressing over time as a consequence of such forces. Individual rectification procedures were designed and implemented for each wall as part of comprehensive conservatory and building works, the purpose of which was to ensure stability. This article presents a procedure of rectification the eastern gable wall and the outer, longitudinal northern wall. The deformation of the eastern gable wall was removed by changing its static scheme, by inserting hinge regions into the wall along the line of selected bed joints. Separate wall patches, which could rotate relative to each other, were created as a result of the forces acting perpendicular to the wall surface. By causing the mutual rotation of such patches, the eastern gable wall reached the desired vertical position. The vertically deflected, longitudinal outer northern wall was rectified by rotating the wall in relation to the wall support edge on the foundations. An analogous procedure was applied to the outer longitudinal southern wall. After the completed rectification, the walls were anchored to the contiguous walls; the places of rotation and anchoring were filled with mortar. A different procedure was adopted for the other deflected walls. The advancing deformations of the western gable wall were stopped by stabilising its position with steel elements connected with ties anchored in the ground. It was inadmissible to rectify this wall because it is covered with plaster and paint coats with the high historical value.

Corresponding Author: Krzysztof Gromysz

DESIGNING OF BUILDINGS IN THE ASPECT OF PROTECTION OF PEOPLE FROM TRAFFIC INDUCED VIBRATIONS

Krzysztof Kozioł

Cracow University of Technology, Institute of Structural Mechanics, Warszawska 24 St. 31-155 Kraków, Poland

ABSTRACT

Newly designed buildings must meet conditions regarding limit states of strength and serviceability. These conditions must be fulfilled in case of static load, dynamic load as well as both of them at the same time. Bearing in mind that currently sources of vibrations are located closer and closer neighborhood of inhabited buildings, particular attention should be paid to this issue. Mentioned problem of vibrations is even more important as it can concern loads (sources of vibrations) as well as buildings that are both existing and designed. It should therefore be considered - depending on the existence stage of the dynamic load and the building - four possible cases of analyzed problem. These are diagnosis, diagnosis with prognosis, designing and designing with diagnosis. The study describes methods how to include in the design and protection of buildings impact of traffic induced vibrations on people staying at the facility. The criteria for assessing dynamic influences on people (as it is presented in codes) are specified. Particular attention was paid to the situation when we deal with existing road (vibration source) and designed building. In this case we are able to determine (by measuring in situ) parameters of kinematic excitation and then affect the FEM model of planned building to meet its dynamic parameters criteria's imposed during assessing of the impact of vibrations on people. The paper presents a calculation example of the building; which location is planned 12 m from the national road. Possible various technical conditions of the road surface including damaged surface and its permissible by national code unevenness that may occur in the surface course were considered. As a criterion for admission selected building to the operational state the provisions contained in the PN-2017 / B-02171: Evaluation of vibration influence on people in buildings were used. Since the main factor determining the fulfillment of the code requirements were vertical accelerations during analysis author focused on choosing the appropriate thickness of slabs.

MEASUREMENTS OF VIBRATIONS AND COMPUTER SIMULATIONS IN THE DESIGN OF VIBROISOLATION OF RAILROADS

Krzysztof Kozioł

Cracow University of Technology, Institute of Structural Mechanics, Warszawska 24 St. 31-155 Kraków, Poland

ABSTRACT

Presented paper describes the problem of vibrations in buildings generated by rail transport. Dynamic analysis presented in this paper were based on two Polish standards developed at the Institute of Structural Mechanics at the Cracow University of Technology: a. PN-2016/B-02170. Evaluation of the harmfulness of building vibrations due to ground motion, b. PN-2017/B-02171. Evaluation of vibration influence on people in buildings (in Polish). These standards define the rules, methods and criteria of the performed evaluations. Prepared computational model of the building as well as the way of propagation of vibrations generated by trains or trams often requires experimental verification. It could be done due to measurements. The results of field tests should be recorded in the databases containing information related to the geometry of the structure (building itself, track bed and tunnel-housing in case of the metro), propagation path (its length and nature of soil layers) and finally material properties. Presented examples of computer simulation application during designing of vibration isolation of railway tracks in the tunnel as well as tram line surface, showed that the basis of such calculations should be carried out vibration measurements in a given case or taken from proper measurement databases. Predictions may concern not only the impact of vibrations on surrounding buildings and people staying in them, but also reduction of expected vibrations of engineering structures. In order to verify correctness of adopted due to computer simulations solutions minimizing vibrations, it is necessary to perform post-implementation measurements, which should be a supplement to mentioned database. This approach to the design of vibroisolation allows to check used numerical procedures as well as implemented material constants describing materials used in the numerical model or in the case of constructing the building the quality of the materials used.

PROPAGATION OF VIBRATION CAUSED BY SUBWAY PASSAGE IN SOLI

Krzysztof Kozioł

Cracow University of Technology, Institute of Structural Mechanics, Warszawska 24 St. 31-155 Kraków, Poland

ABSTRACT

The need to develop communication lines is the cause of reducing their distance from buildings. One of the most effective means of transport is the subway, which often passes under existing buildings. Subway cars moving into a tunnel are causing dynamic loads. These actions have an environmental effect particularly on buildings and people staying inside. Standardization guidelines (eg. PN-2017/B 02170) define influence zones, within which this kind of loadings should be taken into account during designing of structures. However, they do not specify how its amplitude-frequency character depends on distance from source of vibration. It is quite understandable, because a large influence on the waves propagation in the soil medium beyond material characteristics of the individual layer have their alignment. This paper shows changes of extreme amplitudes as well as frequency character of vibration accelerations of the ground depending on the distance from the wall of subway tunnel. These results represent analysis of acceleration waveforms registered in real conditions - "in situ" (in geometrical and material sense). As it turns out, not always with increasing distance from the source of vibration the size of dynamic loads decreases. This phenomenon could be used during designing structures adjacent to the subway. Presented study shows an example calculation of two buildings loaded with dynamic actions caused by passing subway. Analysed buildings are subjected to the ground accelerations measured at their foundation as well as theoretical distributions calculated on the basis of knowledge of accelerations in their neighbourhood.

RESEARCH TO EVALUATE THE EFFECTIVENESS OF THE DIAMOND DISC FOR GRINDING THE GRANITE SURFACE

Marlena Rajczyk, Paweł Rajczyk

Czestochowa University of Technology, Poland

ABSTRACT

The material and geometric design of the diamond disc for grinding granite surfaces is in the aspect of increased global demand for the use of granite slabs for construction industry an important and economically justified task in the development of innovative technologies for surface treatment of building materials. The task undertaken to increase the quality and efficiency of machining processes by increasing the quality parameters of the finishing discs consists in evaluating the geometry of the abrasive segments and a group of materials for making flexible diamond discs formed on synthetic binders. Polyurethane resins modified with copper powders and quartz flour were selected for making the shields. The discs used synthetic MBD diamond powder with a grain size of 40/45 # and a concentration of 25%. In the analysis of structural solutions, the average geometric efficiency index of the active surface of the grinding discs with a diameter of 100 mm was determined, with a kinematic load of n = 366 ÷ 960 rpm, moving with a progressive speed of 0.02 m / s and results of pilot abrasion tests made on experimental samples of circular diamond segments operating at kinematic load n = 660 rpm and pressure on the surface of the 40 N disc.

Corresponding Author: Marlena Rajczyk

FLEXIBLE TOOLS WITH DIAMOND BLADES FOR POLISHING GRANITE SURFACES

Marlena Rajczyk, Paweł Rajczyk, Karolina Bednarczyk

Czestochowa University of Technology, Poland

ABSTRACT

Polishing is an operation of treating the surface of the stone that gives it final useful features, giving the surface shine, which in the final stage of stone surface treatment give it important usable features, which include: aesthetics, i.e. surface property of the stone, characterized by the glassiness of the surface in some the case has a mirror effect, which is characterized by a high degree of reflection of light, allowing it to observe the structure of the stone well in the aspect of its decorative elements placed on its surface. The physical features of polished surfaces are, above all, a shorter time to maintain moisture on its surface, which is the basic factor of material destruction. The quality of the polished surface of natural stone determines the degree of its longevity, this principle is particularly important for polished marble and concrete surfaces. An important value of the quality of polished products is the assessment of this parameter in a commercial assessment. The property of achieving a high degree of polishing can only be achieved with the help of highly effective diamond tools for polishing operations, where the quality of their work is evaluated by instrumental methods using tools measuring the amount of reflected light from the polished surface (gloss meter). Flexible diamond tools for dry and wet polishing operations are a set of 8 discs with a diameter of 100 mm mounted on a fast link formed in the friction surface on a synthetic binder of diamond abrasive with a grain size of 50 ÷ 3000 #. In order to increase the efficiency of surface treatment technology in polishing operations, it is necessary for granite processing for a given polishing operation with grain size 800 #, select the appropriate hardness resulting from the synthetic binder formulation.

Corresponding Author: Marlena Rajczyk

BEHAVIOUR OF GLULAM BEAMS STRENGHTENED WITH BFRP BARS

Marlena Rajczyk, Damian Jończyk

Czestochowa University of Technology, Faculty of Civil Engineering, Akademicka 3, 42-218 Czestochowa, Poland

ABSTRACT

Currently, FRP fiber composites are increasingly used in construction. They can be used in the form of: tapes, mats and bars. Composite rods are already widely used in reinforced concrete structures as replacements for steel rods. They are also used as elements for repairing various types of structures: reinforced concrete, timber, steel and masonry. It is much less popular to use composite rods as reinforcement elements for laminated timber beams at the production stage. The paper presents the results of experimental and numerical analysis of glued laminated timber beams, reinforced with BFRP basalt-epoxy rods to determine the effect of the distribution of composite reinforcement on the load-bearing capacity of reinforced joists. The tested elements were reinforced with bars of various diameters arranged in a different arrangement in the cross-section. The beams were made of GL24h wood, while basalt-epoxy bars with a diameter of 7 and 9 mm were used to strengthen the beams. During the experimental investigations the deflection of beams, the value of the destructive force and the form of destruction were investigated. Computer calculations based on the Finite Element Method (FEA) were also obtained, achieving good consistency of displacement results. In numerical studies, wood and composite rods have been modeled as an orthotropic material. The numerical analysis was carried out in the elastic range. In experimental studies, significant differences in the values of deflections and destructive forces in the scope of one research series were observed, which may be due to the inaccuracy of execution. Values of destructive forces in experimental studies were not directly related to the value of reinforcement percentage of different series of beams.

Corresponding Author: Marlena Rajczyk

MINIMISING MATERIAL CONSUMPTION IN BIONIC AND GEOMETRIC STRUCTURAL FORMS

Anna Nowak

Department of Structure Design, Construction and Technical Infrastructure, Faculty of Architecture, Warsaw University of Technology, Koszykowa 55 Street, 00-659 Warsaw, Poland

ABSTRACT

Interdisciplinary design is an important process influencing the shaping of architecture. In contemporary architectural design, the integration of form and load-bearing structure is becoming more and more important. The integrated design process enables verification and selection of solutions that are more advantageous in relation to the given criteria. As a result, it is also possible to search for model solutions in the attempt to optimize the architectural-construction as an important element of the interdisciplinary design process. Synergic methods of architectural design, enabling the creation of more effective systems, are of particular significance. The combination of architectural and structural analyses is increasingly visible, especially in research projects, where the form of the object is created in a synergic way, taking into account other parameters such as the properties of the materials used. The search for possibilities of shaping optimal and sustainable structures led to the creation of analogies to living organisms, as exemplified by bionic architecture. Architects are interested in methods of surface discretization, which can influence not only the aesthetic perception of the object, but also the material efficiency of the load-bearing structure. As a result of such a design, the search for synergistic solutions that meet both aesthetic and endurance criteria is pursued. The minimization of material consumption by means of interdisciplinary analyses is part of the sustainable architecture trend, which respects the environment and its resources. The article presents model research, based on the analysis of structural forms with homeomorphic assumptions, which corresponds to homologous transformations among structures of common evolutionary origin. In analytical research on selected models, computer-aided design methods were used to minimize material consumption.

INFLUENCE OF MINING SHOCKS ON RESIDENTIAL BUILDINGS IN POLAND

Filip Pachla

Cracow University of Technology, Warszawska 24 St., 31-155 Cracow, Poland

ABSTRACT

The article presents the methods for assessing the impact of vibrations on buildings with a masonry structure subjected to mining shocks. Although Poland is not a seismically active region, there is a problem with induced seismicity. It results from mining exploitation mainly of raw materials such as hard coal and copper ores. Many residential buildings made in traditional technology are not properly designed for additional seismic forces. In Poland, there are no clear guidelines for designing objects for such loads. The article compares the most commonly used methods of calculating the masonry structures subjected to such loads. A masonry, residential building with a regular construction was selected for the analysis. The results presented in the paper on the methods of assessing the impact of mining shocks on buildings present a new view regarding the analysis of the impact of vibrations induced by human activities on objects of a masonry structures. At the work, previous experience and regulations and instructions applicable in Poland have been collected. The aspects requiring expanded discussion were formulated and presented. The current standards in the field of seismic engineering in Europe EC-8 have been confronted with scientific studies on mining shocks. The standard assumptions were confronted with the results of numerical analyzes on spatial computational models. The obtained results will help in developing dynamic forecasts for mining plants and will help to standardize and systematize design issues in the field of designing objects subject to mining shocks.

MODELLING THE TENSILE SOFTENING RESPONSE OF PLAIN CONCRETE IN LS-DYNA SOFTWARE

Petr Král [1, 2], Petr Hradil [1], Jiří Kala [1]

[1] Faculty of Civil Engineering, Institute of Structural Mechanics, Brno University of Technology, Veveří 331/95, 602 00 Brno, Czech Republic

[2] Faculty of Civil Engineering, Department of Structural Mechanics, VŠB – Technical University of Ostrava, Ludvíka Podéště 1875/17, 708 33 Ostrava-Poruba, Czech Republic

ABSTRACT

The aim of this paper is the numerical modelling of the tensile softening response of plain concrete. For this purpose, the explicit finite element software LS-Dyna contains several nonlinear material models. The tensile softening behaviour of a total of four selected explicit nonlinear concrete models (the Continuous Surface Cap Model, the Winfrith Concrete Model, The Karagozian & Case Concrete Model and the Karagozian & Case Concrete Model Release 3) is tested within the numerical simulations of this paper. The numerical simulations of the testing of the mechanical properties of concrete in uniaxial (direct) tension using specific concrete specimens are performed in this paper using the explicit finite element approach. The results of numerical simulations take the form of load-extension diagrams created for a concrete specimen under direct tensile loading whose behaviour was calculated by selected nonlinear material models of concrete. For the purpose of validating the tensile softening response of the selected nonlinear concrete models, the results obtained from the numerical simulations are compared with experimental data obtained from laboratory tests. This comparison shows the differences in the tensile softening behaviour of the individual nonlinear material models of concrete and the approximations of the experimental data. The comparison allows conclusions to be drawn as to which nonlinear concrete models provide the best approximation of the experimental data, and therefore which models best describe the behaviour of the tested concrete in uniaxial tension. The part of the conclusions is also a polemic on topic of other possible tests of mechanical properties of concrete in tension.

Corresponding Author: Petr Král

SHORT TIME AND LONG TERMS LOADS RESEARCH OF REINFORCED CONCRETE BEAMS WITH THE USE OF RECYCLED AGGREGATES

Barbara Sadowska-Buraczewska

Bialystok University of Technology, 15-351 Bialystok Str. Wiejska 45A, Poland

ABSTRACT

The paper presents experimental studies of model reinforced concrete beams with a rectangular section using high-performance recycled aggregates. The experimental analyses conducted as immediate studies concerned the following: short time loads - deflection, carrying capacity, strain of concrete, cracks and long term loads – deflection. The comparative analysis entails the behaviour of beam made of concretes using HSC-HPC recycled aggregates with model control elements made of regular concrete based on natural aggregates. The programme involved four main stages. The first stage consisted in preparing the specimens and performing strength tests on recycled aggregate concrete (50% and 100% of aggregate) and on natural aggregate concrete specimens. The second stage included momentary measurements of model reinforced concrete beams manufactured using recycled aggregate, and control beams made of high-performance concrete exclusively, as well as beams made of normal concrete based on natural aggregate, regarding the following: the deflection, concrete deformability along the height of the beam, damage, and carrying capacity. At the third stage, long-term measurements of the deflection were performed. The summary of the research was the fourth stage.

FINITE ELEMENT MODELLING OF WIDE-FLANGE BRACES UNDER CYCLIC LOADING

Madhar Haddad [1], Nigel Shrive [2]

[1] Architectural Engineering Department, UAE University, 15551, Al Ain, United Arab Emirates
[2] Civil Engineering Department, University of Calgary, T2N 1N4, Calgary, Alberta, Canada

ABSTRACT

Wide flange (WF) steel brace members are increasingly used in framed structures to resist seismic excitations. In the current study, a finite element model with a refined fracture model is presented. A nonlinear elasto-plastic finite element model is used to simulate the behaviour of selected WF steel members connected to gusset plates at their ends when subjected to reversed axial displacements. Four-node finite membrane strain quadrilateral shell elements are used to model the WF brace members. Fixed boundary conditions are applied at the ends of the WF braces with axial displacements imposed for each cycle. The model is able to simulate the hysteresis behaviour and to predict the fracture life of the WF brace members. The effect of the number of integration points, the mesh density and the thickness of the gusset plate on the hysteresis behaviour and fracture life of the members is investigated. The model is able to simulate the shift in location of the mid-length plastic hinge. True stress-strain curves are used in modelling the WF brace members, together with a combined isotropic-kinematic hardening model. It is recommended to reduce the tangent modulus of the engineering stress-strain curve before converting it to a true stress-strain curve to account for the accumulated increase in heat that can promote the movement of dislocations during cyclic loading.

Corresponding Author: Madhar Haddad

DESIGN AND RESEARCH OF THE BENDING TEST SET-UP FOR THE LONGITUDINAL JOINTS IN SEGMENTAL TUNNEL LININGS

Jinfeng Zhang, Ming Zhao

Department of Civil Engineering, No.1239 Siping Road, Tongji University, Shanghai, China

ABSTRACT

As a weak link of the segmental lining ring in the shield tunnel, joints are main reasons for large deformation which further lead to various diseases during the tunnel construction and operation. These diseases, including water leakage, dislocation, joint opening, concrete crack etc., are detrimental to the safety and durability of the tunnel structure. In order to better understand the mechanical behaviour of joints, especially the longitudinal joints, much more attention have been paid to carry out corresponding experimental study. However, the design of the test-up is rarely covered in a lot of literature, which is also a critical factor for a successful experiment. In this paper, a test-up used for experimental study of the longitudinal joints in segmental tunnel rings was designed and executed in detail. The test device needs to meet both the test site requirements of the Building Structure Laboratory of Tongji University and the bearing capacity requirements under the maximum test load. After calculating the maximum horizontal and vertical test loads, the design of the test device system was completed. The set-up included a short column, transverse and longitudinal loading beams, hinge supports, segment sleeves, supporting platforms and pillars. The test device can realize bidirectional loading and meet the requirement of large deformation during the test, which can provide a reference for the design of similar and even more sophisticated segmental joint test devices in the future.

Corresponding Author: Ming Zhao

TENSILE TESTS OF EMBEDDED LAMINATED GLASS CONNECTIONS

Michaela Zdražilová, Zdeněk Sokol, Martina Eliášová

CTU in Prague, Faculty of Civil Engineering, Department of Steel and Timber Structures, Thákurova 7, 166 29 Prague 6, Czech Republic

ABSTRACT

The trend of modern architecture is heading towards maximum transparency of structures, which makes glass very popular building material. It becomes common to use glass as a material for load-bearing components. Glass facades, roofs, beams or columns must be able to bear stresses occurring during the lifetime period and meet high aesthetical standards at the same time. The most problematic parts of the glass structure design are usually the connections. A lot of alternative connection types have been developed so far. Embedded laminated glass connection is the most modern one and there are many ongoing researches focused on its characteristics. This paper is dealing with series of tests focused on embedded laminated glass connections under short-term tensile loads. Different combinations of glass panes and types of foils were tested. The main goal of the experiment was to determine the tensile resistance of this type of connection. However, all the visible changes of appearance (development of bubbles in the connection area or possible delamination) that occurred during the test and the mode of failure were carefully observed and noted. There were three failure modes that were expected to arise. First one is the failure of the weakened glass pane due to reaching the tensile resistance limit. Second way is represented by the failure of foil caused by reaching the normal stress resistance limit and the last failure mode is caused by delamination. It occurs when the tear resistance limit is reached and the steel element separates from the foil. The samples were subjected to several loading and unloading cycles. During the tests, the deflection of the glass panel was measured at two points. The experiment shows that the majority of samples collapsed because of the failure of weakened glass pane. Nevertheless, further research consisting of additional tests and numerical modelling is in progress.

Corresponding Author: Michaela Zdražilová

TORSIONAL BEHAVIOUR OF IRREGULAR BUILDINGS WITH SINGLE ECCENTRICITY

Mohamed Sherif Mehana [1], Osama Mohamed [2], Feda Isam [2]

[1] UNii Engineering Consultancy, PO Box 47378, Abu Dhabi, UAE
[2] Abu Dhabi University, College of Engineering, PO Box 59911, Abu Dhabi, UAE

ABSTRACT

Most building codes require consideration of structural response to two types of torsion: (a) inherent torsion which arises from eccentricity between the centre of mass and the centre of stiffness distribution, which causes a torsional response coupled with a translational response and, (b) accidental torsion arising from accidental causes, including the rotational component of ground motion about a vertical axis, the difference (eccentricity) between assumed and actual stiffness and mass, uncertainty in live load distribution, uncertainties in dead loads due to variations in workmanship and materials. This paper addresses the effect on the torsional response of the ratio, Ω, between two uncoupled frequencies, namely, the structure torsional frequency (ω_Θ), and the transition frequency (ω_x) or (ω_y). A parameter study is conducted on a single story building with variable values of Ω, subjected equivalent static seismic. A horizontal ground motion is applied in one direction and the responses indicate that a structures with Ω > 1.0 is torsionally stiff and displacements magnitudes are not sensitive to increments in eccentricity ratio. In other words, the structure shows planer frame behaviour and the displacements are caused mostly by structural translation with limited or no torsion-induced rotation. Conversely structures with Ω < 1.0 are torsionally flexible and displacements are sensitive to the increment in eccentricity ratio. Therefore, responses in this case are mostly torsion-induced rotations with limited or no translation. It is also observed that the scenario when translational and torsional frequencies are equal, i.e. Ω = 1.0, does not correspond to any substantial amplification in response quantities, therefore, there is no frequency ratio resonance when a single story building is subjected to horizontal ground motion in one direction. Torsional irregularity coefficient as defined by ASCE 7-10 building code, i.e., the ratio between maximum story drift at one end of the structure to the average story drifts at the two ends of the structure, hs been determined for various values of Ω. Results shows that irregularity coefficient increases as the uncoupled frequencies ratio, Ω, decreases. In addition, structures with uncoupled frequency ratio Ω < 1.0 are more sensitive to the magnitude of eccentricity between centre of mass and centre of rigidity. Therefore, irregularity coefficient increases dramatically and significant torsion occurs as the value of eccentricity increases for structures with uncoupled ratio Ω < 1.0, while limited increase is observed on the value of irregularity coefficient when eccentricity increases. It is most likely for structural designers to control the torsional behaviour of the building by calculating building eccentricity only, however, this paper discusses the importance of determining the uncoupled frequency ratio (Ω) for the building in order to control the torsional behaviour and obtain more economic structure system.

Corresponding Author: Mohamed Sherif Mehana

CASE STUDY: THE STRENGTHENING AND REHABILITATION OF A SCHOOL BUILDING WITH POOR CONSTRUCTION QUALITY

Asish Seeboo, Laksham Sanassee

University of Mauritius, Reduit 80837, Mauritius

ABSTRACT

Old infrastructure in most small islands developing states were built with poor construction quality leading to reduced concrete strength and load changes in these buildings are very common. Consequently, these structures have shown signs of premature damages and their service life remain elusive. This article deals with the inspection, assessment and strengthening of a reinforced concrete building, in Mauritius that is currently being used as a public school. The building was built in the year two thousand and is two storeys high. The establishment wants to add an additional storey on the existing building to increase student population. However, the building is showing signs of distress resulted from poor construction quality. The columns are misaligned on all three levels and the slab thickness is inadequate causing excessive vibration on the floors. The managements are not in favour of pulling down the existing building as they will have to abide by the new building regulations which will consequently decrease the allowable buildable area and will cause major disruption to the day to day activities. Therefore, the most feasible solution is to strengthen the load carrying capacity of members which have become structurally deficient over time to make the building safe and adopt to the addition of one storey above the existing building.

Corresponding Author: Laksham Sanassee

DESIGN CONSIDERATIONS AND GUIDELINES IN THE USE OF GRADE 600 STEEL REINFORCEMENTS FOR REINFORCED CONCRETE CONSTRUCTION

Teng Hooi Tan[1], Ngoc Ba Nguyen[2] and Bing Li[3]

[1] School of Science and Technology, Singapore University of Social Sciences, Singapore
[2] Tham & Wong (VN) Co. Ltd, Vietnam
[3] School of Civil and Environmental Engineering, Nanyang Technological University, Singapore

ABSTRACT

There is growing interest within the construction industry in using Grade 600 reinforcing steel for certain applications. There are areas where Grade 600 steel reinforcement can help include improvement in construction efficiencies and reduction in manpower. However, the implementation of these Grade 600 reinforcements in designs and construction still pose some challenges, as a number of unresolved design issues still remain. Notably current EC 2 design provisions do not provide explicit guidelines on the use of these high strength steel reinforcements and may not have addressed some distinctive performance characteristics. This paper lists potential issues with the use of Grade 600 reinforcement, and also provides a comprehensive assessment of available literature on the impact of Grade 600 steel reinforcement on design practices.

Corresponding Author: Teng Hooi Tan

EVALUATION OF THE EFFECTS OF SERVICE CORE REDUCTION ON TALL BUILDING STRUCTURES

Beste Fakıoğlu, Bekir Özer Ay

Dept. of Architecture, Middle East Technical University, Ankara, Turkey

ABSTRACT

One of the primary goals in tall building design is the optimum design of service core in which the vertical transportation, building services, HVAC elements etc. are situated. Particularly for supertall (+300) office buildings, most of the space is occupied by elevators when compared to the rest of the service core elements. Indeed, with the utilization of recently developed elevator technologies, it is possible to decrease the elevator footprint area and thereby to decrease the service core area. Nevertheless, the core of a tall building usually is a part of the lateral load resisting system, namely as a structural core. The aim of this study is to investigate the effects of service core reduction due to the elevator footprint decrease on interior and exterior tall building structures. Generic computer models of outriggered frame and framed-tube buildings with 300m height (75 story) are produced. Then, the service core area of both buildings are decreased considering the effects of recent advances in elevator industry. All building models are subjected to lateral loads. The strength and the stiffness constraints as well as serviceability of primary and reduced core buildings with outriggered frame and framed-tube systems are compared. Thereafter, primary and reduced core buildings of both structural systems are evaluated in terms of the change in top drift to building height ratio, the increase in leasable area and to access to natural light.

Corresponding Author: Bekir Özer Ay

LARGE SCALE MONITORING SYSTEM FOR EXISTING STRUCTURES AND INFRASTRUCTURES

Gabriele Bertagnoli [1], Marzia Malavisi [1], Giuseppe Mancini [2]

[1] Politecnico di Torino, DISEG, Corso Duca degli Abruzzi, 24, Torino Italy
[2] Sintecna s.r.l., Corso Massimo d'Azeglio 118, Torino, Italy

ABSTRACT

Most of the key structures of highways and railways systems in Europe and North America has been built after Second World War during the economic boom that took place between the 50s and the 70s of the last century. This heritage of existing infrastructures and building of the "Western World" is nowadays subject to a natural and gradual aging process, induced by the progressive deterioration and the age of the structures, which causes a consequent functional obsolescence. This process develops with continuity and therefore can be controlled over time and can become foreseeable in most cases. Adequate scheduled maintenance can then be applied to keep the safety levels and the performance of the structures aligned with standards requirements. The best way to control ageing and deterioration is the implementation and installation of diagnostic systems for the estimation of constructions safety levels and operating conditions. This monitoring systems are known and used since many decades, but have never been toughly applied as a standard in civil engineering works as it has happened for instance to the automotive field. Traditional monitoring systems of infrastructures require careful assessment of the current state of the artefacts, through detailed and targeted surveys, expensive laboratory instruments and highly skilled labour. On the other hand, during the last decade, the evolution of low cost sensors derived from TLC industry, the development of high-speed internet communication, the birth of cloud based services and the rise of big data platforms able to apply artificial intelligence techniques, have changed the possible scenario of structural monitoring. Structural Health Monitoring (SHM) can now be deployed on large scale to infrastructures as a standard option (even since construction) and not only when specific pathologies are found. This article presents some diagnostic systems based on an innovative, affordable and minimally invasive monitoring, able to provide the user with real-time information on the state of health of the structure. The system is composed of low-cost sensors, capable of monitoring various physical quantities, and connected to each other with different technologies for data transfer and sensor power supply. The recorded data are initially processed directly on board, then sent to the cloud, where they can be further processed or made available for subsequent processing or for a comparison with the expected response calculated using mathematical models of the structure.

Corresponding Author: Gabriele Bertagnoli

EVALUATION OF INTERNAL ACTIONS IN TUNNEL LINING APPLYING GENETIC ALGORITHMS TO MONITORING DATA

Gabriele Bertagnoli, Francesco Marino

Politecnico di Torino, DISEG, Corso Duca degli Abruzzi, 24, Torino Italy

ABSTRACT

The design of modern infrastructures, both for road and railway transport, is today oriented to the realization of underground structures, such as tunnels, more than in the past. The reduction of the cost of tunnel excavation, because of the widespread use of tunnel boring machines (TBM) and ecology issues as the protection of landscape and noise reduction have significantly increased the use of tunnels instead of viaducts or other solutions in modern transportation engineering. Tunnel excavation is nevertheless a procedure that faces the designer to many unknowns, mainly because of the high variability of geological and geotechnical parameters that may be found during the realization. The cost related to the realization of extended investigation campaigns in the design phase typically leads to the assumption of higher risks and therefore higher safety coefficients, respect to other civil engineering structures such as buildings or bridges. Monitoring of tunnels during excavation is today a standard approach, but structural health monitoring (SHM) of this structures throughout the complete service life is not a widespread technique. During the last decade, the evolution of low cost sensors derived from TLC industry, the development of high-speed internet communication, the birth of cloud based services and the rise of big data platforms able to apply artificial intelligence techniques, have changed the possible applications of structural monitoring that can now be deployed on large scale to infrastructures as a standard option. This article presents an algorithm that can be applied to an innovative diagnostic system for tunnels based on small and low-cost sensors that can be placed inside the tunnel lining and are able to provide the user with real-time information on the state of health of the structure. The aim of the system is measuring the internal actions (axial force, bending moment and shear) and the ovalization of the lining because of the actions exchanged between the ground and the lining itself. The algorithm presented in this paper aims to calculate the forces acting on tunnel lining starting only from the quantities measured by a set of clinometers and pressure sensors placed inside the casting, without any other knowledge of geotechnical or geological parameters. This method can therefore be applied in parallel with other traditional geotechnical investigation tools such as borehole inclinometers and radar interferometry when unexpected actions as landslides are interesting a tunnel.

Corresponding Author: Gabriele Bertagnoli

STABILITY ANALYSIS OF COMPRESSION MEMBER ON ELASTIC SPRINGS

Ivan Baláž, Yvona Koleková, Lýdia Moroczová

Department of Metal and Timber Structures, Faculty of Civil Engineering, STU in Bratislava, Radlinského 11, 812 43 Bratislava, Slovak Republic

ABSTRACT

Part of the large parametric study focused on the stability behaviour of compression single members and the member structures with various loadings and boundary conditions is presented here. This part relates to the stability analysis of the compression member on elastic springs. The span of the member $L = n\ell$, where ℓ is the length of the panel which equals to the distance between the neighbouring elastic springs. The members under investigation have seven various numbers of the panels $n = 2, 3, 4, 5, 6, 7$ and ∞. The members have uniform bending rigidity EI, uniform normal force N and $(n - 1)$ elastic springs with equal spring stiffness C_w. The results are presented in the form of eight diagrams. The curves of diagrams were replaced by the straight lines to be able derived approximate formulae for calculation of the critical force. It is shown that approximate formulae give the values of the critical forces $F_{cr.a}$ which differ from diagram values F_{cr} less than 3.3 %, being slightly on the safe side. The values of the critical forces F_{cr} obtained from the solution of the stability equation are verified by comparisons with results $F_{cr.IQ}$ of the computer program IQ 100. Excellent agreement is achieved between $F_{cr.IQ}$ and F_{cr}. The presented solution of the compression member on elastic springs may be used also for the calculation of the critical force of the compression member on elastic foundation. The solution given in the paper creates scientific background needed in the design of the semi-through bridge trusses.

Corresponding Author: Ivan Baláž

Session Title:

Building Performance & Simulation

ANALYSIS OF BUILDING SECTOR PERFORMANCE

Vojtěch Stehel, Radimír Novotný, Aleš Kaňkovský

Institute of Technology & Business in Ceske Budejovice Ceske Budejovice, Czech Republic

ABSTRACT

Economic performance of a company depends on many factors. They can include factors easy to influence by the company (internal factors) or factors that are very difficult to influence (external factors). An example of an external factor is e.g. the development of economy. Internal factors include e.g. assets structure and liabilities. Other factors a company can influence is income structure and diversification. The contribution analyzes a structure of these parameters for building companies in the Czech Republic between 2012 and 2017. For the analysis, statements of the Czech Statistical Office for the companies with more than 500 employees were used. The statistical survey was conducted 4 times a year; obligatory participation of the companies in the survey resulted from the obligations related to the legislation in force. Company performance assessment is based on the Economic Value Added (EVA) considering not only the performance as such (profit), but also the risk that the company or owner takes in the market. For the analysis, especially financial analysis tools are used, when financial statements of building companies in the given economy are analyzed. Furthermore, statistical methods for assessing categories of companies are used with the aim to describe clearly the significant differences between the individual categories. In total, 4 categories were determined (ranging from the best performing companies to the companies where a collapse is very likely). The objective of the analysis is to identify an optimal structure of a building company (machines, inventory, or material), method of its financing, and a suitable diversification of income sources from the perspective of financial statement. The results show that significant differences in these structures can be identified and that the individual structures have a great impact on the overall company performance. In practice, the results of the analysis create a benchmark for a building company management in the given economy. The analyses took into account seasonality typical for the given sector.

Corresponding Author: Vojtěch Stehel

RADIATIVE HEAT TRANSFER IN BUILDINGS

Tomáš Ficker

Brno University of Technology, Faculty of Civil Engineering, Veveří 95, CZ-602 00 Brno, Czech Republic

ABSTRACT

In the field of building physics, heat and moisture transports are often studied. These transports represent core problem in building performances. The heat transport is often investigated as heat conduction through building envelopes but the heat transfer inside buildings usually remains overlooked. The heat transfer in closed spaces may consist of conduction, convection and radiation. In thermal equilibrium, these transports compensate not only heat losses going through building envelopes but they may influence the temperatures of interior surfaces that occasionally suffer from the condensation of water vapors. So far, the thermal building technology has investigated heat losses prevalently as simple heat conduction through building envelopes along with ventilation (infiltration or exfiltration). Such an approximation avoids considering an alternative procedure taking into account *direct* radiative and convective heat flows from interior heating sources towards exterior spaces. For this purpose, it is necessary to have a computational formalism capable of determining the radiative heat flows established in interiors of buildings. The recent monographs provide such formalism only for gray or black bodies but not for their mixture. In this contribution, the general formalism for the computation of radiative heat flows between black and grey bodies is derived. The formalism consists of the system of equations specifying radiosities, heat fluxes and heat flows related to each surface of the interior. It is shown that this *general system* of equations may be reduced *to two particular systems* holding separately for black and grey bodies. In this way, the universality of the developed computational formalism is documented.

RADIOSITY MODEL AND COMPENSATION THEOREM

Tomáš Ficker

Brno University of Technology, Faculty of Civil Engineering, Veveří 95, CZ-602 00 Brno, Czech Republic

ABSTRACT

In the preceding conference contribution called “Radiative Heat Transfer in Buildings”, a general model for radiative heat transfer in inner spaces of buildings has been developed. The model is capable of determining radiosities, heat fluxes and heat flows with each surface of the interior. In *closed* spaces like interiors, the radiative energy should be conserved so that the *total* heat flow should be zero. This property may be formulated as the *compensation theorem* and should be mirrored in each reasonable model. Thus, it is desirable to verify whether our developed model satisfies such a property. The mathematical proof has been presented which has confirmed that the developed model obeys the compensation theorem. As a numerical illustration, radiative heat flows in a simple room have been computed and their *total* sum has been quantified and shown that this summation leads to zero value. The numerical illustrations start with formulating matrix of view factors that describe the *‘mutual visibility’* of interior surfaces and in this way they assist to redistribute radiative heat among the interior surfaces. As soon as the matrix of view factors is established, the system of algebraic equations is formed. These equations serve for computing surface radiosities. The radiosities enable estimating heat fluxes and heat flows occurring in the interior. Some of the heat flows are positive and some are negative. The positive value of heat flow means that the corresponding surface emits energy into the interior whereas the negative value indicates that the corresponding surface absorbs energy from the interior. By summing the positive and negative values of heat flows, the total heat flow can be obtained whose value is zero in agreement with the *compensation theorem*.

ESTIMATIONS OF RADIATIVE HEAT TRANSFERS IN ENCLOSURES

Tomáš Ficker

Brno University of Technology, Faculty of Civil Engineering, Veveří 95, CZ-602 00 Brno, Czech Republic

ABSTRACT

In *large* closed spaces of buildings, the heat radiation dominates over the other two transfer mechanisms, i.e. over conduction and convection. This fact may be easily illustrated on the basis of the Stefan-Boltzmann law, Fourier's law and convective correlations of Nusselt's number. For this reason, when the computations of heat losses of buildings are performed, the radiative heat transfers running between inner sources of heat and inner surfaces of walls should not be overlooked. This conference contribution is devoted to such problems. In the preceding two conference contributions called "Radiative Heat Transfer in Buildings" and "Radiosity model and compensation theorem", a general model for radiative heat transfer in inner spaces of buildings has been developed and completed by the compensation theorem. This theorem mirrors the basic property of closed building envelopes stating that the *total* radiative heat flow in a closed envelope is zero. The present conference contribution thematically continues the preceding two contributions and applies their theoretical results to the case of radiative heat flows established within a living room consisting of 6 different grey interior surfaces. The surfaces mutually differ in temperatures and emissivities. Such an arrangement represents a real room without too much simplification. The corresponding matrix of view factors has 36 elements determined on the basis of formulae and graphs published in the technical literature. The system of 6 equations determines the 6 values of radiosities belonging to 6 interior surfaces. The radiosities represent auxiliary values that facilitate finding the heat fluxes and heat flows associated with each inner surface of the room. The sum of all the obtained positive and negative values of the heat flows has resulted in zero value which documents validity of the compensation theorem also in this complicated enclosure consisting of 6 thermodynamically different surfaces.

PAVING THE WAY TO NZEB OF TWO HISTORICAL BLOCKS IN LISBON POMBALINE QUARTER

Carlos Duarte, António Morais

University of Lisbon, Faculty of Architecture, Research Centre for Architecture, Urbanism and Design, Rua Sá Nogueira, Polo Universitário, Alto da Ajuda, 1349-055, Lisbon, Portugal

ABSTRACT

The 1758 Lisbon Pombaline Quarter reconstruction plan is made of compact rectangular shaped residential blocks, built with a system that complies solid mass construction elements with a light wooden structure. If we take into consideration both constructive and architectural inherent features of the original Pombaline block, it shows the potential to achieve NZEB level if an energy retrofit strategy at a block scale is implemented, instead of the usual single building or fraction approach. The retrofit of historic buildings has raised questions regarding interventions depth and efficiency, as the impact on the built heritage value has to be residual or null while energy-related improvements must be noticeable. With this in mind, this paper intends to analyse and compare the result on energy demand and primary energy consumption of passive, active and BIST/PV systems packages implementation on two original blocks, with the challenge of minimizing the impact on case studies appearance. A Building Energy Simulation methodology is applied using the whole-of-building dynamic simulation software EnergyPlus. The results show that exterior envelope improvements can reduce up to 50% heating and cooling energy demands increasing thermal comfort at the same time. Finally, a combined VRF/Biomass heating solution display the best results on primary energy consumption while photovoltaic and solar thermal systems proved to have an essential role to achieve NZEB performance.

Corresponding Author: Carlos Duarte

BUILDING ENERGY SIMULATION IN EUROPEAN HISTORIC BUILINGS: A REVIEW

Antonio Martinez-Molina [1], John D. Murphy Jr. [2]

[1] Department of Architecture, University of Texas at San Antonio (UTSA), 501 W. Cesar E. Chavez Blvd., San Antonio, TX 78205, USA

[2] College of Architecture, Construction and Planning (CACP), University of Texas at San Antonio (UTSA), 501 W. Cesar E. Chavez Blvd., San Antonio, TX 78205, USA

ABSTRACT

In the last decade the importance of building energy efficiency and thermal comfort in historic buildings has increased immensely, as evidenced by the many research projects and initiatives that have been undertaken. Proper energy retrofits of heritage buildings undoubtedly contribute not only to reducing carbon emissions and energy consumption, while enhancing sustainable development and improving indoor thermal comfort, but also to maintaining cultural and historic legacies. We should therefore aim to preserve built heritage for future generations. The best way to accomplish this goal by adapting historic structures to modern comfort and environmental standards and thereby keeping them in use. Research has demonstrated that building energy simulations are a key tool when trying to achieve this ambitious goal. This study is an extensive overview of the literature surrounding this topic. This paper summarizes the different methods and techniques that have been used in Europe to achieve performance refurbishments using energy simulations. Articles are organized based on the different building types that were used as case studies. The results reveal what building typologies, software and methodologies have been most often used. Moreover, Europe, and particularly Italy, is leading the research. The aim of this note is to demonstrate the feasibility of maintaining built heritage values of European historic buildings while achieving significant improvements in their energy efficiency and thermal comfort levels through energy simulations. The strategies, projects and ideas discussed herein provide useful examples for cities and governments worldwide.

Corresponding Author: Antonio Martinez-Molina

THERMAL TRANSMITTANCE AROUND EDGE VACUUM GLAZING

Ivan Chmúrny

Slovak Technical University, Radlinskeho 11, 810 05 Bratislava, Slovakia

ABSTRACT

The main objective of the calculations thermal performance properties of the edge of vacuum glazing was the quantification of the heat flow around edge of glazing. Additional heat flow around edge of glazing is expressed by means linear thermal transmittance. Linear thermal transmittance of the junction between edge vacuum glazing and wooden frame or wooden-aluminium frame was calculated by using a two dimensional (2D) numerical calculations. Edge sealing of vacuum glazing is assumed by means solder glass with Indium metal strip, so it is metal-based edge seal. In vacuum glazing the edge seal acts as a thermal bridge between the glass sheets. Heat flows from the glass sheet on the warm side through the edge seal to the sheet on the cold side, not only does it increase the overall thermal performance of the glazing, but also it causes temperature variation (decrease surface temperatures) and stress in the edge region.

DAMPING PROBLEM OF NUMERICAL SIMULATION OF STRUCTURAL REVERBERATION TIME

Krzysztof Nering

Cracow University of Technology, Warszawska 24 St., 31-155 Cracow, Poland

ABSTRACT

Finite element simulations of sound insulation are very problematic due to problem of damping. Omitting damping issues in dynamic analysis, which in conclusions leads to acoustic performance of system may reflect in non-reliable results. In this paper study using different values of Rayleigh damping and viscous damping characteristic for Explicit analysis. Due to fact that applying β-coefficient of Rayleigh damping may lead to non-convergent result, substitution of linear bulk viscosity parameter and quadratic bulk viscosity parameter is preferred. These parameters where accompanied by α-coefficient of Rayleigh damping. To investigate behaviour of structure under different damping structural reverberation time and total loss factor is calculated. Analysis is performed on slabs 10, 20, and 40 [cm] thick. Load on structure was applied in 3 different points with unit pressure on small area (5x5 [cm]) using amplitude of load as Dirac delta approximation. Results shown mid and high frequencies affected by viscous damping and low frequencies by Rayleigh damping. Without mass damping α-coefficient equals to zero in subresonant zone (below first mode of structure) there was no possibility to calculate structural reverberation time properly. As a result, in this analysis it can be stated that damping is crucial issue to reflect acoustical behaviour of considered structure. Stiffness matrix modifier β-coefficient of Rayleigh damping is also investigated in this article to provide answer if it could be substituted by linear bulk viscosity parameter and quadratic bulk viscosity parameter but only in homogenous structures. It is motivated by fact, that these parameters are applied to whole model, not to material.

ANALYSIS OF BUILDING ENVELOPES BY MEANS OF ADVANCED THERMAL SIMULATION TOOLS

Fernando del Ama, Hunter Davis, Cameron Aylward, Danielle Pinette, Audrey Oberst

Keene state College, 229 Main St. Keene, New Hampshire 03435, USA

ABSTRACT

Buildings represent complex systems with high levels of inter-dependence on many external sources. Building users are demanding more quality and this complexity is growing. Integrating new technologies, increasing the comfort levels and reducing the energy consumption are the challenges of current building designers. Building envelope expertise is part of the building process, from pre-design through post-occupancy. Building modeling and simulation can be the right way to approach to dynamic outdoor and indoor conditions. Building energy models are primarily used at the design stage, usually for the purpose of energy code compliance certification. The aim of this article is the validation of simulation tools in Zero energy residential buildings. A comprehensive validation methodology should consist of a literature review, analytical verification, comparison of the same model behavior on different software and empirical validation. The main effort will be put on analyzing the discrepancy between predicted energy consumption of the same building using different Energy simulation software. Combining simulation at the design stage and monitoring the operation of the building will lead building owners and designers to understand how buildings and sites can become energy producers. Finally, the last section of this article will provide building designers with a catalogue of tested solutions to achieve zero energy buildings.

Corresponding Author: Fernando del Ama

NUMERICAL SIMULATION AND EXPERIMENTAL STUDY OF A DEPLOYABLE FOOTBRIDGE

Fernando del Ama [1], Mariano Molina [2], Covadonga Lorenzo [2], Maria I. Castilla [2], Dolores Gomez Pulido [3], Juan G. Millan [2], Juan C. Sancho [2]

[1] Keene state College, 229 Main St. Keene, New Hampshire 03435, USA
[2] EPS CEU San Pablo University, Madrid, Spain
[3] Instituto de Ciencias de la Construccion Eduardo Torroja (CSIC), Madrid, Spain

ABSTRACT

Spatial structures with bars have been used in different fields since the beginning of the 20th century. These were first used in aerospace industry to obtain lightweight structures and it was as of 1930 when their use in construction became widespread, especially in roofs with big spans. Deployable structures can be considered a special case within the broader class of spatial structures. They can be transformed from a closed compact configuration to a predetermined expanded form. There is a wide range of applications, such as temporary construction and roofing systems, or for movable elements in the aerospace industry. This article describes a deployable structure that has been patented by researchers of San Pablo CEU University and Eduardo Torroja Institute of Madrid, Spain. The presented invention optimizes the material needed to fulfil the safety requirements according to the span it covers. It has a folding and unfolding system that makes transport easier and cheaper. It is versatile, since it adapts perfectly to many different uses with a reduced number of elements and it also reduces the cost by making the best possible use of the materials. Specifically for space deployable structures the main challenge remains to ensure high reliability in deployed geometry, stiffness and function.The goal of this article is to simulate different options to reduce the axial stress and the deflection of a 40-meter span deployable structure. Firstly, the basic elements that define the system will be described; secondly a first analysis on software SAP2000 will be shown; finally, this paper presents the procedure and methodology to improve the shape of a structure through optimization, and to control the deflection at mid span by means of post-tensioning.

Corresponding Author: Fernando del Ama

RESEARCH ON MECHANICAL BEHAVIOR OF HIGH-RISE DIAGONAL GRID TUBE STRUCTURE AND CASE STUDY

Qian Fu [1], Xuerong Wang [1], Dai Tao [2]

[1] School of Information Engineering, Nanjing Audit University, Nanjing 211815, China
[2] China Shanghai Architectural Design & Research Institute Co., Ltd., Shanghai 200063, China

ABSTRACT

In order to obtain the mechanical characteristics of high-rise diagonal grid tube structure under horizontal and vertical loads, three types of structure model were established by the finite element software Etabs respectively, which were diagonal grid tube structure, diagonal grid –frame tube and framed tube structure, to analyze the laws, such as the internal force distribution, the interstory displacement, the base shear and the shear hysteresis effect. The results showed that Compared with the frame tube structure, the oblique grid cylinder structure had the characteristics of larger stiffness and shorter period. Under the horizontal seismic load, the total shear force of the oblique grid structure was 20% higher than that of the frame tube structure, but the interlayer shear force and the interlayer displacement angle distribution were basically the same. The inclining column to the diagonal grid structure could effectively enhance the lateral stiffness in its plane, but improve less out of its plane. Under the action of lateral load, the shear lag effect existed, especially in the flange inclined column. Subsequently, the finite element software ABAQUS was used to analyze the dynamic elastoplastic time history of a one-way oblique grid system high-rise building under rare earthquakes. The results showed that the maximum interlayer displacement of the structure was less than the specification limit, and the structure could achieve the seismic fortification target of no collapsing in the strong earthquake. The diagonal grid could be used as a part of the overall structure for high-rise or super-tall buildings in seismic zones.

Corresponding Author: Xuerong Wang

ANALYSIS OF THE THERMAL CONDUCTIVITY COEFFICIENT FOR MORTARS OF DIFFERING CEMENT TYPE AND WATER/CEMENT RATIOS

Agata Stolarska, Jarosław Strzałkowski, Piotr Szwejkowski

Department of Building Physics and Building Materials, Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology Szczecin, al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

This study examines the thermal conductivity of cement mortars which differ in their cement type and water/cement ratio. As part of this study, the effect of dampness on the thermal conductivity coefficient was tested using nine mortar types. The study consisted of producing nine 25x25x6 cm samples of mortar on the basis of three different types of cements, namely: CEM I 42.5R; CEM II A-S 52.5N, and CEM III A 42.5N. Of each cement type, three samples were additionally produced which differed according to their water/cement ratio. Three values of the w/c ratio were tested: 0.5; 0.55; 0.6. After 28 days from mixing, the surfaces of the obtained samples were evened so that they could fit tightly against the heating and cooling plates of the heat flow meter. Next, the samples were inventoried and dried to constant weight at a temperature of 105°C. Testing was carried out using a stationary method by means of the GHP8302.3 heat flow meter with guarded heating plate. Measures were taken at three temperature levels each time with the difference of 20°C. The tested ranges were: 5-25°C; 10-30°C, and 15-35°C The next stage was soaking the samples and re-testing them using the heat flow meter at the same temperature ranges. The tests performed allowed for determination of the density of samples, absorbability and thermal conductivity in two states: dry and soaked. While the density of dry mortars ranged from 1.97 to 2.06 kg/dm^3, the maximum absorbability measured was 9.3%. The values were used to determine the relationship between the measured parameters for the nine mortars tested. Also, an adverse effect of dampness on the thermal insulation of the studied materials was confirmed. In extreme cases, the increase in thermal conductivity due to material dampness was 81%. In addition, the results demonstrated the effect of the adopted temperature ranges on the obtained values of the thermal conductivity coefficient.

Corresponding Author: Jarosław Strzałkowski

AUTOMATED FLOOR PLAN EVALUATION APPLICATION FOR RESIDENTIAL STRUCTURE REMODELING

Seungbum Koo [1], Hyeongmin Ryu [2], Cheolhong Kim [3], Jinyoung Kim [2]

[1] Engineering Research Institute, Ajou University, 206 Worldcup-ro, Yeongtong-gu, Suwon, 16499, South Korea
[2] Department of Architectural Engineering, Ajou University, 206 Worldcup-ro, Yeongtong-gu, Suwon, 16499, South Korea
[3] Department of Software and Computer Engineering, Ajou University, 206 Worldcup-ro, Yeongtong-gu, Suwon, 16499, South Korea

ABSTRACT

This article focuses on the development of a computer application targeted explicitly for use in residential building remodeling projects. Remodeling of a structure reuses much of the structural frames and load-bearing walls as possible; however, they are still subject to change and be modified as the new floor plan requires. A necessary structural evaluation must follow as the modification in the load-carrying element shall take place; nevertheless, as the remodeling project involves a multitude of entities with different stakes, an overwhelming number of floor plans are proposed, and the opinion converging process of the individual's preference on to an agreed floor plan is long and painful. Consequently, the evaluation is typically bypassed and postponed until a finalized floor plan is determined. The application is developed to resolve both problems: volume and stake. The automation in the evaluation process makes the qualitative structural evaluation possible. With a little preprocessing on the floor plan proposals, the application reads the drawing and returns various supportive information regarding the structural performance almost instantly. The structural engineers could refer to this information and help them determine if the floor plan should be accepted or revised. In addition, as such information for the engineers should be inapprehensible for the non-professionals, the application also provides an abstract index that reveals the qualitative structural performance based on the configuration change in the load-bearing walls of the imported floor plan. With these two main functions, people with structural engineering background can conduct the qualitative evaluation, which was not viable therefore bypassed, and estimate the structural performance of the proposed floor plans. Also, the people without such knowledge can have a sense in the performance of the current proposal compare to the original floor plan from the provided abstract index. As the application makes the qualitative structural evaluation possible and lets the multitude of entities to share a common understanding of the structural performance on a proposed floor plan, communication amongst them shall be more fluent; hence the process to have an agreed floor plan shall be expedited.

Corresponding Author: Jinyoung Kim

NUMERICAL STUDY OF APPLICATION OF PCM FOR PASSIVE THERMAL ENERGY STORAGE SYSTEM FOR SPACE COOLING IN RESIDENTIAL BUILDINGS

Sandris Ručevskis, Pavel Akishin, Aleksandrs Korjakins

Institute of Materials and Structures, Riga Technical University, Kipsalas iela 6A, Riga, LV-1048, Latvia

ABSTRACT

Conventional heating, ventilating, and air conditioning systems are responsible for most of the energy use in buildings as well as for associated greenhouse gas emissions. In the European Union, buildings account for approximately 40% of total energy consumption and over 36% of greenhouse gas emissions. Hence there is a demand for alternative energy technologies such as thermal energy storage (TES) systems that can reduce the energy consumption in buildings and at the same time provide thermal comfort indoor. The recent developments in TES show that latent heat thermal storage systems with the application of phase change materials (PCM) has received considerable attention due to their ability to provide high volumetric heat capacity and their ability to store thermal energy at relatively constant temperatures. PCMs absorb or release the energy equivalent to their latent heat during the phase change process thus providing a large heat capacity over a limited temperature range. Latent heat TES systems for buildings can be categorized into two main application methods - active and passive. Active TES systems such as solar heat pumps, air-conditioning units, floor heating, and thermally active ceiling panels use fans and pumps to transfer energy to air or water, which serve as the working fluids to move thermal energy of the PCMs. Passive application methods, on the other hand, are technologies where the TES system is operated without the external supply of energy. Typically, the PCM melts during the daytime thus absorbing the heat and solidifies during the night by dissipating the stored energy. Effectiveness of PCMs for application in passive TES system for space cooling in residential buildings under the typical summer conditions of the Baltic States is investigated numerically in this research. Two types of PCMs (salt hydrate and paraffin) with different melting/solidification temperatures are analysed. Stand-alone PCM storage units located between the lower surface of the concrete ceiling slab and the indoor finishing layer of ceiling is proposed for space cooling in a multi-storey nearly zero-energy residential building. Effectiveness of three different PCM storage unit's installation configurations (with and without air gap between PCM storage unit and ceiling finishing layer, and without finishing layer) was analysed and compared. The investigation is carried out by using computational fluid dynamics (CFD) software Ansys Fluent. The results showed that passive application of PCM have positive effect on thermal comfort and reduce the indoor air temperature for the studied room; however, the PCM suffers from poor solidification rate at night due to continuous heat loads owing to the indoor air temperature being above the solidus temperature of the PCM. Considering that PCMs are a form of TES that requires dissipation of stored heat to return to a solid state in order to begin melt-freeze cycle again, the obtained results suggest that additional dissipation of stored heat is required to take the entire advantage of the PCM's the storage capacity.

Corresponding Author: Pavel Akishin

IMPACT OF THE WEST FAÇADE'S SHAPE AND CONSTRUCTION MATERIAL ON THE ENERGY EFFICIENCY OF OFFICE BUILDINGS IN DRY AND ARID CLIMATES

Safieddine Ounis [1], Laila Sriti [1], Abdelhafid Ounis [2]

[1] Lacomofa Laboratory, University Mohamed Khider BP 145 RP, 07000, Biskra, Algeria
[2] LARGHID Laboratory, University Mohamed Khider BP 145 RP, 07000, Biskra, Algeria

ABSTRACT

Solar radiation is the most important source of penetrating heat inside the building, and in a hot and arid climate, this constraint increases proportionally in east and west façades due to low solar altitude. As the building envelope is responsible for the interactions between indoor and outdoor spaces, and as lighting is imperative in an office building, thermal gains through the envelope cannot be excluded but prevented through passive or active solutions. Aside from the evolving technology leading to the kinetic and adaptive façades, passive design methods introduce multiple affordable solutions to minimize heat gains and improve the building's energy efficiency. In this research, an analysis of the thermal and visual performance and the energy efficiency of a hypothetical isolated office building located in Biskra in Algeria is set, while applying modification on the western façade, and simulated with the Rhinoceros and Grasshopper with Ladybug and Honeybee tools. The applied modifications on the western exterior wall takes into account three variable parameters, four cases of Window to Wall Ratio that go from 10%, to 40%, four common construction materials available in the area which are earth-straw, alucobond cladding, brick wall, and curtain walls, and three vertical façade shapes generated through an algorithm from basic vertical façade shapes. With all these parameters, a matrix will generate 48 cases which are then modelled and simulated. The results are compared on the base of thermal performance, heating and cooling and visual comfort to define the optimal compromise between the façade's geometry and the construction materials in terms of energy efficiency.

Corresponding Author: Safieddine Ounis

MULTIPICATION ANALYSIS OF THE CAUSE, FORM AND EXTENT OF DAMAGE TO BUILDINGS IN AREAS WITH MINING IMPACT

Monika Gwozdz - Lason

University of Bielsko-Biala ATH, Faculty of Materials, Civil and Environmental Engineering, Institute of Civil Engineering, 43-309 Bielsko-Biala, 2 Willowa St., Poland

ABSTRACT

This publication is a summary of all tasks carried out in recent years of research, calculations, simulations and analyzes related to the performed research on parameter analysis that affect the form, scope and cost of removing damage in buildings and structures in areas with mining impact. The analyzed problem is interdisciplinary and contains legal, geotechnical, engineering - mining, construction, material and economic analysis. The ground reaction forces were analyzed for buildings and structures in the mining area. Coordinating activities of the land model, foundations and construction of buildings and structures in the mining area were adopted and the distribution rights and changes in additional reaction forces of the structure in the mining area were analyzed and various factors which affect the construction damage were indicated. Problems were also identified in the mining impact forecasts that affect the design scope of new engineering structures and the impact of existing buildings and structures. The influence of various factors was analyzed and additional dependency formulas were proposed, which are needed for current calculations and analyzes of the scope and costs of strengthening the structure or its modernization. Based on the output data and the analysis of the results of the empirical examination of selected buildings, the determination of all factors affecting the technical condition of the building erected in the areas with the impact of mining operations. Classification according to currently used guidelines and clarification of new attributes affecting the technical condition of buildings and structures (typical and modern geometry of the building's structure, type of foundation, type of construction protection, type and stiffness of the structure). Backward analysis of damages (their temporary changes) identified as factor affecting the current state of engineering objects.

THE DEVELOPMENT DATA-COLLECTION METHODS FOR THERMAL COMFORT ASSESSMENT IN TROPICAL COUNTRIES

Carolina M Rodriguez [1], Juan M Medina [2], María Camila Coronado [3], Marta D´Alessandro [4]

[1] Architecture Program, University Piloto de Colombia, Bogotá, Colombia
[2] Architecture Department, University of Los Andes, Bogota, Colombia
[3] Architecture Program, University Piloto de Colombia, Bogotá, Colombia
[4] Architecture, Built Environment and Construction Engineering Department (ABC), Polytechnic University of Milan, Milan, Italy

ABSTRACT

Many countries in the tropics are adopting thermal comfort standards such as the ASHRAE Standard 55, the EN 15251, and the ISO 7730 to regulate the use of air-conditioning in buildings. However, the application of these standards has been questioned, as they have been developed based on research primarily from non-tropical regions. There is substantial evidence to argue the need to confirm these standards further through post-occupancy studies and fieldwork in tropical climates. In this context, methodologies for gathering data during fieldwork are thought to require particular attention, as the accuracy of the theoretical models for the assessment of thermal comfort depends on the quality of this information. There is also a need to consider a broader range of interrelated psychological, physiological and social variables that affect the tropics, which can differ from other geographical locations. In recent years, there have been various attempts in academic literature to propose alternative models for specific tropical conditions, countries or regions. Although most of these models are based on the adaptive model recommended by the ASHRAE, they have had little effect on the adjustment of related local policy. Furthermore, there is no consensus yet of their suitability for diverse environments. This manuscript illustrates and expands on these research gaps through the analysis of Colombia as a case study. It stresses the need for standardised fieldwork data and gives suitable examples of collection and methodology systems. This aims to contribute to the current efforts of improving the understanding of thermal comfort and its impact on the development policy.

Corresponding Author: Carolina M Rodríguez

ATTEMPT AT NUMERICAL REPRESENTATION OF GAS EXPLOSION IN A LARGE PANEL BUILDING

Marta Kadela [1], Andrzej Cińcio [2], Jan Fedorowicz [3], Robert Geryło [1]

[1] Building Research Institute, Filtrowa 1 Str., 00-611 Warszawa, Poland
[2] Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5 Str., 44-100 Gliwice, Poland
[3] Katowice School of Technology, Faculty of Architecture, Civil Engineering and Applied Arts, Rolna 43 Str., 40-555 Katowice, Poland

ABSTRACT

Analysis of the construction market in Poland and its trends in the recent years indicates a resurgence of prefabricated technology in residential construction. The main period of prefabrication development in Poland was in the 1970s. when it was referred to as large panel. According to a report by Building Research Institute, buildings constructed with large panels are characteristics for their high durability and any damage occurring in the buildings built using the technology can be divided into two groups. The first is damage similar to that occurring in traditional construction, such as damage to partition walls, roof covering or installations. The other is damage related to the prefabrication technology itself, i.e. the production of elements (material damage) and their assembly (damage at connections). Other potential threats include mining activity in the case of buildings located in mining areas and gas explosions related to the gas systems present in this type of building. This paper, therefore, attempts to recreate the process and consequences of an explosion in a closed room of a multi-family building using a numerical model. The simulations are based on: literature data (concerning calculating and applying explosion actions) and own experience in assessing the response of a concrete structure described using an elastic-plastic-damage (e-p-d) model. The result of the analyses included indication of areas directly affected by risk of loss of stability (with potential expansion of disaster area). The paper also presents the effect of “expulsion” of an external wall due to explosion. It was found that structure failure states obtained in the analyses are fully compatible in qualitative sense with observed real construction disasters caused by explosions. Real quantitative trustworthiness should result from laboratory tests of materials from which the buildings under analysis are built of.

Corresponding Author: Marta Kadela

ENVIRONMENTAL PERFORMANCE OF A SOCIAL HOUSING TYPE CHARACTERISTIC OF SOUTHEASTERN MEXICO

R. Alexis Barrientos-González [1], Ricardo E. Vega-Azamar [1], Julio C. Cruz [1], Gabriela Rosas-Correa [1], Norma A. Oropeza-García [2]

[1] Mexico's National Technology, Chetumal Institute of Technology, Insurgentes 330, Chetumal 77050, Quintana Roo, Mexico

[2] University of Quintana Roo, Boulevard Bahia s/n esq. Ignacio Comonfort, Chetumal 77019, Quintana Roo, Mexico

ABSTRACT

National indicators point that 85% of Mexico's energy production come from fossil fuels. Quintana Roo is the state with the most significant increase on energy consumption with almost 20% from 2010 to 2017. This project carries out a holistic energy analysis approach in three case studies in typical dwellings built with average materials and construction systems under tropical climate conditions. Two validation levels were performed, one with an historical weather data file, and the second one with a costumed weather file corresponding to February 2019. The obtained values of mean bias error on an hourly-based analysis in interior conditions varied with the following ranges: level 1, from 1.57% to 2.11%; in level 2, from 1.17% to 1.74%. On the other hand, it was also found that the first level of simulation predicted the electricity consumption slightly closer to actual values reported for February 2019, with values ranging from 7.56% to 16.63%. However, further analysis with more detailed input data and monitoring of daily consumption is recommended in order to reduce the variation ranges.

Corresponding author: Ricardo E. Vega-Azamar

Session Title:

Transportation

MONITORING THE CURRENT STATE OF THE CZECH SECTION OF HORSE-DRAWN RAILWAY ČESKÉ BUDĚJOVICE – LINZ AND DESIGN OF ITS REVILATIZATION – PART 2

Jiří Šál, Petra Nováková

The Institute of Technology and Businesses in Ceske Budejovice, Czech Republic

ABSTRACT

This article follows on the article "Monitoring of the current state of the Czech section of horse-drawn railway České Budějovice - Linz and the design of its revilatization" and deals with the mapping of the remains of the Czech part of the České Budějovice - Linz line. The article lists the remaining parts of the track that were not listed in the first article. In the first article we dealt with parts from Holkov to the state border with Austria. In the current article we focus on parts from České Budějovice to Holkov. Relics Horse-drawn tracks are kept as national cultural monuments, each separately. Unfortunately, for this reason, it is impossible to work with the railroad as a whole and therefore it is very difficult to revitalize this track, even though the horse-drawn railway is one of the first large logistics operations in the Czech Republic. In České Budějovice, all relics are in good condition, after previous renovations and regular maintenance. All these relics are buildings located in the city center. The track in these places can no longer be restored to connect the objects to a single unit as these sites are built. The remaining parts of this section of the track are neglected and often in a catastrophic technical condition. In this work we propose measures to increase tourism on the remains of the track. The possibility of revitalizing a section of the track to make tourists more attractive could be seen as possible. The work proposes new educational trails on horse-drawn track on the remains of the track. Trails, positions and stops are suggested for the nature trails, and what they should be concerned about, but the panels themselves are not designed. It is also proposed to use modern technologies, usable in smart devices.

Corresponding Author: Jiří Šál

INTEGRATION OF DYNAMIC AND STATIC DATA FOR ROAD SAFETY INFORMATION

Choong Heon Yang, Jin Guk Kim, Duk Geun Yun, Sung Pil Shin

Korea Institute of Civil Engineering and Building Technology Goyangdae-Ro, Ilsanseo-Gu, Goyang, Gyeonggi-Do, 10223, Korea

ABSTRACT

With advent of smart phones and the traffic data collected from various sources, interest in the development of new and useful traffic information that can improve traffic safety is increasing. This can be achieved by employing not only the data from the current fixed roadside units but also the data from probe vehicles. The purpose of this research is to suggest new information that can improve traffic safety based on the data of Digital Tachograph (DTG) and small camera of commercial vehicles and conventional road inventory data. The former may include real time traffic conditions along the roads. In addition, the latter can also be currently operated by road authorities with the purpose of road maintenance. Real-time data collected from commercial vehicles has dynamic characteristics and becomes a major source of information on road freezing, fog, and potholes. On the other hand, the existing road database has static characteristics, and it contains road attribute information such as the number of lanes, curve radius, grade and so on. It is expected that these would play a very important role in enhancing existing traffic information service as well as establishing road management strategies for the public sector. Particularly, probe vehicle data can be essential technologies in the future connected and autonomous vehicle (CAV) era.

Corresponding Author: Choong Heon Yang

ESTIMATION ROAD SURFACE TEMPERATURE VARIATION USING COMMERCIAL VEHICLE AMBINENT SENSOR

Choongheon Yang, Dukgeun Yun, Jinguk Kim, Sungpil Shin

Department of Infrastructure Safety Research, Korea Institute of Civil Engineering and Building Technology, 283, Goyang-daero, Ilsanseo-gu, Goyang-si, Gyeonggi-do, 10223, South Korea

ABSTRACT

Road surface temperature is more important than ambient temperature in term of road safety during winter season. The conventional method to collect road surface temperature is to install Road Weather Station(RWS). However, RWS can only collect spot information and could be costly. To enhance these problem, this study used the commercial vehicle ambient temperature(VAT) sensors can collect the pattern of air temperature along the road effectively and rapidly. Also the thermal mapping equipment was used to collect the road surface temperature(RST). After that, our research analysed the similarity of the patterns of road surface and ambient temperatures using correlation analysis. The result showed that the patterns of temperature variation collected from VAT sensors are statistically comparable to patterns of road surface temperature variation collected from a thermal mapping. In addition, this research developed a way to segment roadway based on variation in road surface temperature. This segmentation is useful to road authorities for managing the road and providing information based on road segmentation. Although VAT sensors do not provide highly accurate temperature readings, they can identify patterns of surface road temperature on roadway sections. This study found out that the VAT can be estimated the patterns of RST and could be replace the road weather station or thermal mapping system. This information can be used so that individual drivers, commercial vehicle and fleet operators and road authorities acquire critical real-time information on road conditions. Further, using these sensors instead of fixed sensors or thermal mapping can significantly reduce road maintenance costs. Also the result could be applied to the automated driving system to provide the road surface condition in the future.

Corresponding Author: Dukgeun Yun

ACCESS TO TRANSPORT SERVICES AND PARTICIPATION IN TRAFFIC FOR PEOPLE WITH MENTAL HEALTH DISEASES – CHALLENGES TO MEET THE UN SUSTAINABLE DEVELOPMENT GOALS (SDGs) TO PROVIDE AN OVERALL INCLUSIVE TRANSPORTATION SYSTEM

Georg Hauger [1], Alessandra Angelini [1], Matthias Nagler [1], Ulli Röhsner [2], Christian Dominko [2], Christopher Schlembach [3]

[1] Technische Universität Wien, Centre of Transportation System Planning, Augasse 2-6, 1090 Wien, Austria

[2] MAKAM Research GmbH, Hietzinger Hauptstraße 34, 1130 Wien, Austria

[3] Dr. Christopher Schlembach, Roosevelt Platz 2, 1090 Wien, Austria

ABSTRACT

Engineers and planners are always jointly responsible for the usability of their interventions. In the transport sector, universal design is a planning imperative to ensure that all user groups participate equally in traffic. Usually only physical impairments are in the foreground. However, there is an ever-increasing group of people with psychological impairments. Mental health diseases, especially phobias, anxiety and compulsory disorders, are one of the most prevalent diseases in industrial countries – one-year prevalence rates are estimated at 10 up to 15%. Although rules, regulations, policies and action plans have been established to create an overall inclusive transportation system, the needs of people with mental impairments are mostly not considered. At the same time, participation in traffic is important for people with mental impairments to satisfy their daily needs and to reach therapeutic institutions. In addition, social interaction and the mastery of every-day tasks strengthens self-confidence and supports the healing process. Not least for that reason the UN SDGs have been formulated. By conducting an exploratory study, the behaviour and needs of people with phobias, anxiety and compulsory disorders and the effects on their participation in traffic were explored. The paper shows general aspects concerning the traffic behaviour of people affected during the course of the disease. Furthermore, different forms of mobility barriers for people with phobias, anxiety and compulsory disorders were identified, distinguishing between infrastructural barriers, social barriers and organisational barriers.

As a result, several approaches to support the participation in traffic of people with phobias, anxiety and compulsory disorders, based on coping strategies used by the target group, are mentioned. In addition, the paper identifies potential future challenges in context with mobility trends concerning the accessibility of the transportation system for people affected as well as further research needs.

Corresponding Author: Georg Hauger

EXTENSION OF THE ROAD NETWORK AS THE DETERMINANT OF DEVELOPMENT OF THE REGIONS ON THE EXAMPLE OF CRACOW

Monika Siejka, Karol Relidzyński

University of Agriculture in Cracow, Department of Land Surveying, Al. Mickiewicza 21, 31-120 Cracoow, Poland

ABSTRACT

The construction and development of the road network determines the economic level of the region and the country. The aim of the publication is to show the relationship between extension of the road network and the development of the warehouse and industrial areas located in the city and the Krakow region. The methodology of research works consisted in the use of data contained in local spatial information systems for the analysis of land development. The research was carried out at the Rybitwy area. It is an area located in the south - eastern part of Krakow. This area is considered to be the logistic centre of Krakow and has been analysed in the aspect of the impact of the construction of the eastern bypass of the city, on the development of facilities with a warehouse and industrial function. The eastern bypass of Krakow is located along the S7 expressway connecting southern Poland (Zakopane) with its northern end (Gdansk). The conducted research proved that over the period of the investment (2010-2018), more than 19,000 m^2 of warehouse and production space were built in the area of Rybitwy. The increase in interest in the analysed area is also confirmed by a significant increase in the degree of lease in this area. Before the construction of the bypass, the vacancy rate was equal 30% of the area intended for rent, while on the date of analysis (2018) already only 10%. This shows the development of the studied area and its attractiveness for entrepreneurs. In addition, the development of the road infrastructure in the form of the eastern bypass of the city of Krakow (along the S7 route) has contributed to the creation of a special economic zone in the area of the Wieliczka commune. This commune is adjacent to Krakow. The Wieliczka Economic Activity Zone, due to its location in the vicinity of the Krakow agglomeration and direct access to the S7 expressway, encourages entrepreneurs to locate their businesses in this area. At the date of the analysis over 30,000 m^2 of warehouse and production space were built there. Therefore, the development of the road infrastructure is an important factor determining the location of industrial or warehouse facilities, which contributes to the economic development of the region, as well as to the increase of the competitiveness of the Polish economy.

Corresponding Author: Monika Siejka

AVERAGE DAILY TRAFFIC AND POLLUTION EMISSION CALCULATION IN URBAN AREA

Jacek Chmielewski

University of Science and Technology in Bydgoszcz, Al. Kaliskiego 26/24, 85-796 Bydgoszcz, Poland

ABSTRACT

At present transport analyses related to road traffic and pollution emission in Europe are widespread used. They concern both the actual state, especially at the scope of functioning of existing transport solutions and proposed changes, for example in private transport road network, as well as the forecast period. Estimation of the annual average daily traffic (AADT), noise and pollution emission produced by traffic is one of the most important elements in the field of transport analyses. Such data make it possible to estimate the consequences of investment activities, including the construction of new elements of transport infrastructure, but also changes in spatial development like e.g. new housing estates. Most of the analyses carried out by the researchers, consulting offices, as well as the expectations of road administrators concern mainly the impact of the investment on traffic conditions. Residents expect answers whether the new intersection, road interchange or other improvements in transportation infrastructure will make it easier to do trips for them. On the other hand, how much a new housing estate or shopping centre will affect negatively everyday trips, especially those related to work and learning places. Bearing in mind that transport problems in most cities related to traffic congestion occur during morning and afternoon rush hours, most of the transport analyses are being prepared for these periods. Meanwhile, the impact of individual investments, in particular the emission of noise and pollution, takes place 24 hours a day. This means that from the point of view of the impact of traffic on the environment, the most important are the annual average traffic volumes and not only pick hours. The method of average daily traffic and pollution emission calculation on the entire transport network is the subject of this paper. The method is based on data from automatic traffic count locations and spatial arrangement of the study area using transport demand models.

ANALYSE OF WEEKEND TRAFFIC IN URBAN AREA

Jacek Chmielewski

University of Science and Technology in Bydgoszcz, Al. Kaliskiego 26/24, 85-796 Bydgoszcz, Poland

ABSTRACT

Issues of weekend traffic in urban areas are not an area of many studies conducted all over the world. A typical work day traffic is an object of observation in most cases, in which many traffic obstructions resulting from the daily trips of residents, associated primarily with education, work and business are observed. In contrast, traffic on weekends is not usually associated with business trips, in addition, usually it is not restricted by congestion phenomena and large losses of travellers' time resulting from it, and it is carried out at a higher flow speed and with a definitely higher freedom of movement. That is why, they are reluctant to take up this issue. However, the weekend traffic is undoubtedly directly related to the noise emission resulting from the impact of road transport on the environment. Residents of urbn areas usually want to take time off from work for active recreation, walking with family, cycling or running. Traffic and related noise emission as well as the transport pollution undoubtedly have a negative effect on this activity. The goal of this article is to indicate the problem of road traffic on weekend days, which in the future may become the basis for deeper planning analyzes in the field of urban mobility policy. The article presents the results of traffic analysis on weekend days for a selected medium-sized city. The goal of the research work was to determine the factors affecting the average daily traffic volumes on weekend days, as well as the daily distribution of traffic volumes separately for Saturdays and Sundays. The basis for the analysis were all-year automatic traffic counts conducted in 2018 as part of the ITS system in over 150 measurement locations located on the city's main road network at various distances from the city center. A rich measurement base covering over 100 days of observation on weekend days enabled presentation of basic traffic characteristics for those days.

INFLUENCE OF WEATHER INTO TRAFFIC FLOW SPEED IN URBAN AREA

Jacek Chmielewski

University of Science and Technology in Bydgoszcz, Al. Kaliskiego 26/24, 85-796 Bydgoszcz, Poland

ABSTRACT

The issue of the impact of weather conditions on vehicle speeds has been studied for a long time and it is still the subject of many scientific researches. The impact of atmospheric conditions on the speed with which drivers drive their vehicles seems to be obvious. Good weather conditions, sunny weather with good visibility surely provokes higher speeds while rainfall, wind and visibility limitations will force drivers to reduce speed, drive with more concentration, and be more cautious. In the light of emerging new possibilities of acquiring data on vehicle speed, especially travel speed indicating the speed of trip between designated speed measurement points using modern measurement technology new researches are possible. Increasingly in the ITS systems being implemented mainly in urban areas, ANPR (Automatic Number Plate Recognition) cameras are one of the ITS element. These cameras make it possible to determine the real time of appearance of the vehicle in the register area of the camera, thus determining both the matrix of trips between each two observation points (ANPR cameras), but also the vehicle's ride time between successive cameras, and thus the speed of trip. In conjunction with data on weather conditions registered by several dedicated weather stations, they allow to significantly increase the research sample in terms of vehicle speed, and thus to obtain a statistically more confident inference. Thus, it gives a chance for further analysis regarding the impact of atmospheric conditions on road traffic conditions, including on travel speed and capacity of transport infrastructure. The article will present the results of empirical analyses to determine the impact of weather conditions (including temperature, wind and precipitation) on the travel speed and observed traffic volumes. It will be indicated to what extent atmospheric precipitation translates into average travel speed in car traffic, and thus to traffic volumes and conditions.

MODELLING THE ROLE OF SPEED IN RURAL ACCIDENTS RISK (CASE STUDY: KARAJ-CHALOOS HIGHWAY, IRAN)

Vahid Najafi Moghaddam Gilani[1], Mostafa Roshani[2], Mahboobeh Abbaspoor[3], Daniel Safari[1]

[1] School of Civil Engineering, Iran University of Science and Technology (IUST), Tehran, Iran
[2] Department of Civil Engineering, Khorasgan (Isfahan) Branch, Islamic Azad University, Isfahan, Iran
[3] Department of Civil Engineering, North Tehran Branch, Islamic Azad University, Tehran, Iran

ABSTRACT

Modeling to predict the severity of accidents in terms of its parameters specially speed or non-occurrence of accidents need to provide relief supplies. In addition to using this model to assess the impact of each factor on the ends of accidents. It is obvious that such knowledge leading to possible planning of traffic engineers, traffic will be safe and they can better understand the factors that have a positive or negative effect on crash severity. Therefore, identification of effective factors in accidents resulting in decreased frequency and severity of accidents, it is clearly understandable. The aim of this study is to create statistical models for the frequency of accidents in Karaj-Chaloos highway. In this study, by collecting accident information from this route in 2016 and using the logit model, the probability of occurrence of each category of accidents were calculated. For this purpose, different methods of modeling such as backward, foreward and enter methods used and evaluated. Finally, the model of backward method according to the two criteria of goodness of fit (0.586) and R^2 (95.10), the best way to create the severity of accidents logit model in Karaj-Chaloos route were selected. According to the logit model the severity of accidents, the independent variables between the hours of 12 to 24 hours of an accident, rainy weather situation, cause of the complete lack of attention forward and speed between 81-95 and 96-110 kilometer per hour increases the likelihood Pride accidents and vice versa variables with negative coefficients (day Tuesday, summer and spring seseon and smooth and sunny climate, the driver guilty man, the situation daylight can reduce the likelihood of accidents and the severity of injury. The logit model output severity of accidents within the Karaj-Chaloos roote, lack of safety and efficacy of immense pride vehicle in the crash.

Corresponding Author: Vahid Najafi Moghaddam Gilani

THE EFFECT OF RAIN ON PEDESTRIANS CROSSING SPEED

M.R. Esmaeeli [1], Vahid Najafi Moghaddam Gilani[1], Ali Khorram soleymandarabi[2], Amir Amini[1]

School of Civil Engineering, Iran University of Science and Technology (IUST), Tehran, Iran
[2] Master of Science, Payam Noor University of Tehran, Iran

ABSTRACT

The pedestrian crossing speed in the signalized intersections is one of the most important parameters in designing intersections and also is essential information in controlling the amount of delay and traffic. The present study aims to measure and statistically analyze the pedestrian crossing speed according to weather conditions, which is either normal or rainy. In order to do this, the crossing speed of 4381 pedestrians has been gathered through photography of two signalized intersections in Rasht city. Furthermore, these findings have been analyzed through Independent Sample T-Test. The results show that, with a 95 percent confidence, in both gender groups of men and women, the difference in the pedestrian speed according to weather conditions of either normal or rainy is statistically meaningful and the pedestrian crossing speed was significantly more in the times of rain than in normal weather conditions. Meanwhile, in rainy Condition s, the 15th percentile crossing speeds for men and women increase 3.0 percent and 21.5 percent according to 15th percentile speeds in normal weather conditions respectively. Therefore, it is suggested that pedestrian speed in normal weather conditions be regarded as the base for designing, so that the 15th percentile crossing speeds and the average of all samples in rainy Condition are 1.05 and 1.24 meter per second successively.

Corresponding Author: Vahid Najafi Moghaddam Gilani

LOCATION OF THE NEIGHBORHOOD SHOPPING CENTERS IN DECENTRALIZATION FROM DOWNTOWN STUDY CASE: THE CITY OF FUMAN (GUILAN, IRAN)

Seyed Masoud Mousavi, Mehdi Nouri Haris, Athar kadivar, Soheil Yektaparast

University of Fooman, Iran

ABSTRACT

The neighborhood markets have a variety of economic and social effects on urban development, or even expansion, which is later in economic include employment, income, increase in family savings, increase in added value of products. In the meantime, social markets have helped sell cultural products as well as promoting local customs, and at the same time, it can be local to sell crafts as factor to promote native culture. Fuman city as one of the tourist county of guilan province, currently only has permanent market and weekly market. according to the location of this market (non-access of all citizens to this place) it is essential to provide the appropriate access of citizens of the city to in this attention of citizens to these centers, with the supply and distribution of questionnaire among the head of the city of Fuman.it was designed in two parts that the first part of it was associated with the behavior of people in purchase of the city markets and the second part of it, it effective factors in the construction of the neighborhood shopping by checking results from the first part of questionnaire, the 55% of the interviews are dissatisfied with the current state of the city markets, and 90% of them agree with the construction of the were also4 original indicators designed in the second part of the questionnaire , in order for proper products indicators, the amenities of shopping centers, how to access markets and economic and income of more priority. The quality of products, the price of products and access to the markets has been more important. it is also considered to locate the new neighborhood shopping centers on the surface of the city of Fuman, the parameters of the right earth, the size of the earth, the access, the population density, the urban hierarchy, the according to these parameters, 8 new locations were offered as locations of the neighborhood shopping centers, considering walking distance 5 to 7 minutes.

Corresponding Author: Soheil Yektaparast

IMPACT OF SCHOCKS ON CARGO SECURING DURING THE ROAD TRANSPORT

Martin Vlkovský [1], Tomáš Binar [1], Jiří Švarc [1], Kateřina Buscuházy [2]

[1] University of Defence, Kounicova 156/65, 662 10 Brno, Czech Republic
[2] University of Technology, Purkyňova 464/118, 612 00 Brno, Czech Republic

ABSTRACT

The paper deals with the impact of shocks on cargo securing during the road freight transport. Commonly used methods of cargo securing do not take into account the different quality of roads; therefore, the cargo securing might not comply with principles of safe fastening. The paper highlights different values of shocks and inertia forces on different quality roads (highway and 3rd class road) based on data obtained from the conducted transport experiments. The resulting shocks (values of acceleration coefficients) are statistically significantly higher on a 3rd class road than on a highway even at half the average speed. The optimization of calculation using acceleration coefficients and their correlation with the resulting inertia forces is included in a separate part. The output of the paper is a methodical procedure to optimize the cargo securing during the road transport.

Corresponding Author: Martin Vlkovský

BELT CONVEYOR SYSTEMS AND APPLICATIONS OF WEAR PROTECTION MATERIALS IN QUARRIERS

Jan Fiala[1], Milan Mikoláš[2]., Miroslav Lapka[3]

[1] K Potoku 243, Horoušánky 250 82, Czech Republic
[2]VŠB Technical university, 17.listopadu 2172/15, Ostrava – Poruba, 708 00, Czech Republic
[3] Vrbka 31, Postoloprty, 440 01, Czech Republic

ABSTRACT

The article analyzes systems of transport tracks on technological lines for processing of raw materials on selected quarries of the Czech Republic and the Slovak Republic. It deals with the functionality of the technological equipment in relation to the move mento fraw material with in these technological lines, it introduces and compares various systems of raw materials transfer to the long-distance transport of raw materials between the technological department softening organizations. It brings different views on how to deal with the negative effects on the life time of individual part sof technological units. It deals mainly with the problems of abrasionon raw materials transported and the problems of abraziv influences of fine particles in the process of extraction of individual nodes of the technological line. The article provils possibilities for more efficient maintenance of this equipment, financial savings in subsequ ently pairs and a view of the application of modern materials such as UHMW-PE, polyurethane, teflon, wear protection rubber. By combining the anti-abrasion protection systems of the technological equipment, significant savings can be made in the maintenance of aggregate processing technology.

Corresponding Author: Jan Fiala

A CROSS-STUDY ON VIDEO DATA GATHERING AND MICROSIMULATION TECHNIQUES TO ESTIMATE PEDESTRIAN SAFETY LEVEL IN A CONFINED SPACE

Chiara Gruden[1], T. Campisi[2], A. Canale[2], G. Tesoriere[2], M. Šraml[1]

[1] University of Maribor, Faculty of Civil Engineering, Transportation Engineering and Architecture – Smetanova 17, 2000 Maribor, Slovenia
[2] University of Enna Kore, Faculty of Engineering and Architecture – Cittadella Universitaria 94100 Enna, Italy

ABSTRACT

Recently, pedestrian safety is a growing problem: on the one hand pedestrian movement is increasing, on the other hand measures to improve walkers' safety are still a few. During the years, various behavioural models have been proposed, which consider several parameters characterizing both the infrastructure and the road users. Many studies define accident risk as a combination of three main factors, which are the accident probability to occur, the vulnerability of the involved users and the economic and social damages due to the accident. Various are the approaches spotted in literature about pedestrian safety assessment and they mainly deal with vehicle-pedestrian conflicts. These studies have been developed in order to foresee and reduce possible losses in human lives. Also pedestrian-pedestrian encroachments can lead to dangerous consequences, but researches about them are still limited. The present study aims to highlight the differences and similarities between two analysis methods applied to pedestrian dynamics, focusing on situations where no interactions with vehicular traffic exist. This is one step of a wider research, which has been carried out on a confined space, selected because of the easy replicability of its general geometrical features and of the effects on pedestrian trajectories induced by some local peculiarities of the facility. The study focuses on the evaluation of a real case, which has been monitored through the use of cameras and analysed via a dedicated tool. The achieved results have been then compared to the outputs obtained by reconstructing the same situation in a micro-simulation model. The first step - video acquisition and elaboration - allowed to observe how people behave in the examined area and how the infrastructure influences their trajectories, while the second phase permitted to understand if a microsimulation tool can reliably reply pedestrian movement in the analysed scenario and therefore provide surrogate safety values comparable to the ones obtained from real data. In the model, a simplified but still accurate infrastructure has been set up: homogeneous geometric features have been drawn and no obstacles have been considered. The modelled pedestrian flow is a bi-directional, 2400 ped/h flux, characterized by heterogeneity of the agents: both male and female adults. In order to be able to compare the data obtained by video footages and elaborated through an ad hoc tracking tool with the outputs of the microsimulation model, from the whole flow on the ramp some intersecting pedestrians have been selected in both directions of walking. This cross-study of two different techniques has allowed to inspect the effects of the environment on pedestrian dynamics and to precautionary estimate the level of safety via calculation of surrogate safety parameters.

Corresponding Author: Chiara Gruden

FACTORS AFFECTING TRANSIT RIDERSHIP: CASE STUDY OF DALLAS AREA RAPID TRANSIT

Ardeshir Anjomani, Ahmed Daqrouq

University of Texas at Arlington, Arlington Texas, 76019, USA

ABSTRACT

Transit ridership is at the heart of transportation policy making and the success of any transit system. Urban planners have been focusing on the need to reduce car dependence and promote more sustainable transportation alternatives. Automobile dependence is a concern for many reasons and switching to more sustainable and environmentally friendly transportation modes such as public transit is likely to be an effective solution to most of these problems. In recent years, the introduction of intelligent transit information systems (ITIS) applications that provide real-time information to transit users created a new hope for increased transit ridership, however, its impact in facilitating increased Transit Usage is not clear yet. This study explores the factors affecting transit ridership including ITIS and selects the Dallas Area Rapid Transit (DART) as a case in a large metropolitan setting for this research. The research examines the factors affecting train, bus, and transit ridership. In addition, this study attempts to fill some of the gaps that exist in the literature by exploring the impact of intelligent transit information systems (ITIS) on transit ridership, and how its availability has affected transit ridership since 2012. The study adopts a monthly time series perspective (2007 to 2017) to enable the researcher to examine changes in transit ridership over a 10-year period and the incremental exposure to ITIS technology. This enables the research to capture any changes in ridership over this 10-year period, few years before to few years after the implementation of ITIS transit applications, in addition to any seasonal changes. In this type of research quite frequently, one is interested in interpreting the effect of a percent change of an independent variable on the dependent variable, which we can achieve through a double-log (log-log) model. As such, the elasticity of demand for transit with respect to some of the factors in the model such as fare, income or the research question variable, ITIS usage, are explored and policy implications out of these elasticities are discussed, including the ITIS reduction of negative aspects and cost of using transit through providing information, saving time and other attributes.

Corresponding Author: Ardeshir Anjomani

EFFECTS OF RAIL TRANSIT STATIONS ON POPULATION DENSITY: THE DALLAS FORT WORTH METROPOLITAN AREA CASE

Ardeshir Anjomani [1], Saad AlQuhtani [2]

[1] University of Texas at Arlington, Arlington Texas, USA
[2] College of Engineering, Najran University, 61961, Saudi Arabia

ABSTRACT

Dependency on the automobile in the United States has been associated with many urban problems, such as urban sprawl, traffic congestion, air pollution, etc. As the use of automobiles increases, negative externalities also increase. As a result, many American cities have seen a rebound of public transportation systems—many of which have built modern rail transit systems to mitigate the negative impacts of higher dependency on automobiles, to improve mobility and accessibility for commuters, to offer alternative to drivers, to shape development patterns, and to increase economic growth. This resurgence of rail transit systems has caused apparent shifts in economic, social, and spatial aspects of neighbourhoods located in proximity to rail stations, but negative impacts may still also occur. This study investigates the changes in population density between 2000 and 2014 in 454 block groups within a one-mile buffer around rail stations located in the Dallas-Fort Worth metropolitan area to determine if there is a correlation between proximity to rail stations and density. This study uses two approaches to analyse the data. First, a comparison of changes in density within block groups located in the study area during the study period is introduced. Next, an innovative approach is employed to select the best regression model using the data on the block groups located within the study area to understand the relationships between the selected independent variables and the changes in density during the study period in relation to the research question. The findings demonstrate that during the study period, block groups that were closer to rail stations experienced higher changes in density compared to block groups found to be interesting. These findings are a useful addition to the existing literature and contribute to the field of urban planning to mitigate the effects on density and other important social and economic variables surrounding station areas. In addition, planners and policymakers could use the implications from the findings to adopt some policies for furthering the success of rail transit systems in urban areas by sustaining station area development.

Corresponding Author: Ardeshir Anjomani

ANALYSIS OF THE REAL ESTATE MARKET DYNAMICS AS THE EFFECT OF CHANGES IN ROAD INFRASTRUCTURE - CASE STUDY IN POLAND

Monika Mika

University of Agriculture in Krakow Department of Land Surveying, Balicka 253A 30-198 Krakow, Poland

ABSTRACT

The paper is of analytical and research nature. The scope of the research includes a case study of the real estate market as a result of the rebuilding of a part of the road infrastructure. The purpose of the work is to determine the impact of the development of the communication system on the activity of the real estate market in two communes of the Żywiec district on the example of the section of the S1 expressway. Each type of investment carried out on the market has a positive or negative impact on the environment. The construction and development of the communication system are often a stimulant of the region because in most cases they increase its economic level. As a result of this kind of investment activities of the commune, there are changes on the local real estate markets, related to the spatial development of the region, affecting the standard of living of the population or the level of attractiveness and competitiveness of the region. These changes should also be visible in the level of transaction prices on the local real estate market. Therefore, the analysis of the number of transactions and the level of transaction prices of non-built-up agricultural and forest real estates was undertaken. The research period concerned the time from 2008 to 2015. The research area was made up of two communes in Southern Poland, located in the Malopolska voivodship. A section of the S1 road is located in these communes, the reconstruction of which is an important element of the research. Analyzes carried out allowed to answer the question whether the development of the communication system in the analyzed communes affected the average prices per 1m2 of undeveloped land. Is there a relationship between the time the transaction is made and the price? Did the year 2011 (as the date of initiation of investments) cause a systematic increase or decrease in the number of transactions concluded? On the basis of the statistical analyzes carried out, it was found in the examined case that there was no linear relationship between the time variable (T) and the price variable (P). This means that these variables are not correlated. The various values of the coefficient of variation calculated for the data of both communes indicate a large dispersion of transaction prices in the examined period. Basic statistics such as: correlation coefficient, coefficient of variation, standard time and price deviation, max and min values, median, kurtosis, as well as skewness were examined for the tested sample.

EFFECTS OF ROAD INFRASTRUCTURE ON PEDESTRIAN SAFETY

Marcin Budzynski [1], Lucyna Guminska [1], Kazimierz Jamroz [1], Tomasz Mackun [1], Piotr Tomczuk [2]

[1] Gdansk University of Technology, Narutowicza 11/12, 80-233 Gdansk, Poland
[2] Warsaw University of Technology, Koszykowa 75, 00-662 Warszawa, Poland

ABSTRACT

Pedestrians represent more than 30% of all of Poland's road traffic fatalities. This is much higher than the EU average (about 20%). Pedestrian accidents are usually the result of a complex situation and a number of contributing factors involving road users, the road and roadside and the vehicle. Pedestrian accidents are caused by road user error (drivers and pedestrians) and wrong planning and design. Poorly maintained road infrastructure is also a very frequent cause. The objective of the work was to identify risks for pedestrians that involve road infrastructure and roadside and to define how selected elements of geometry and traffic layout affect driver behaviour (speed on approaching pedestrian crossings). The results have helped to formulate recommendations on pedestrian crossing design. The research included an analysis of 2013-2017 statistics to identify the circumstances and causes of pedestrian accidents. Field work at about 2,000 unsignalized pedestrian crossings was the basis for assessing the safety of these crossings. Assessment criteria were selected and a safety classification was made with specific recommendations made for possible treatments. More field work was designed to measure speeds near pedestrian crossings in three cases: no pedestrians in the crossing area, a pedestrian is approaching a crossing, a pedestrian is waiting to cross the road. The study was conducted in different areas (city, transit roads passing through small towns, non-built-up areas) for different cross-sections (one carriageway and two lanes – 1x2, two carriageways with two or three lanes each – 2x2, 2x3, one carriageway and four lanes – 1x4). The study also looked at speed limits – 50 and 70 km/h. The share of drivers giving way to pedestrians waiting to cross was also assessed. Pedestrians were surveyed and asked about how safe they feel crossing the road. The survey also asked drivers about driver behaviour and use of speed management measures. Statistical analyses show the circumstances and causes of pedestrian accidents. These include driving across a pedestrian crossing illegally, pedestrians stepping onto the road abruptly, night-time, excessive speed and others. Pedestrian crossings are the site of more than 30% pedestrian fatalities which shows the need for treatments. By assessing the hazards caused by road infrastructure near and at pedestrian crossings, the following hazards could be identified: limited sight-distance, poor illumination, excessive speed and no means of speed management, wrong geometry, technical condition of the road and signage. Speed tests near pedestrian crossings show that some 40% of drivers do not observe the speed limits in built-up areas (especially on sections of transit roads passing through small towns and on dual carriageways in urban areas) and 30% do not observe the speed limits on rural roads. Previous work by the authors and the literature show that field work must be conducted to observe pedestrians and drivers near pedestrian crossings for different locations, how they are equipped and their speed limits. It is important to identify pedestrian hazards which involve road infrastructure. This will help to implement standards for safe pedestrian infrastructure.

Corresponding Author: Marcin Budzynski

IDENTIFYING SELECTED TRAM TRANSPORT RISKS

Marcin Budzynski [1], Agnieszka Tubis [2]

[1] Gdansk University of Technology, Narutowicza 11/12, 80-233 Gdansk, Poland
[2] Wroclaw University of Science and Technology, 27 Wybrzeze Wyspianskiego St, 50-371 Wroclaw, Poland

ABSTRACT

When analysing transport management as part of urban public transport, analysts responsible for risk assessment should focus on transport infrastructure and organisation. Hazard identification should look at the resources that help to carry out transport and how that transport service is delivered. As a consequence, the risk analysis will cover five groups of incidents triggered by rolling stock, drivers (tram drivers), passenger behaviour, service delivery and transport infrastructure. In the area of transport infrastructure risks, infrastructure is inspected for safety. As regards tram infrastructure which is a component of urban transport infrastructure, there are potential collisions with cars, cyclists and pedestrians. The objective of the study is to identify hazards in the operation of urban public transport with a special focus on tram transport and to formulate recommendations on how it can be improved for quality and safety. Using Gdańsk as an example, an analysis was conducted of accidents involving trams between 2013 and 2017. Field work included a tram safety inspection on all of Gdańsk's tram lines (about 55 km) looking at tram and road safety. The inspections helped to identify recurring problems or problems that occur on longer line sections. Process analysis helped to define accidents that have had an organisational element to them. Once identified, the hazards were used to carry out operational risk assessment in connection with the daily operations of transport and maintenance companies. This risk occurs when trams operate which is a repetitive, known and cyclical activity. In general operational risk involves consequences which occur when the following are wrong or unreliable: processes (tram traffic), people (traffic users) and systems (infrastructure, rolling stock and organisational system) or external incidents (weather, vandalism, terrorism, etc.). The most frequent accidents involve collisions and crashes when another vehicle or pedestrian are hit. The second most common cause of tram traffic suspension is loss of power in overhead lines, a result of a variety of substation breakdowns. The next cause of suspending tram traffic are derailments, a result of wrong reverse movements of trams, switch breakdowns or other damage to tracks. The average time to restore tram traffic after derailment is 60 minutes. The inspection helped to identify the main infrastructure risks. They involve mainly the parameters of geometry, signage and functional features. The article gives examples of such risks. The analyses of infrastructure risks are supplemented with a cause and effect analysis in the area of organisation which may have an effect on the risk for the defined accidents. The role of an urban transport operator is to limit the frequency of accidents when the source of an accident is controlled by the company. This applies primarily to those resources that are used to deliver the service. Key to this is having a strategy for the operation of trams, maintenance and extension of tram infrastructure and a human resource policy, especially as regards tram drivers. These three resources are the basic source of risks that affect an effective and safe operation.

Corresponding Author: Marcin Budzynski

RISKS TO OLDER PEOPLE IN ROAD TRAFFIC

Marcin Budzynski [1], Agnieszka Tubis [2]

[1] Gdansk University of Technology, Narutowicza 11/12, 80-233 Gdansk, Poland
[2] Wroclaw University of Science and Technology, 27 Wybrzeze Wyspianskiego St, 50-371, Wroclaw, Poland

ABSTRACT

Demographic forecasts show that by 2050 about 25% of Europe's population will be 65 or older. Ageing society translates into older people using roads. An increasing number of older people are drivers, cyclists and pedestrians representing a potential increase in accident risk due to functional limitations. The article looks at road traffic risks and main trends from the perspective of older road users (drivers, cyclists, pedestrians). With a longer time to react, poor eyesight and hearing, impaired mobility, ill health and medication, older road users are put at risk. A comprehensive and pro-active strategy is needed to deal with these risk factors and meet the safety and mobility needs of older people in the (nearest) future. The strategy should focus on assessing the main trends and identifying the road traffic risks for older road users. It should also aim to implement treatments such as ITS and change how road infrastructure is designed today. The objective of the work is to identify the risks to older people in road traffic and develop recommendations on ways to improve the safety of this age group. A study of the literature helped to identify the risk factors faced by older road users. Statistical analyses were used to define the trends, causes and circumstances of accidents involving this age group in the EU and in Poland compared to the EU. The article identifies risks and classifies them for older drivers, pedestrians and cyclists. Needs for universal road infrastructure design are identified (to ensure full accessibility for all age groups, including older people and people with disabilities) and ITS treatments are formulated. EU data shows that about 44% of all pedestrian fatalities are people aged 65 and older. This highlights the seriousness of the problem. With an increasing share of this age group in society and a lack of road treatments to improve the situation, the statistics may deteriorate even further. In Poland drivers aged 65 and older have caused 10% of all accidents involving 14% of all fatalities. Pedestrians in this age group have caused 6% of fatality accidents. The article defines and classifies risk factors in three groups: growing exposure to risk, growing accident risk (factors involving the user directly such as behaviour, illness, functional limitations) and growing accident severity (fatality and serious injury accidents). The age group of 65 and older is at a particular risk of being involved in a road accident. This applies mainly to pedestrians who are accident fatalities and drivers when they cause an accident. Infrastructure work, educational campaigns, additional training, driving license limitations and verifications, in-vehicle technologies and ITS can compensate for older people's road traffic restrictions only to some extent. Mobility, health and quality of life are interrelated with loss of mobility leading to a poorer quality of life and poorer physical and mental health. As a result, the safety and mobility of older people should be balanced when relevant strategies are developed.

Corresponding Author: Marcin Budzynski

AN IMPROVED ACTUATED CONTROL ALGORITHM FOR URBAN INTERSECTION BASED ON INTELLIGENT VEHICLE INFRASTRUCTURE COOPERATIVE SYSTEM

Haiyan Gu

College of Transportation Science & Engineering, Nanjing Tech University, Nanjing 210009, China

ABSTRACT

Urban traffic congestion has become one of the problems that plague big cities in China. The congestion of key nodes is more obvious in big cities, such as intersection congestion. In developing countries represented by China, the phenomenon of mixed traffic is very prominent. At intersections, the conflicts among bicycles, pedestrians and motor vehicles are also very significant. This not only leads to the decline of traffic efficiency, traffic jams and other issues, but also affects the safe travel of residents, and is not conducive to the promotion of people-oriented traffic concept. Traditional actuated control is suitable for the intersections with small traffic flow and big stochastic volatility. This paper proposes an improved actuated signal control algorithm based on Intelligent Vehicle Infrastructure Cooperative Systems by the relative theory of delay mechanism of inductive signals control between vehicles and pedestrian, the theory of signals timing while crossing and theory of decision making. Based on classical actuated control, a concept of traffic priority is put forward. Dedicated Short Range Communications (DSRC) technology is used to collect the traffic volume data and queue length and vehicle delay data are calculated by detectors. In order to verify the validity of the method, this paper takes a single intersection as the research object, using the VISSIM traffic simulation software to analyze the traffic signal control indexes of the improved actuated control method and the fixed control method in different stages. Simulation results prove that the improvement of the proposed algorithm is significant, especially when the traffic volume is heavy and the saturation is high, the proposed algorithm is still outstanding comparing with traditional algorithm.

THE RESPECT OF SPEED LIMIT IN SELECTED ROAD SECTIONS IN POLAND

Jan Kempa

University of Science and Technology in Bydgoszcz, Poland

ABSTRACT

Vehicle speeds are one of the most important traffic characteristics. They decide about the level of road safety, a trip comfort, transport economics, as well as the degree of traffic impacts on environmental. From an engineering point of view, the speed of vehicle being driven in free flow motion conditions plays a very important role. It is used to shape geometrical elements of road infrastructure, determine a road capacity, and what is undoubtedly the most important to shape the desired level of road safety. In Poland, there have been and are conducted studies on vehicle speed in free flow traffic conditions, but unfortunately to a limited extent. The effect of the time of day or surface condition caused by weather conditions is still poorly recognized. The author determined degrees of speed limit violations (that is ratios of selected positional measures of speed distributions to the speed limit) on the basis of speed measurements in free flow motion conditions. Values of this ratio that exceed 1,00 prove the vehicle overspeed the speed limitation. The overspeed value means the speed greater than the safe speed, i.e. the speed limit resulting from the specific road environment (road facilities, road surroundings, traffic and atmospheric conditions), road users and vehicles. The overspeed value is associated with a high probability of a road incident. The higher overspeed value means the higher probability of a road incident. Therefore, it is so important, due to road safety reasons, to know ratios of the overspeed value and factors they depend on. This paper presents the results of research on the ratios of speed limits respect on selected sections of national and provincial roads. The results of studies have already shown that the scale of ignoring speed limits in Poland is unfortunately large and mainly depends on the geometric parameters of the road, the condition of the pavement surface caused by weather conditions (dry or wet), and the time of day, i.e. driving conditions during day and night time.

EFFECTIVENESS AND RESPECTING SPEED LIMITS IN THE UNARRANGED TRAFFIC-CALMING ZONE

Jan Kempa

University of Science and Technology in Bydgoszcz, Poland

ABSTRACT

The purpose of the study was to test the level of respecting a speed limit by drivers of vehicles in a traffic-calming zone that was not formally designated, located in a part of an old city in a middle Polish city. Due to historic assets in that location, the applied means of traffic calming included only legal-organizational means, i.e. local speed limit signs. The analysis was carried out of vehicles speed in selected measuring sections; next, the level of respecting speed limits by drivers was determined. The results proved that just installing speed limit signs at entrances to zones or at priority to the right intersections is insufficient to obtain required speeds. The tests revealed that in all tested sections drivers exceeded the speed limit of 30 km/h. An average speed varied from 32.1 km/h to 37.1 km/h, with the 85% quantile of speed amounting from 36.1 km/h to 42.7 km/h. A large percentage of drivers who overspeed the speed limit was recorded, which was from 35% to 90%. The lowest percentage of drivers exceeding the maximum speed was recorded in sections where surface was made of cobblestone (only 10%). This stemmed from the fact that in order to obtain driving comfort, drivers were forced to reduce speed significantly. The results of tests show explicitly that in order to obtain desired traffic conditions from the safety perspective, it is necessary to apply physical means of traffic calming that force drivers to reduce speed. Such measures should include: an adjustment of traffic corridor geometry in a general layout, narrowing a lane, speed bumps, raised speed tables at intersections, and raised pedestrian crossings. The applied traffic calming measures, including but not limited to areas that are subject to conserver's supervision, should meet high functional, engineering, and visual standards, and be a harmonious part of the historic surrounding.

ASSESSMENT OF ROAD AND RAILWAY INFRASTRUCTURE AND MEANS OF TRANSPORT BY ASPECT OF SURVEY IN THE SELECTED AREA OF POLAND

Jan Kempa, Damian Iwanowicz

University of Science and Technology in Bydgoszcz, Poland

ABSTRACT

Current socio-economic conditions of some developed and developing countries are not favorable for the development of public mass transport services. Most of the residents of large and medium-sized cities, but also smaller towns, use their own passenger car on mandatory trips. This phenomenon perfectly reflects the constantly growing of motorization index in such countries. The consequence of this is, of course, the decreasing number of passengers carried by means of public mass transport, in particular operating outside of large urbanized areas. This causes and unfortunately will cause further problems of automotive congestion on transport networks of urban areas, reduction of road safety level, but also adverse environmental effects in the form of pollution. The authors of the article analyzed the results of transport surveys, which were carried out in recent years among public transport passengers. The surveys concerned the assessments and postulates and expectations of passengers. The research was carried out in one of the typical in terms of socio-economic conditions of Polish voivodships (a country dynamically developing in the passenger transport sector, in terms of both mobility, as well as the quantitative and qualitative status of transport means and transport infrastructure). The voivodship subjected to such analysis was the Kuyavian-Pomeranian Voivodeship, located in the central part of Poland. The respondents were asked to speak on topics related to, among others, transport infrastructure, means of transport, access to services of public transport systems, comfort and safety of traveling. The analysis also included assessments and postulates related to tariff systems, travel information systems, and transport integration systems - functioning in the voivodship. The results of the research were analyzed by rail passenger transport and bus passenger transport as part of voivodship public transport system. In the majority of cases, passengers' assessments were not satisfactory. The most frequently issued evaluations fluctuated only around the average (on a scale from 1 to 10). The authors have thoroughly analyzed the results of the transport survey, confronting the results obtained and trying to find out their causes depending on the characteristics of the area under analysis.

DATA COLLECTION METHODOLOGY TO ASSESS ROAD PAVEMENT CONDITION USING GPS, VIDEO IMAGE AND GIS

Bertha Santos, Pedro G. Almeida, Leonor Maganinho

Calçada Fonte do Lameiro, Department of Civil Engineering and Architecture, University of Beira Interior & CERIS-CESUR ECI/04625, 6200-358 Covilhã, Portugal

ABSTRACT

Traffic loads, along with the environment, damage pavement over time. The degradation of pavement quality is reflected in the development of a diversity of pavement distresses, such as cracking, deformation or deterioration. These distresses may occur on the surface and/or in the pavement structure, having a determinant role in pavement's quality. Aiming to increase the degree of reliability of the pavement distress data and reduce pavement observation time and visual inspection operations cost, this work presents the main steps proposed for a methodology to observe, record and evaluate flexible road pavement distresses to assess the quality of road pavements. This methodology is based on an in-vehicle inspection using GNSS and video image capture devices and in the use of Geographic Information System (GIS). Validation of the proposed methodology was made through a case study by comparing the results obtained on the in-vehicle inspection to those from a traditional visual inspection performed on foot. The similarity of results obtained by the two approaches allowed to conclude about the feasibility of the proposed methodology. Among the main advantages of the proposed methodology a highlight is on the possibility to identify, quantify and locate the most severe pavement distresses through the use of spatial tools available on GIS, producing information maps and reports that can be used in the decision-making process about road pavements rehabilitation and conservation.

Corresponding Author: Bertha Santos

PEDESTRIAN ROAD ACCIDENT INDEX FOR MUNICIPALITIES: THE PORTUGUESE CASE

Bertha Santos [1], Carmen Carvalheira [2]

[1] Calçada Fonte do Lameiro, Department of Civil Engineering and Architecture, University of Beira Interior & CERIS-CESUR ECI/04625, 6200-358 Covilhã, Portugal
[2] Rua Conselheiro Emídio Navarro 1, Department of Civil Engineering, Instituto Superior de Engenharia de Lisboa, 1959-007 Lisbon, Portugal

ABSTRACT

Portuguese road traffic accident statistics show that the number of accidents with fatalities and serious injuries has in general decreased in recent years. However, the number of accidents involving pedestrians is still high when compared with those observed in other countries of the European Union. In order to assess this problem, an index of pedestrian road traffic accidents for municipalities that could be used in decision-making about pedestrian safety measures is proposed. The use of absolute values of accidents involving pedestrians (running over) does not allow itself a reliable comparison of pedestrian safety level between municipalities. In this sense, the approach proposed uses the information available in the Portuguese database PORDATA to calculate a municipal index that takes into account the degree of exposure of pedestrians to an accident, based on national and municipal resident population annual growth rates and number of road accident involving pedestrians. This index allows to identify the municipalities with unfavourable deviation to the national numbers of road accidents involving pedestrians (per 10 000 inhabitants), supporting the plan and allocation of human and economic resources for the diagnosis, definition and implementation of safety measures. The results obtained can be visualized in a GIS for a more comprehensive comparison between municipalities. The analyses performed for Portugal showed that, in general, municipalities with higher resident population annual growth rates, located mostly along the coastline and in more consolidated urban areas, tend to present better index values, which points to the need to intervene in less consolidated areas.

Corresponding Author: Bertha Santos

ANALYSIS OF DRIVER REACTION DURING BRAKING AND AVOIDANCE MANEUVER

Bucsuházy Kateřina [1], Svozilová Veronika [2], Stáňa Ivo [1], Semela Marek [2], Gruberová Olga [3]

[1] Institute of Forensic Engineering, Brno University of Technology, Purkyňova 464/118, 612 00 Brno, Czech Republic
[2] Department of Biomedical Engineering, Brno University of Technology, Technická 12, 61200 Brno, Czech republic
[3] CEITEC – Central European Institute of Technology, Brno University of Technology, Purkyňova 123, 61200 Brno, Czech republic

ABSTRACT

One of the parts of the accident analysis is also the objective assessment of responsibility of accident participants related to their behavior and objective ability to avert the imminent critical situation. During a critical situation, the driver can respond by avoidance maneuver, critical braking or a combination of both. However, most of the research studies have been focused on the analysis of driver brake-reaction time. The aim of this paper is to analyze driver reaction time in detail during avoidance maneuver and critical braking. For the purpose of this study, combination of eyetracking technology and electromyography has been used. The combination allows detailed and accurate determination of the onset of muscle activation during reaction. For the elimination of result distortion, measurements were carried out in a real vehicle on predetermined route. Participants responded to the sudden braking of the leading vehicle. The obtained results demonstrate the time necessary for the activation of lower and upper limb during critical situation.

Corresponding Author: k.bucsuhazy@gmail.com

MODAL SPLIT – DIFFERENT APPROACHES ON A COMMON TERM

Adam Ungvarai

University of Debrecen, Department of Civil Engineering, Debrecen, Hungary

ABSTRACT

The modal split, also known as modal share or mode choice, is a common and widespread indicator in transportation engineering to evaluate transportation behaviour. In very short, the modal split shows the percentage of travellers using a particular mode of transport in the ratio of all trips made. For example, a higher modal split number of bicycle users indicates a more sustainable city. But when going deeper in analysis, it turns out that surprising variations in the definition are known, each more or less different in meaning. But even if definitions would be crystal clear, the measuring practice makes it almost impossible to state certain mathematical numbers as one and only result. However, honoured researches still use it as indicator. Crucial exact conclusions and result may be drawn from modal split numbers. As the origins go back to the 1960's, how can this indicator still work? How can it still be the best method to calculate trends in transportation? Isn't there nowadays a better indicator? It turns out: no. Modal split is still the best evaluation method in measuring quality of some regions transportation system. In this article I try a methodical make up of this term, and also point out practical issues. I give a short overview in the history of modal split, and finally show up examples based on real cases to demonstrate where problematic approaches can occur.

INFLUENCE OF DIFFERENT TYPES OF TRAINS ON HUMAN IN THE BUILDINGS

Filip Pachla, Alicja Kowalska-Koczwara

Cracow University of Technology, Warszawska 24 St., 31-155 Cracow, Poland

ABSTRACT

Poland belongs to rapidly developing countries. Recently, the railway has been developing particularly intensively. In the near future on one of the most important railway lines in Poland it will be possible to travel by passenger trains with speeds of 250km / h. In such cases, when the speed is raised, it is necessary to assess the impact of vibrations on people in buildings near the railway line. This paper presents the results of the assessment of the impact of vibrations on humans in the buildings from the passage of passenger trains at different speeds. The assessment was made on the basis of field studies. For the assessment, single-family buildings located near the railway line at the distance of up to 60m were selected. The source of vibrations was the travel of passenger trains, including the Pendolino model ED250. The analysis of the impact of vibrations on humans was performed in accordance with the Polish code PN-B-02171, which recommends the use of the a_{RMS} method as well as the vibration dose (VDV method). The conclusions from the research and analyzes as well as the results presented in the work may be useful in further planning the rail infrastructure in Poland.

Corresponding Author: Filip Pachla

MODELLING FREIGHT TRANSPOARTATION IMPACTS OF THE GULF COOPERATION COUNCIL REGION USING GIS

Hasan Tayyeb [1], Ali Kassim [2], Mubark AlFalahi [3]

[1] Department of Civil Engineering, Umm Al-Qura University, Makkah, Saudi Arabia
[2] Department of Civil & Environmental Engineering, Carleton University Ottawa, ON Canada
[3] Municipal Roads & Infrastructure Department Abu-Dhabi, City Municipality, UAE

ABSTRACT

Freight transportation is a key element in economic growth and the development of countries. Linking freight lines between Gulf Cooperation Council (GCC) countries (specifically Kuwait, Saudi Arabia, Bahrain, United Arab Emirates and Oman) will increase revenues, improve infrastructure asset efficiency and generate employment. Shipping and transport industries endure continuous changes and transformations in response to technological developments and changes in world trade. Significant amounts of documentation, research papers as well as technical and economic reports are available in literature that details ways in which these industries respond to and meet the needs of shippers and consumers. Information and data are valuable assets in providing a basic understanding and base knowledge of the different types and methods of shipping options, as well as the impacts of different transportation modes. In this paper, possible environmental impacts will be discussed, including air quality, noise levels and vibration. In addition, safety factors such as fatalities and accidents will be incorporated into discussions on mode selection. A GIS model was implemented and a case study was created to assess these impacts, estimate damage costs as well as discuss concerns with logistics and mode selection. Finally, possible mitigation measures to manage environmental and safety concerns will be proposed. Based on the analysis and results, more work on environmentally sustainable models and designs need to be implemented to mitigate impacts and to ensure that the environment and quality of life can be preserved. Incentivizing shifts from truck to rail or to intermodal systems is key for shippers' participation in reducing environmental and societal impacts. Encouraging shippers to change their mode selection can relieve congestion and lower accident rates.

Corresponding Author: Hasan Tayyeb

METHODOLOGY OF COLLECTING DATA FOR EVALUATING PUBLIC TRANSPORT SERVICES

Marek Braniš, Tibor Schlosser, Silvia Cápayová, Andrea Zuzulová, Dominika Hodáková

Slovak University of Technology, Radlinského 11, 810 05 Bratislava, Slovakia

ABSTRACT

One of the parts of sustainable mobility is surely the quality of the public transport service. It includes suitable vehicles, as well as the stations, stops and various other integrated transfer points of the public transportation system. For the optimization of using these transfer points, as well as the overall optimization of public transport services, it is necessary for us to obtain traffic data in real time. At present, the many various technical systems for collecting data became more popular, which have undisputed benefit for the provider. Unfortunately, the added value of these data for operational traffic management is not always fulfilled. The important value in public transport service evaluation is the number of transported passenger. According to the ticket sales or according to the automatic counting systems installed in vehicles, we can get these data, but these data reflect just the number of passengers in a particular vehicle, between two particular stops. Unfortunately, in our circumstances, it is also not a habit to use the data of transported passengers even in the detection of inter-region relations. That is the reason, why we are looking for the new ways, how we can reach the data, which can be more indicating. The possibility of recording and evaluating this data could be useful for public transportation operators as well as the municipalities and cities on the side of public transportation customers. It could be helpful not only for optimizing the effectiveness of using vehicles, transfer points, etc. but also for dealing with contractual relation between the transport operators and municipalities.

Corresponding Author: Marek Braniš

RESHAPING THE GDANSK HARBOR –THE CONTINUOUS PROCESS

Piotr Lorens

Gdańsk University of Technology, Faculty of Architecture, ul. Narutowicza 11/12 80-233 Gdańsk, Poland

ABSTRACT

Gdańsk is the harbour city with a history of more than 1000 years. For many centuries the harbour structures were evolving within the central part of the historic city centre, and – in result – a specific urban structures associated with these functions were created. But the evolution of the maritime technology as well as new needs regarding servicing the ships and cargo-handling activities effected in creation of the more modern facilities. Within the article a reflection regarding these issues is presented, which takes into account both the global trends in harbour developments and local specifics of the city. In result, the article can serve as the reference paper for research associated with evolution of the ports and port cities.

IMPROVING PRODUCTIVITY OF PAVED ROAD ASSET MANAGEMENT

Jan Filipovsky, Timo Saarenketo, Tomi Herronen, Annele Matintupa

Roadscanners Centeal Europe s.r.o., Czech Republic

ABSTRACT

The PEHKO project is largely based on long term work, carried out by ROADEX projects and ROADEX Network within the Northern European Road Agencies and on Roadscanners' own product development. The PEHKO project has now been underway since 2015 and preliminary results have exceeded expectations. Right from the start the weakest links reducing pavement life and increasing cycle costs were identified. These sections, spread all over the network, covered only 10-20% of the length, but incurred up to 50% of the annual paving costs due to deficiencies in both pavement structures and daily maintenance. Typical structural problems were thin pavements and heavy trucks on road sections with soft subgrade soils. Maintenance deficiencies were mainly associated with poor drainage and inadequate winter maintenance. PEHKO pilots in Lapland and Central-Finland areas started in 2015 and in 2018 Uusimaa region joined in. The project in Lapland covers altogether 1252 km of paved roads in the Kemi-Tornio area and main roads of the Rovaniemi area. In Central Finland, the project covers paved roads in the Karstula area with a total length of 401 km. The Uusimaa area PEHKO roads are located in the Hyvinkää maintenance area and their total length is 860 km.

Corresponding Author: Jan Filipovsky

Session Title:

Architectural Space

SPATIAL MEMORY: A CHILDHOOD HOUSE - A PROPOSED MODEL OF THE MEMORY AND ARCHITECTURE RELATIONSHIP

Nilufer Ozak [1], Gulcin Pulat Gokmen [2]

[1] Abu Dhabi University, College of Engineering, Faculty of Architecture, United Arab Emirates
[2] Istanbul Technical University, Faculty of Architecture, Department of Architecture, Turkey

ABSTRACT

This paper has been shaped and developed on the proposition that a relationship exists between memory and architecture. The mechanics of memory have been studied for many years by various disciplines and its connection with architecture, either individual or collective, forms the spatial memory in architecture. In the formation of this spatial memory, the interaction with one's environment and the memory of this interaction stored in one's brain makes the ability to remember and recall important. Consciously, what significance do people attribute to remembered spaces? How do they value them, in their own words? How do the remembered spaces interact with them? Can spatial memory emerge and bring new values to architecture? This study aims to investigate the importance of the formation of spatial memory in an individual's dynamic relationship with any particular space. A "*Childhood House*" has been selected as the space for the study. There are many scholarly books that address the space of the house where it has been a particular focus from a memory point such that it collects an individual's past relationship with the space. The recollection of the childhood house by an individual relates the spatial relationship one has with memories of the past. Spatial memory, which has been formed on concepts of memory, perception and this house, is analyzed in a proposed model aimed at explaining what spatial elements might be inputs in forming spatial memory. Individual features, the social environment of the era and physical characteristics of the space are selected as the main features to form the spatial memory of a childhood house. The model also puts forward several sub-features which enhance the recall moment of an individual when interacting with a space. Main and sub-feature inputs of the model form multi-layered spatial memory outputs, which show the brain's ability to code, store and recall. Twenty individuals were chosen to contribute to the study, using their recall of childhood house memories to respond to pre-set memory/space related questions. Each individual's spatial recall verified that the proposed memory/space relationship model showed clear evidence that the spatial memory is formed under the influence of these three important characteristics: Individual, social/cultural and physical interaction act in concert to constitute a spatial memory.

Corresponding Author: Nilufer Ozak

"SOUNDS OF ARCHITECTURE" - INTERDISCIPLINARY RESEARCH ON THE USE OF AUDIO SIGNALS IN THE COGNITION AND DESIGNING OF ARCHITECTURAL SPACE

Agnieszka Kłopotowska

Bialystok University of Technology, Faculty of Architecture, Department of Housing Architecture, Unit for Urban and Spatial Planning, Wiejska str. 45A, 15-351 Białystok, Poland

ABSTRACT

In the oculocentric world of image, the basic attribute of architecture is its visuality. Visual perception - an efficient, vigilant mechanism that registers spatial reality, seems (as never before) to define the quality of human encounters with architecture. Rich concepts: “to feel space”, “to learn about it”, “to live in it”, too easily are being replaced with one word today: “see". Perceiving architecture, only by sight we lose its spatiality. The progressive deprivation of the senses of whole sensory apparatus of the human body leaves a mark in the aesthetic as well as the existential aspects of these experiences. The above considerations have become the inspiration for a multidisciplinary project entitled "Sounds of Architecture", dedicated to research into the phenomenon of sound and its importance in the perception and use of the architectural environment by humans. This project was carried out (under the direction of author) in 2014-2015 with the participation of representatives of various disciplines of science and art. The effect of interdisciplinary research was a monography “Sounds of Architecture”, published in 2016.

DECONSTRUCTION: BETWEEN ICON AND ARCHITECTURAL LANDMARK, TWO SPANISH EXAMPLES

Tiago Rodrigues [1], Ana Maria Tavares Martins [2]

[1] Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001 Covilhã. Portugal

[2] UBI, Lab2PT, CIDEHUS. Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001 Covilhã. Portugal

ABSTRACT

The 20th century was a period in the history of humanity that was distinguished by numerous technological advances, many discoveries and achievements in knowledge, science and the arts, as well as numerous changes and political restructuring. In the Human Sciences, especially in Philosophy, new concepts and thoughts emerged that marked and conquered the opinions of the intellectuals of that time. One of these new concepts was the "Deconstruction" around the 60's of that century. The term "Deconstruction" was used for the first time by the philosopher Jacques Derrida in his work "De Grammatologie" of 1967. Deconstructivist Architecture emerged in the 80's of the 20th century. Deconstruction had as main intention the rediscovery of new values, through the contrast of concepts, and the suppression of Modernism. Architecture was no exception, because new thoughts, styles, movements and new constructive techniques arose, which produced and caused a (re)affirmation of Architecture in society, through the implementation of new configurations and modern spatial conceptions. "Deconstruction" as an architectural movement arose from the fusion of Russian Constructivism and other movements related to the philosophical concept of "Deconstruction", presented by Jacques Derrida. But it is the 1998 exhibition "Deconstructivist Architecture" organized by Marc Wigley and Philip Johnson at the Museum of Modern Art (MoMA), in New York, that acknowledges Deconstruction in Architecture. Frank Gehry, Peter Eisenman, Daniel Libeskind, Rem Koolhaas, Zaha Hadid, Coop Himmelb(l)au, and Bernard Tschumi were the avant-garde architects featured in this exhibition. On the 25th anniversary of the exhibition, MoMA curator Barry Bergdoll hosted "Deconstructivism: Retrospective Views and Actuality", which traced the subsequent careers of that seven architects to examine the impact of the exhibition and the changes in architecture in those 25 years. This paper identifies the deconstruction concepts that were the basis of deconstructivist architecture but keeping in mind that Iconic deconstructivist architects were not committed completely to all concepts of this philosophy as they produced their architectural objects. Two iconic buildings as Peter Eisenman's City of Culture outside Santiago de Compostela (Spain) and Frank Gehry's Guggenheim of Bilbao (Spain) are presented to achieve the debate.

Corresponding Author: Ana Maria Tavares Martins

INFLUENCE OF COMMUNICATION DESIGN TOOLS ON THE WAYFINDING PROCESS OF USERS IN CHILDREN'S HOSPITALS

Ali Matay [1], Didem Kan-Kilic [2]

[1] İzmir University of Economics, Faculty of Communication, Department of Cinema and Digital Media, Sakarya Street,No: 156, Balcova, Izmir, Turkey
[2] İzmir University of Economics, Faculty of Fine Arts and Design, Department of Interior Architecture and Environmental Design, Sakarya Street,No: 156, Balcova, Izmir, Turkey

ABSTRACT

This study aims to improve health-seekers´ wayfinding experience in children's hospitals and understand how wayfinding process of hospital users empower by using communication design tools. In addition, we try to investigate how communication tools might support patients experience navigation activities in a healthcare facility. We believe that wayfinding has a great significance in a hospital design considering stress level of the users with a time limitation. Therefore, the communication design tools can help the users to reach the target in a limited time and communication design tools are important to decrease the stress level of the users. We think that children's hospital has a worth to study wayfinding process of users. To ensure a broadly representative sample we attempt to select seven children's hospitals and analyzed their wayfinding systems in relation with their environment. The instruments of this study are based on photo documentation which represents the interior settings of chosen hospitals. Finally, based on the analyses of the photo-documentation it was found that simple communication design tools can create imaginary environment for children and decrease their stress level and increase their comfort in such an unpleasant space.

Corresponding Author: Didem Kan-Kilic

ANALYSE THE FUNCTION OF THE SENSE OF SMELL IN PERCEPTION OF ENVIRONMENT

Selin Kocabiyik, Didem Kan-Kilic

İzmir University of Economics, Faculty of Fine Arts and Design, Department of Interior Architecture and Environmental Design, Sakarya Street,No: 156, Balcova, Izmir, Turkey

ABSTRACT

How are smells kept people memories in their minds with infinitely and how do those scents make a structure of perception of our environment? The sense of smell recall our memories and also it protects our old memories in our mind. When people smell familiar scents that belong to somewhere else, they remember and they started to imagine the specific environment. Hence, the main purpose of the study to examine people's memories connected with the sense of smell. Moreover, this article aims to understand how people describe the spaces revived in their minds when they smell familiar scents and also while describing the environment, what design elements they used. Therefore, I prepare 7 research questions which are '' Is there any connection between the memories and scents? , Can it provide that the smell is unforgettable in human memory? , What scents types do people use to remember their memories? , Do people use familiar smells to remember their memories? , How an environment can revalue in their mind when they smell familiar scents? , How do they describe this environment? , What type of design elements that they mention in their mental map?'' In my opinion, scents can recall the people's old memories because in my experiment participants remember their old memories and they mentioned deeply what they remember. In the methodology part, I made an experiment. First, I selected 12 people that have no problem with senses because participants smell 10 different scents while they couldn't see anything thanks to the blindfold. This experiment was in a studio in art faculty of the Izmir University of Economics. This experiment has 5 stages. Shortly, participants smelled the scents one by one then they chose 3 of them after that they drew their cognitive maps that related with their memories. In finding discussion part, I understand that sense of smell has a huge role in our perception of space. In this study, participants smelled the scents, remembered their memories and drew cognitive maps with only using the sense of smell.

Corresponding Author: Didem Kan-Kilic

EFFECTS OF INPATIENT UNIT DESIGN ON NURSES WALKING DISTANCES AND JOB SATISFACTION IN THREE JORDANIAN HOSPITALS

Israa Shlool, Bushra Obeidat

Jordan University of Science & Technology, 3030, Irbid 22110, Jordan

ABSTRACT

Jordan seeks to improve the healthcare facilities to meet the increased demand for healthcare services. Nurses represent the largest labour force in any Jordanian hospital, and the efficiency of their work environment has obvious implications for maximizing productivity, collaboration, and satisfaction, and accordingly improving the care delivered to patients. The main goal of this research is to identify the influence of inpatient unit layout on nurses' movement patterns and the resultant level of their satisfaction. There have been many studies that investigated how these concepts influence care delivery on inpatient units, but no study has evaluated the design of inpatient units in Jordan. A field research and comparative study was conducted on three inpatient units in three Jordanian hospitals. This study utilizes a mixed-method approach that involved unobtrusive shadowing, systematic behavioural observation, online surveys, and advances spatial and physical analysis of units' layout. Results specific to nurses' activities, walkability, and nurses' satisfaction are compared and reported for the three case studies. The study concludes that co-location of medications and supplies; and spatial proximity between nurse station and patients should be considered while designing an inpatient unit. Understanding the key nurses' activities sequences helps to determine the best location of the nursing station and the arrangement of supportive spaces in relationship to patient rooms.

Corresponding Author: Bushra Obeidat

THE CURRENT FEATURES OF THE CENTRAL PUBLIC SPACE FUNCTIONING IN THE HISTORICAL CITY, A UNESCO WORLD HERITAGE SITE

Bohdan Cherkes, Anna Fedak, Andrii Shtendera

Lviv Polytechnic National University, Institute of Architecture, Bandera str., 12, 79013, Lviv, Ukraine

ABSTRACT

A common feature of the significant squares in historical cities is the contradiction between the problems of protection and functioning. A striking example of such a contradiction is the Rynok Square in Lviv - public space, which since its appearance in the 14th century, has always been a communicative hub for citizens and guests of the city. In 1998, the central part of Lviv was included in the UNESCO World Heritage Site, and only 15 years later, the entrance of private vehicles to the Rynok Square was restricted, making the central square again a public space. Since then, there is no data on the use of square as a public space. Qualitative changes in the functioning of the city square are visible to the naked eye, but it is difficult to assess the scale and vector of these changes without a detailed study. For a comprehensive understanding of the Rynok Square public space functioning and the level of its socialization, we have developed a methodology for evaluating the quantitative characteristics of the social and cultural aspects of the urban environment. From October to December 2018, a pilot study of the interaction of people with institutions and spaces of the Rynok Square was conducted. The process of research was divided into two main stages. Firstly, we analyzed the volume-functional features of the Rynok Square, where the architectural and planning characteristics of the space were taken into account, and, for the sake of further research, the territory was divided into 4 fragments, and the city council as a central element of geometry. The second stage included the research of the quantitative characteristics of space functioning. According to the types of activities of users and visitors, we singled out two basic types of data: the number of visitors of community, cultural and service establishments; and total numerical value of people, who use the Rynok Square as a public space. As a result of the study, we identified a territorial disbalance in the functioning of the Rynok Square as a public space. Thus, there is a more active use of the north-western part for various public and service establishments due to higher pedestrian activity and simpler rental situation. The southern side, because of the combination of public transport, historically has a transit role in the city's structure. There are most of the museums on the eastern side, and it plays role of a cultural center of Rynok Square. The survey data gives us an understanding of the current state of using the Rynok Square as a public space, so it might be a good basis for further sociological and economic research. This will allow us to more detailed study to the issues of organizing new public, cultural or service establishments, and the creation of potential spaces for communication. Due to this data, we can speak about behavioral tendencies of residents and visitors of the historical city, which will allow to qualitatively improve the spaces for their future use.

Corresponding Author: Andrii Shtendera

ISSUES OF WATER IN URBAN SPACE ON THE EXAMPLE OF THE CITY CZĘSTOCHOWA

Nina Sołkiewicz-Kos

Polytechnic University of Częstochowska, 42-201 Częstochowa, ul.Dąbrowskiego 69, Poland

ABSTRACT

Searching for and creating new "places" in a narrow urban space has become a need to compensate for the space deficit. The attempt to redefine place often involves the renewal and revitalization of cultural spaces. The author presents three elements of urban space, the common feature of which is the water factor. The example of park areas, riverside areas and the city square presents a different scale, function and approach to the use of water in creating space. Water element occurring in the discussed areas may result directly from local and natural conditions. It can also be the result of human activity and technologies used by him. The city of Częstochowa has so far used the potential of the river and water as an element of industrial infrastructure. The presence of water in the city was associated with its servile role in the industry. When discussing selected areas, the author presents changes that have occurred over the years. It presents the evolution in the approach to the use of the water element when creating a recreational space. The current revitalization activities carried out within the city focus on the use of the potential of water, regardless of the scale of activities. An example may be the renovation of the area around the lagoon, the restoration of riverside areas to the city or the modernization of city squares with enrichment of them with a water element. Urban spaces in the form of small squares, squares, riverside boulevards, riverside baths accumulate and unload the pace of life in the city becoming its integral element. The urban planning activities in the inner city areas force the architects to develop innovative solutions in the way of managing tight intermingling spaces.

SHAPING OF THE PUBLIC SPACE IN THE DOWNTOWN AREA ON THE EXAMPLE OF THE CITY OF CZĘSTOCHOWA

Nina Sołkiewicz-Kos

Polytechnic University of Częstochowska 42-201 Częstochowa, ul.Dąbrowskiego 69, Poland

ABSTRACT

The author undertakes the task of the evolution of public spaces in the city of Częstochowa over the years. The choice of a medium-sized city such as Częstochowa results from a broader analysis of cities that are important in Polish history and belong to the culture-creating places of the nation. In such places one should expect, above all, urban and architectural solutions that emerge from the uniqueness of the place and its role - a pilgrimage city, an academic and tourist center. On the basis of collected archival, cartographic and photographic materials, the author presents changes in selected urban spaces from the early 20th century to modern times. Selected examples of urban spaces are located in the key places of the compositional axis of the urban layout of the city and function in the minds of the inhabitants as important places. The first example that concerns urban changes in downtown areas is the urban park zone near the Jasna Góra monastery. This area is the beginning of the composition canvas for the urban layout of the city of Częstochowa (1826). The location of the area and historical background creates a huge potential of the place attracting city residents as well as tourists and pilgrims. The central part of the historical urban axis of the city is Biegański Square. The urban development program developed by the city authorities assumed the elimination of vehicular traffic and the creation of a cohesive public space in the city center (2011). The last, third of the discussed urban spaces of the city concerns the Old Market Square. This is the area closing the historical axis of the Częstochowa urban foundation. This problematic area requires revitalization activities in response to contemporary functional requirements and newly defined social needs. The discussed changes within the urban space illustrate the process of transforming these areas into special places - important for the urban development of the city.

FACADE ART GLASS IN THREE CONTEXTS: URBAN LANDSCAPE, ELEVATION OF THE BUILDING AND ITS INTERIOR

Alina Lipowicz-Budzyńska

Faculty of Civil and Environmental Engineering and Architecture, UTP University of Science and Technology, Al. prof. S. Kaliskiego 7, 85-796 Bydgoszcz, Poland

ABSTRACT

The aim of this publication is to define the effect of façade art glass on the architectural space. The façade art glass – unlike stained glass – has a pronounced visual presence in three compositional structures of an architectural space: It is seen as part of the urban landscape, the form and façade of the building, as well as its interior. The dissertation describes the characteristics of each of these areas.

The wide range of impact of monolithic art glass on the perception of the architectural space is connected not only with the previously the application techniques, but mostly with the specific image structure, which dictates how double-sided layers are made that are seen both with the light shining at them and coming from behind them. This paper lists several strategies used to create double-sided layers. Monolithic art glass is a relatively new phenomenon, and its influence on the surroundings is still being discovered with each new project. An image put on glass becomes an integral part of the building it adorns and is key to a number of important aspects. As an artistic element, it affects how the building's aesthetic values are seen – determining its' expression, symbolism, nature and colour scheme – as well as becomes integrated into the façade. As a divider, it plays a part in the modification of the passing light, determining how the interior, and indirectly also the exterior, is seen.

SOCIAL AND ECONOMIC URBANIZATION PROCESSES IN COMMUNES IN A METROPOLITAN AREA

Hanna Borucinska- Bienkowska

Faculty of Civil Engineering, Architecture and Environmental Engineering, Department of Architecture and Urban Planning, University of Zielona Gora, Poland

ABSTRACT

The article discusses selected social and economic changes taking place in communes of a metropolitan area following a political transformation period in Poland, Central and Eastern Europe. Dynamic urbanization of communes of Polish metropolitan areas was one of numerous results of socio-economic transformation of the country after 1989. The process played an important part in shaping both functional-spatial systems and awareness of self-governmental authorities and local communities in terms of the values of development of integrated systems of technical infrastructure. Rapid changes taking place during the first years of the social and economic transformation caused a few negative functional-spatial phenomena in the communes bordering the central city. The analysis covered processes taking place in communes that constitute a considerable part of the Poznań Metropolitan Area. Monitoring processes which promote increased electricity demand (of both social and economic nature, including migration and increase in the number of economic operators in years 2000-2018) taking place in areas of communes within the impact area of the central city may enable self-governments to implement sustainable development rules and facilitate both controlled urbanization of communes of Polish metropolitan areas and correct sustainable development of technical infrastructure. The example of the analyzed selected economic and social issues concerning transformations of communes within the impact zone of the central city shows that the transformation process in metropolitan areas in Poland after the political change occurs at different levels and to varying degrees. In result, the new situation rendered it necessary to connect developing economic functions, urban in character, with traditional functions of agricultural production space. However, expansion of the central city caused a lot of rural communes to lose their primary agricultural character. Combination of housing and economic functions along with traces of agricultural functions, development of technical infrastructure, and transportation network for cars and passengers caused qualitative and quantitative changes in areas of communes adjacent to the central city. The functional-spatial changes and socio-economic transformation in Poland began a dynamic urbanization process of areas of rural communes bordering the central city. All the processes facilitated synergy in transformation of communes. A variable pace and scale of the ongoing ecological, economic and social phenomena requires constant monitoring both by architects and urban planners, both in practice and theory to examine synergistic processes occurring in contemporary urbanization in rural areas. Self-governments and local communities, who share responsibility for functional-spatial planning and management of communes in a metropolitan area, should modify tendencies of sustainable functional-spatial and socio-economic development. The need to design and realize new buildings with diverse functions in rural communes activates their further development. Finally, this need stimulates synergistic processes occurring in functional-spatial and socio-economic development in communes of a metropolitan area.

POETICAL INTRINSIC CONSCIOUSNESS IN CONTEMPORARY CULTURAL ARCHITECTURE

Alma-Dia Hapenciuc [1], Oana Andreea Banescu [2]

[1] Polytechnic University of Timisoara, Timisoara 300570, Str. Cerna, Nr. 14, Bl. 3, Ap. 9, Romania,
[2] 300063, Str. Take Ionescu, Nr. 19, Ap. 8, Timisoara, Romania

ABSTRACT

The intangible is one of the most thought about fundamental architectural themes, but unlike visible, palpable topics relying on function, structure or materials, the ineffable presence only sometimes generated by architectural space will always be a collective informational void that can only be holistically explored through theories and visions of poetics, psychology, literature, history, etc. The justification of architecture itself, its spatial consciousness, its temporality, its integrity and its presence can become - only in profoundly authentic and sincere spaces - the native language of architecture itself, beyond the aesthetic, structural, functional, material, environmental or light vocabulary, eventually generating together with them, the very life of a building. This, experimented by the human factor, as a product of the interaction of the aforementioned dynamics, can create an architectural experience, beyond a building. From Antiquity until today, sight has been considered the noblest of senses - from expressing certainty to the correlation with primary elements (fire, light, etc.), to symbolic form, approximating the intellect, the metaphorical, the immaterial. Given that man has therefore transcended the visual through a synaesthetic collaboration between all senses and emotion or imagination, we are interested in experimenting spaces that use and exploit numerous senses, as well as their actual inner void and intrinsic spatial consciousness. We aim to use the analysis and a personal research project in order to generate a theoretical equation or expression of dialogue between theoretical spatial poetry and actual practice in contemporary spaces. In the current evolutionary context that has an explosive crescendo on excessive information, the ever-increasing technology and the pressure of constant innovation, only some of the contemporary functions manage to create spaces that go beyond the visual, through the cumulus of senses, in a dimension in which architecture speaks without words, transforming itself into lyricism and nurturing an inner space of feeling and poetry. Therefore, mostly spaces of meditation and cultural reflexion, remembrance and historical representation, which shelter individual and collective emotions, artistic expressions, creations and beliefs can breed intrinsic spatial and temporal identity. The personal knowledge acquired by previously designing an interactive experience museum has generated a strong background in analyzing the features and accordingly creating immaterial, poetical space of experimentation and dialogue between the users/visitors and the desired cultural references. Thus, it will be essential in finding the optimal means to obtain an architectural equation/expression in which theory, lyricism, ambient poetry, practice and technology compliment themselves in a harmonious and efficient manner.

Corresponding Author: Alma-Dia Hapenciuc

NOISE IN CHILDREN PLAY AREAS " MALLS": CASE STUDY OF MALLS IN AMMAN

Malek Al Mumani, Feryal Hamdan

Faculty of Engineering Technology, Zarqa University, Zarqa, Jordan

ABSTRACT

The children's play areas are one of the most important entertainment facilities in the Malls. Recently, the idea of play areas in Malls have been wide spread in the Arab world specifically in the Gulf countries and Jordan While the idea of shopping was turned to become more for entertainment and spending free time. These indoor spaces are representing noisy environments with all sources of noise inside, such as noisy games, and occupant's activities. The first statement in the seriousness of children's exposure to noisy games was published in 1960 by the Ministry of Health Canada After measuring the sound level of several noisy games .This paper describes the noise level in children play areas in several Amman Malls, by measurements. And describe the architectural variables such as size of architectural spaces and type of finishing materials; in terms of their effect on level of noise in this area. In addition to the quality of noisy games which exist in it and their effect on the level of noise. On the other hand, this paper confirms the importance of the application of international standards for noise in the early stages of the design of these areas to achieve a healthy, comfortable and safe environment to play without causing inconvenience and harm to children. The measurements were conducted during Fridays and Saturdays where most of the families are visiting Malls for shopping and other entertainments. the children spend 2-4 hours in these areas and their ages are between 2-15 years are playing in the same spaces. the measurements are including the sound pressure levels (SPL) at different frequencies and cumulative sound pressure (dBA) within 2-3 hours, also include reverberation time to estimate the reverberant sound contribute to the final noise. The result is showing that the cumulative noise is higher than the maximum dose recommended by the ISO and OSHA standards between (3-5 dBA). By discussing The effect of noise on human in particular on children. It is quite obvious that the aural conditions are not recognizing in the design of these spaces, and there is an urgent need to government regulation to make these places safe for every one.

Corresponding Author: Feryal Hamdan

Session Title:

Social Sciences & Architecture

CENTRAL ASIA MIGRANTS' ROLE IN CHANGING OF RUSSIAN MEGALOPOLIS SOCIOCULTURAL ENVIRONMENT

Elena Grunt

Ural Federal University named after the first President of Russia B.N. Eltsin, Mira st, 19, Yekaterinburg, Russian Federation

ABSTRACT

In recent decades, the processes occurring in the world have led to a sharp increase in the growth of interregional and international migration. Migration as a social phenomenon has a completely objective determinacy (global economic crisis; flashpoint areas; terrorism etc.). Today Russia has become one of the leading immigrant-receiving countries in terms of the absolute number of immigrants. The main flow of migrants to Russia is channeled from the countries of Central Asia, from the former Soviet republics. At present, labor migration from Central Asian countries has long occupied a prominent place in Russian reality, affecting various spheres of public life and changing the socio-cultural environment of megalopolises. The major research objective was to study migrants' activities in the process of adaptation to life in the Urals and the role of migrants from Central Asia in changing of Russian megalopolis socio-cultural environment. The research methodology combined both quantitative and qualitative approaches. The primary data was collected using questionnaires and in depth-interviews. 500 migrants were questioned on the basis of spontaneous sampling. In depth-interviews (20) were organized for the migrant's diaspora leaders and those migrants who have lived in the Urals for more than ten years. Our research has fixed that a part of the migrants from Central Asia (about 25.0%) are actively adapting to the culture of the host community. They actively learn Russian, intermarry, use mixed methods of children' education and use mixed national cuisine, etc. Migrants, adapting to Russian culture, at the same time affect it and changing the urban environment. The study has revealed two large residential communities inhabited by migrants from Central Asia – no-go- areas (South – west of the city and the central part of the city that is near the railway station). We call them "Kirghiztown" and "Tajiktown. About 60.0% of the respondents live there. This is an extensive social network with a high concentration of migrants from Central Asia. There is a secondary school where 42.0% of the total number of schoolchildren is the migrants' children. Migrants poorly adapt to the sociocultural conditions of the host community (communicate both in the family and in the professional team in their native language, adhere to national traditions, etc.). In fact, there remain "foreign community" in one of the biggest Ural's megalopolises. Meanwhile, the local population lives next to them. The coexistence of two cultures, on the one hand, leads to the blurring of culture distinction, and on the other hand, to a change in the cultural picture of the urban environment. The study has determined the new trends in Russian megalopolis 's cultural environment- the emergence of no-go-areas, the presence of multi-ethnic marriages (migrants with the local population), the use of Russian-Kyrgyz / Tajik methods of education and joint teaching of children, etc.). These trends indicate a change in the sociocultural space of the urban environment.

SOCIAL SIGNIFICANCE OF TECHNICAL WATER PURIFICATION AND TREATMENT PLANTS—ON THE CUSP OF NEW FUNCTIONS OF THE TECHNICAL SERVICE BUILDINGS OF CITIES

Agnieszka Wójtowicz-Wróbel

Cracow University of Technology, ul. Warszawska 24, 31-155 Kraków, Poland

ABSTRACT

Departure from environmentally unfriendly public attitudes and the increasing awareness of environmental protection and the management of natural resources among the residents of cities lead to pro-environmental design efforts—including planning and urban-design-related ones, for the shaping of urban structures. One of the elements of cities that, on the one hand, stir public emotions and on the other constitute an inseparable element of the urban organism, are structures that provide technical services to cities. Examples of these structures include wastewater treatment and water purification plants. The goal of this article is an attempt at finding an answer to the question about what role do wastewater treatment and water purification plants currently play in the structure of Polish cities and what other roles can they play. Particular emphasis was placed on the public reception of such structures. Based on Polish cases, this reception appears to most often be either neutral or negative. The author explores the mechanism of these reactions and their causes, particularly in reference to other structures that provide technical services to cities (e.g. eco-incineration plants, whose construction is faced with intense opposition from residents in Polish conditions almost every time). Nine Polish cities in which a total of thirteen wastewater treatment and water purification plants were subjected to an analysis. The article also referred to examples of good practices in the construction of such structures found in other foreign cities. The author searches for an answer to the question about the cause of public opposition to the construction of these types of structures, and whether we can—and if so, then how—prevent such public attitudes in relation to these types of structures.

EXPLORING THE ATTRACTION OF COMMUNITY EXTERNAL SPACE TO THE ELDERLY THROUGH SPATIAL SYNTAX

Dake Wei, Xuejiao Chen

Harbin Institute of Technology, No. 66, West Dazhi Street, Nangang District, Harbin, China

ABSTRACT

The aim of this study is to analysis how to improve the attractiveness of the external space of urban communities in cold regional city to the elderly's outdoor activities in winter. In view of China's aging social background and the elderly-care policy, a large number of communities in China have carried out the work of aging-adapted transformation. Outdoor activities are an important part of the daily life of the elderly, while climatic factors lead to obvious differences between the outdoor activities of the elderly in summer and winter. In this paper, taking Harbin Huayuan Street Sub-district as the research case, based on the investigating of the elderly's demand for outdoor activities in winter and the status quo of the community's external space environment, combining the methods of spatial syntax and sunshine simulation, this paper analyzes the factors affecting the attractiveness of typical external space such as residential group space, street space, riverside space, market space, sports venue and idle space to the outdoor activities of the elderly in winter, including accessibility, visibility, Sunshine shadow, floor height difference, landscape quality, etc. Put forward the design methods and strategies of the aging-adapted transformation for the Harbin Huayuan Street Sub-district, and improve the attractiveness of the external space of urban communities in cold regional city can enhance the willingness and quality of outdoor activities of the elderly. This study makes up for the deficiencies of the existing relevant research, and provides typical case support and reference for the aging-adapted transformation of similar communities.

Corresponding Author: Dake Wei

THE INFLUENCE OF "THIRD PLACES" ON THE QUALITY OF THE PUBLIC DOMAIN

Joanna Dudek

Department of Town Planning and Architecture, Faculty of Civil and Environmental Engineering and Architecture, Rzeszow University of Technology, Powstańców Warszawy Avenue 12, 35-959 Rzeszow, Poland

ABSTRACT

The attractiveness of public spaces depends on many factors. Both physical components, functional and spatial solutions as well as the number and variety of activities of people using them are significant. However, one of the most important roles of public spaces is to enable user integration and interaction — the existence of the so-called sphere of the "public domain" by facilitating establishing relationships between people. These relationships can be varied and determined among others by the length and type of contact between people, but also by the distance between the users. The greater the possibility of a deeper relationship, the more the quality of the "public domain" increases. Certain places with specific features give such an opportunity. They are so-called "third places." They are informal public gathering places where people can interact and socialize. Care for the high level of the "public domain" and the broadly understood attractiveness of public spaces is important because it allows to increase the inhabitants' quality of life. This fact, in turn, may also have a direct impact on the growth of the value of a given space both in the social, economic as well as cultural and political context. This article is intended to bring closer the types of interpersonal contacts occurring in the public space as well as different ways of their qualification. Above all, the basic aim of the work is to familiarize readers with the idea of "third places" and to present the possibilities of increasing the quality of the "public domain" both inside the buildings and between them.

WHAT MATTERS IN HOUSING ARCCHITECTURE – A SURVEY OF DWELLERS' OPINIONS

Angelika Lasiewicz-Sych

Instytut Projektowania Architektoniczego, Wydział Architektury, Politechnika Krakowska
Ul. Warszawska 24, 31-155 Kraków, Poland

ABSTRACT

The work presents results of a questionnaire survey conducted among users (aged 13 to 81, N = 440; one third of those dealing professionally with architecture) of various housing environments in Poland (including blockhouses in the largest cities of the country, comfortable suburban villas, as well as small rural houses). The aim of the research was to analyse the most valued features of the housing environment in dwellers' opinion. Concluding the results, these seem to be: the location, plan and area of the flat and its immediate surroundings. Location is the most important for residents of big cities (it appears in their opinions three times more often than in the other respondents' opinions) and students. The most frequently mentioned elements are here: position against city centre and important services (schools, shopping centres and places to go) as well transportation links and green areas. The apartment plan and its correspondence with functionality and social meaning (valued features are here: centrality and privacy as well possibility to perform various activity in the same space) is especially valued by more educated people (including those professionally dealing with architecture) and those involved in intellectual work; the size of the flat and the immediate surroundings are in turn more valued by less educated people employed in basic services. Other features of the physical environment that are important in the appraisal of the flat, such as interior design, attractive views (and connections with nature), the appearance and style of the building (architecture) are slightly more frequently mentioned by people professionally associated with architecture (students of architectural faculty and practicing architects). The research results show that in assessment of housing environment, personal aspects (private space and its position in the structure of the house) and social relations inside the home (relations with other residents within the perceived home space) and in the immediate neighbourhood (good neighbours) are at least as important.

Corresponding Author: Angelika Lasiewicz-Sych

THE ROLE OF SOCIAL AND CULTURAL INTERACTION BETWEEN RUSSIAN AND CHINESE STUDENTS IN CHANGING THE EDUCATIONAL SPACE OF THE RUSSIAN UNIVERSITY

Ekaterina Belyaeva

Urals State Mining University, RF 620026 Ekaterinburg Lunacharskiy str. 210A-7, Russia

ABSTRACT

The development of cultural ties and cooperation between Russia and China in the field of education correlates with the current strategy of internationalization of Russian universities. Many Russian universities today tend to develop partnerships with Chinese universities. In particular, the number of Chinese students studying in Russian universities constantly increases; academic exchange programs are successfully implemented, the number of scientific contacts between representatives of universities of the two countries grows. The implementation of such cooperation is accompanied by problems of social and cultural interaction in the field of education of Russian and Chinese students. General purpose of the study was identifying the axiological component in the interaction of Russian and Chinese students in the space of the Russian university. Chinese students who study in Yekaterinburg universities (390 people), Russian students who study / live with Chinese (500 people), 10 Chinese experts, 10 Russian experts in the field of education in Russia and China were interviewed. The results suggest that the Russian students find the values of hedonistic nature – love and pleasure – to be more important than the Chinese ones, while the Chinese students consider study and personal security to be most important (and this is determined by the goals of coming to Russia and the conditions of staying in the territory of a foreign country). Nevertheless, it cannot be said that the values of students from the Russian Federation and the People's Republic of China differ radically and may interfere with the productive socio-cultural interaction between them. Besides, the great importance of such values as world peace and love of country for Chinese students can be the basis for attracting them to participate in the activities of patriotic and cultural student associations that already exist in the Ural universities. The practical significance of the results obtained is that the identified problems of socio-cultural interaction between Chinese and Russian students make it possible to develop technologies for optimizing the socio-cultural interaction of foreign students in Russian universities, which is especially important in the initial stages of their education in Russia. Among the recommendations for optimizing the process of entering Chinese students into Russian universities (in addition to Russian language classes) are joint Russian-Chinese leisure and holiday events, joint social student associations (volunteering, tourism, music, etc.), excursion programs aimed at acquaintance with the culture of the host country, the joint interaction of Russian and Chinese students in social networks and messenger apps.

VISITOR VOICES IN HISTORIC SITES INTERPRETATION CENTERS IN BAHRAIN

May Al-Saffar, Kheira Anissa Tabet Aoul

United Arab Emirates University, P.O.Box 15551, Al Ain, UAE

ABSTRACT

Throughout the past decade, a number of site interpretation centers, such as site museums, visitor centers, site exhibits, have grown in Bahrain, a country that is seeking international recognition through culture. Site interpretation centers constitute a specific typology of museums to explain the nearby historical site through the use of multiple interpretation strategies. Understanding the visitors' expectations is an important component in the success of cultural institutions. Exploring and understanding the components of a visitor experience and an expectation within site interpretation centers has received limited attention. Hence, this research intends to analyze the visitors' experience and expectations in two specific site interpretation centers in Bahrain: Qalat al Bahrain Site Museum and Riffa Fort Permanent Exhibition. The visitor experience and expectations were assessed through two streams of feedbacks. First, an analysis of the comments recorded on the visitors' book. These comments addressed the visitor's reflections, expectations, experiences, and the type of activities undertaken within the premises. Second, the online Google reviews From the 169 valid returns, 200 Google reviews and an overview of the visitors' written comments, different types of emotional and spiritual experience expectations were extracted for further analysis.. In parallel, this research analyzed visitor's behavior through observation over one year inclusive of different timings during the day and during the year to understand the impact of climatic condition on the visitors' experience and expectation for validation purposes. Finally, some related discussion and suggestion were proposed based on visitor's voices and reflection underlining the reasons why people choose to visit site interpretation centers with reference to personal and social demands.

Corresponding Author: May Al-Saffar

Session Title:

Architectural Culture

SOUTH CHILE – EXTREME ARCHITECTURE

Kazimierz Butelski

Cracow University of Technology Department of Architecture, Cracow Poland Warszawska 24 str.

ABSTRACT

Typhoons, earthquakes, volcanic eruptions on the one hand and the lack of roads due to the inaccessibility of mountain areas and the extended coastline, combined with the harsh climate of both hot and polar, make designing and building in Chile an extreme task. It is and always was also hard to design and built in Chile due the isolation of this country from the rest of the South American continent thanks to the difficult to overcome barrier that the Andes form. Can these unique conditions be used to create a unique architecture that brings new qualities to the world heritage? Maybe all these "threats" are also a big potential of creation using beautiful landscapes and pure nature? In the beginning there was a word. Architectural culture requires faith and extreme sacrifice. For this reason, the presentation begins with a project for which architects devoted life and decided to choose a state of clergy. Buildings devoted to religious worship often exceed the utilitarian dimension of architecture, becoming the determinants of directions in architecture will follow. An example of this heroic expression of architecture is the construction in 1962-1964 of the Benedictine Church in Les Condes, a suburb of Santiago. Does Theater be the cure to overcome trauma? The program of reconstruction destroyed in 2010 by the tsunami the city of Conception in Chile included not only the restoration of previously existing housing and infrastructural functions, but also the introduction of new culture function. In 2011, an architectural competition for the project of the Regional Theater was announced, which was won by three Chilean architects Smiljan Radić, Eduardo Castillo and Gabriela Medrano. The building was put into use in 2018 and is a monument memory of the past but also sign of new beginning. One of Chile's greatest natural resources is diverse landscape. Difficult accessibility of many areas, low population density and unfavorable climate are the main factors that have influenced the stay of large areas of land in the natural state. Along with the development of society and popularization of tourism, a need arose to build the right background for exploring these natural values. The history of a tourist in extreme conditions is not long. In Poland, for example, it dates back to 1850, when the first time in winter was a trip to the Valley of Five Ponds in the Tatras. In Chile, the first tourist expedition to Patagonia took place in 1879 and was described in the book by its organizer and participant Lady Lorance Dixie (Dixie, 1880). These extremely hard natural conditions have created a unique opportunity to create modern architecture in interaction with the natural landscape. We will examine this problem on the example of 5 hotels and 5 ways of interacting with the landscape and study these architectural ideas.

FROM STONE MASONRY TO EMIGRANT'S MANSIONS CHANGES IN VERNACULAR ARCHITECTURE IN CENTRAL PORTUGAL

Marta Marçal Gonçalves [1], María Teresa Pérez Cano [2], Stefan Rosendahl [3]

[1] Universidade do Algarve, ISE-DEC, Campus da Penha, Faro, Portugal
[2] Universidad de Sevilla, ETSA, Av. Reina Mercedes, Sevilla, España
[3] Instituto Universitário Dom Dinis, Marinha Grande, Portugal

ABSTRACT

The research made for this purpose was realized to study the connection between the way of life, the climate, the geology and the vernacular architecture in the parish of Cernache do Bonjardim, municipality of Sertã, central region of Portugal, where various styles of rural houses can be found. The traditional rural home of this territory is constituted by stone walls, mostly made of shales or granite and has two floors: a lower floor with a place for animals or food storage, and an upper floor with the kitchen/living-room and bedrooms. Usually, both floors are joined by outside stairs. Each available space, for instance under these stairs, is used to keep animals like swine or hens, goats or rabbits, and to store food. Usually there is a piece of ground around the house used for the plantation of vegetables and fruit trees. This kind of home is adapted to the people's way of living and the climate, using local materials like stone or wood. In the 19th century there was an emigration wave to Brazil. When the people returned they wanted to show their acquired richness and culture (sometimes) to the neighbours in the village and constructed large houses of mansion-type, which didn't show the strong adaption to the environment anymore, but had other functionalities and a better comfort. As the transportation means improved, the building material wasn't limited to the local offer. The emigration from the sixties of the 20th century until today brought new kinds of buildings. Their style was influenced from the country of emigration. There is no more relation to the local style of building. For the construction, modern materials like concrete, tile walls and roof tiles are used. The major conclusions of the research are that the vernacular architecture of the studied region has changed from houses adapted to the climate and the rural way of life, to larger and no more "typical" buildings. The main reasons for this change are the return of emigrants from abroad and its influence, the availability of new materials, the better education and income of the people, the wish to life more comfortably, and the change of the people´s way of life from farming to employment.

Corresponding Author: Marta Marçal Gonçalves

SHORT-TERM TUNA FISHING COMMUNITY: THE DWELLINGS IN THE 30s AND 60s

Nuno Batista, Marta Marçal Gonçalves

Universidade do Algarve, ISE-DEC, Campus da Penha, Faro, Portugal

ABSTRACT

This article describes the dwellings of a short-term tuna fishing community settled in Faro beach, Algarve, Portugal, between the 30s and 60s, that already disappeared. It is related how the change from the reed houses to the wooden sheds took place and how was the day-by-day of fishermen and their families during the tuna fishing season, from March to June. In the course of this research it was discovered that such fishing community took place in Faro beach for long decades, involved a large group of fishermen and their families that lived there, in a structured way. The main results we hope to achieve are the general awareness of this heritage and its dissemination. This research was based on documentary analysis, photographic and bibliographic research but, more importantly, interviews with people involved in this art, that still remains. During the development of this research, limitations were found due to the scarcity of available information and to the advanced age of the people involved, now with around 90 years old. That's why there's an urgency to make an adequate registration and disclosure of this heritage. This paper is original because there aren't many works about this theme under this point of view, taking Faro beach as object of study. As a vernacular heritage, it must be valued, so, publishing such work would influence the society in general, but primarily, the region's society, to alert them to a value that has been forgotten and, at the same time, clarify the future generations, helping to preserve the collective memory of a professional art that disappeared from the Algarve.

Corresponding Author: Nuno Batista

A MUSEOLOGICAL APPROACH OF AN URBAN PROJECT: PARISIAN CULTURAL INSTITUIONS AS URBAN ACTORS

Clara Mosquera-Pérez [1], Eduardo Mosquera-Adell [1], Javier Navarro-dePablos [2]

[1] University of Seville, History, Theory and Architectural Composition Department, Avenida Reina Mercedes, 2. 41012 Seville, Spain
[2] Urbanism and Territory Management Department, Avenida Reina Mercedes, 2. 41012 Seville, Spain

ABSTRACT

Considering the most recent contemporary history, geographical and social displacements of places of power have been taken into consideration through the role of culture and arts on them. The aim of this research is to examine, from the perspective of the urban historiography of Paris, an analyse of the trajectory and transformation of the city by means of its museums' institutions. Paris has suffered from important processes of acceleration and changes to become the contemporary capital that it is nowadays. The city counts with the precedent of its great Haussmannian transformation into a modern city and the historical three concentric growth of its city walls perimeter and the later succession of up to six international exhibitions (between 1855 and 1937). However, after the impasse produced by the two war periods, a new urban and political project -still present in our days- was built up based in cultural institutions. Great new cultural infrastructures were designed for expecting areas and *terrain vagues*, most of them with a proved level of change, at the Seine riverbanks. They follow the Louvre museum historic model of implantation. Meanwhile, historical inner Marais district experimented a deep restoration and reuse process, with cultural institutions as the main actors. Even more, Beaubourg void was pointed as an opportunity for a decisive change for the whole city. Cultural insertions at opportunity spaces beside the river have definitely established Paris as a top rank cultural destination. Heading the cultural tourism rates at a global level, its historical heart -The City Island, nowadays being under research conducted by the French architect Dominique Perrault, with the horizon of a 25-years renovation project-, the Right Bank (with the French Cinematheque, the Arsenal Pavilion, Louvre Museum, Decorative Arts Museum, The Orangerie, The Grand Palais, The Palais of Tokyo and the Palais of Chaillot) and the Left Bank (counting with the French National Library, The Arab World Institute, the Orsay Museum, the Invalids Hospital, Quay Branly Museum and the Eiffel Tower), sum up to the most relevant museums' institutions and exhibition spaces of the city. Thus, the research will deepen in the urban strategy for the choice of museums and cultural institutions as decisive architectural actors for the renewal of the Parisian urban landscape. The role of their architectures, intimately associated with their performing use, will be critically examined.

Corresponding Author: Clara Mosquera-Pérez

THE INTERRELATIONSHIP BETWEEN SOCIO-CULTURAL FACTOR AND AESTHETIC JUDGEMENT IN EVALUATING THE QUALITY OF ARCHITECTURAL WORKS

Mustafa G. Ramadan[1,2] Eman S. Abowardah[3,4]

[1] Dar Al Uloom University, College of Architectural Engineering & Digital Design, Riyadh, Saudi Arabia
[2] Misr Institute of Engineering & Technology, Architecture Dept., Mansoura, Egypt
[3] Architectural Engineering Department, Prince Sultan University, Riyadh, Saudi Arabia
[4] Architecture Department, College of Engineering, Tanta University, Egypt

ABSTRACT

Building performance evaluation means the assessment of the built environment quality by using measuring metrics for many aspects; health, safety, security, functionality, as well as psychological, social and cultural satisfaction of building users. Most of the previous studies that discussed strategies for architectural criticism and building quality judgment relied mainly on assessing the aesthetic qualities and appealing of form, without taking into considerations evaluating the reflection for social identity and culture values for the local built environment. This leads gradually to lose the cultural identity and discourage the community from seeing and thinking holistically. The study raises one main question; investigating if integrating socio-cultural values in the buildings' design makes them aesthetically and intellectually appealing among both external form and internal spaces, and accordingly affects the viewer's opinion in evaluating the building performance? Therefore, to answer the research question, this study aims to highlight and discuss the effect of considering the socio-cultural aspect on the aesthetic judgment in architecture. To reach this goal, the study implements both analytical and quantitative research methods. First, the analytical method aims to propose a comprehensive integrated framework for evaluating the building performance. This theoritical framework comprises measuring criteria, which incorporates socio-cultural values in the cultural building type as a case study. Second, the quantitative method through conducting questionnaire survey for a group of participants from different and variable educational level to compare the liking rates of different participants on various contemporary cultural projects in Riyadh city. The main purpose is to measure the satisfaction degree of users and professionals, to rate how the building satisfies certain chosen qualities and the expected functionality. The data obtained indicates that integrating socio-cultural values in the buildings' design affect positively the building aesthetic appeal and expected functionality. Accordingly, it shows a high positive correlation and interconnection between aesthetical judgement and Building performance evaluation in the process of evaluating the buildings' quality that would promote more liveable environments enabling comprehensive quality assessment in architecture.

Corresponding Author: Eman Sabry Abowardah

REINTERPRETING TRADITION: HYBRIDIZATION AND VERNACULAR EXPRESSION IN EMIRATI HOUSING

Mohamed El Amrousi [1], Mohamed Elhakeem [2], Paolo Caratelli [1]

[1] Department of Architecture, Abu Dhabi University, UAE,
[2] Department of Civil Engineering, Abu Dhabi University, UAE

ABSTRACT

Contemporary urbanism and architecture in cities in the United Arab Emirates are becoming more aware of issues such as improving energy consumption and constructing a local identity as mandated in the Abu Dhabi 2030 master plan. Remnants of Emirati heritage is currently being revisited such as the *majlis*, a space of meeting that was part of local vernacular expression in the UAE, and the *liwan*, the shaded portico preceding private spaces in the Emirati housing. The *majlis* provided an autonomous space that retained family privacy by providing a male space on the boundaries of the domestic one. These phenomena are being revived in contemporary architecture signalling their socio-cultural need that cannot be satisfied by western styled villas. This paper studies contemporary Emirati housing typologies in Abu Dhabi and the emerging hybridization of designs that allow for modifications/cultural expression within their walled boundaries. This research highlights also highlights the re-emergence of the *majlis* and the *liwan* as a cultural counter space to the rapid sprawl of modernity in the UAE.

Corresponding Author: Mohamed Elhakeem

Session Title:

Theories of Vision & Visuality

MODULATING INTERIOR SPACES LIGHTING ATMOSPHERES USING MATERIALS

Safieddine Ounis [1], Laila Sriti [1], Abdelhafid Ounis [2]

[1] Lacomofa Laboratory, University Mohamed Khider BP 145 RP, 07000, Biskra, Algeria
[2] LARGHID Laboratory, University Mohamed Khider BP 145 RP, 07000, Biskra, Algeria

ABSTRACT

In search of improving the lives of the users of architectural spaces, designers have given a great importance to the relationship between the user and the environment. This relationship is explained by the project's opening to its surrounding environment. But, in regard to specific local conditions, it is not possible to reach a total opening of the interior spaces to the exterior. This research develops, in addition to energy saving motivations, and improved visual comfort, a qualitative and quantitative assessment of the impact of reflective materials on the lighting's atmosphere modulation in interior spaces by studying the relationship between the ambient light and the reflective material's color, as well as its ability to reproduce the external environmental component inside the building. The research work is based on the distribution of natural light by combining several parameters, namely the material's class and texture, the distribution of the openings, and the time factor as a criterion of the natural light's dynamism, precious element not only architecturally and aesthetically, but also in terms of performance. The fundamental assumption in this framework states that the effect of the material can generate dynamic lighting atmospheres all day long in the architectural project in general, and in the interior space specifically. To achieve this goal, we proposed an analog simulation with scale reduced model of the central space of a designed museum and considered three key factors during the shootings and the measurements; the use of three different materials including a control material and two different reflective materials; straight and prismatic, the view of the user and the time of shooting. The photos and the acquired measurements were analyzed using qualitative and quantitative criteria to define the rate of external reflected component in the interior space and assess the visual quality of the user. The results have shown that the chosen reflective materials modulate dynamically the interior lighting atmosphere and reflect the exterior environment into the interior, although, the prismatic reflective material has lower glare percentage and more distributed lighting.

Corresponding Author: Safieddine Ounis

ANALYSIS ON AN ARCHITECTURAL (FULL DESIGN) PROJECT DEVELOPMENT PHASES: FROM IDEA TO CONSTRUCTION WORKS

Virgil Profeanu

Ion Mincu University of Architecture and Urbanism, Faculty of Architecture, 18-20, Academiei Street, Bucharest, Romania

ABSTRACT

The paper presents a useful algorithm which can be applied in development of a design and construction project, in order to reach a pertinent conclusion on investing or not in it. The algorithm describes the chronological process through which any investor should go through. Every step of this process implies additional costs and will be taken only if the algorithm indicates so. Firstly, the paper enlightens the main steps in developing a design and construction project financed through public resources. In this case, the process has a clear path due to the legislation in the field imposed in Romania. After that, it continues with defining the steps for a similar project but financed through private resources. This is a more complicated case because the private investor has fewer financial resources and in the opportunity stage, for the most part, he does not own the site for the future project. Therefore, a private investor has to pay more attention to every step taken in the investment decision, especially in the construction domain. The interest for studying these processes derived from my observations on my company's clients' needs when taking decisions related to design and construction projects. It is obvious that the standard business plan is not sufficient in developing such a project. In addition, these specific projects have different involvements from other types of projects that were taken into account when proposing the algorithm. Consequently, the algorithm from this paper was elaborated based on my personal experience in over 40 design and construction projects as an entrepreneur and on the literature review I carried out.

URBAN STRATEGY FOR IMPROVING THE AIR QUALITY IN BUCHAREST (ROMANIA)

Virgil Profeanu

Ion Mincu University of Architecture and Urbanism, Faculty of Architecture, 18-20, Academiei Street, Bucharest, Romania

ABSTRACT

The paper presents an effective urban solution of update for the General Urban Plan (GUP) of Bucharest in order to reduce air pollution. The proposal presented is based on the good urban design planning practice offered by other cities that manage to preserve the air pollution level below an established limit. Firstly, the paper includes a literature review I carried out in order to study the latest scientific research papers related to the subject and the examples of good practice. Furthermore, the paper highlights the present situation in Bucharest generated by the high levels of air pollution and the need to reduce the toxic emissions. Romania has committed through Directive 2016/2284 of the European Parliament and of the Council to reduce the national emissions of certain pollutants. In addition, the proposal of update for GUP was developed according to the present national targets and to the specificity of the city, existing green space, tree density, small size surfaces. If the urban solution presented is applied through the General Urban Plan, the air quality in Bucharest will be considerably improved and the positive effects will not wait to appear in different perspectives, such as: inhabitants' health condition, urban aesthetic, efficient use of the allocated budget for the improving air quality in the European capital. In order to successfully implement the urban solution, the present research has to be completed by an arboretum study in Bucharest. The topic of the paper is characterized by multidisciplinarity as it takes into consideration research information from Urban Design and Ecology.

Session Title:

Architectural Design & Methods

ANALYSIS OF THE CREATIVITY DEVELOPMENT AND ASSESSMENT OF ARCHITECTURAL DESIGN EDUCATION: A CASE STUDY OF BASIC DESIGN STUDIO

Beyza Şat Güngör, Derya Yorgancıoğlu

Özyeğin University, Faculty of Architecture and Design, Cekmekoy Campus, Istanbul, Turkey

ABSTRACT

Basic design education retains its seminal role in most of the architectural curricula today. Having the primary goal of getting acquainted students with knowledge and skills of design basics, basic design education supports the development of creative ways of thinking combined with hands-on learning experiences. The assignments address the articulation of the basic design in 2D and 3D elements such as lines, planes, volumes, structures and forms, while students are encouraged to experiment the potentials of different materials and techniques. Course included 9 different 2D and 3D exercises that focuses on design principles and elements together by adding different design problems in process. For instance, structural problems as self-standing or modular 3D units' penetrations and strengthens for complex design problems are added for further assignments in the schedule. In this process creativity development is assessed and evaluated by considering the whole course schedule at the example of individual student assignments. The objective of this paper is to make an analysis of creativity development with regard to the assessment and evaluation procedures, taking the process and products of a basic design studio as a case study. The methodological framework of this paper is based on the examination of two sets of data; 1- 'quantitative data' that includes the grades of assignments that are designed as part of ARCH 101 course of architecture program at Ozyegin University Faculty of Architecture and Design; 2- 'qualitative data' that includes the studio observations and reflective interpretations of instructors regarding the creativity development process for individual student assignments. Grades give the idea of which student exercise has been understood well and reached its learning objectives by considering the whole class. Majority tendency of the grades help assessment of the schedule from the aspect of creativity development. The evaluation of creativity includes manifold aspects of assessment. Teachers' style, schedule of the course, personal factors such as students' personal backgrounds, former education, and the styles of thinking and learning, being individual or collective are all effective on creativity. Creativity is considered as a key component of 21st century skills and it is learnable. Just as creativity is learnable, it is also possible to assess its development (Lucas, 2016).

Corresponding Author: Beyza Şat Güngör

GLASS FINS – A STRUCTURAL, FUNCTIONAL AND AESTHETICAL APPLICATION IN GLASS FACADES

Marcin Brzezicki

Wroclaw University of Science and Technology, Faculty of Architecture, Prusa 53/55, 50-317 Wroclaw, Poland

ABSTRACT

The use of glass fins constitutes a recently emerging trend in the façade industry. Fins (ribs) could be defined as long glass strips mounted perpendicularly to the surface of the façade. Fins are used as (i) decorative (aesthetical enrichment of the facade), (ii) functional (sunshade) and (iii) structural (stiffening and load-bearing) element of the facade. The overall trend of using glass fins is a result of the abundance of proper quality glass, that allows for safe use of relatively small elements that are point mounted or fixed in a different way to the surface of the facade. This glass fin trend deserves a review, illustrated with the on-site made photographs showing different areas of application. Given review of the application of glass fins is based on a general morphology study of transparent facades that the author conducted through the year 2017-2019 and including the position of the fin, the orientation of the fin and the transmissive qualities of the fin – transparent, translucent and screen-printed. Fins could be also addressed as a formal articulation element strategic from the point of the building's architectural form.

THE STUDENTS' COMPETITION FOR THE INTERIOR DESIGN OF PEDIATRIC DEPARTMENT OF THE CITY HOSPITAL: METHODOLOGY OF A PRE-DESIGN RESEARCH AND PROJECT DESCRIBING

Dorota Winnicka-Jaslowska

Silesian University of Technology, Faculty of Architecture, ul.Akademicka 2a, 44-100 Gliwice, Poland

ABSTRACT

The Students' Competition for the interior design and the visual identification of the WSS pediatric department in Rybnik, carried out in April 2018 at the faculty of Architecture of the Silesian University of Technology in Gliwice, had been the effect of a common venture undertaken by the hospital's employees: the head of the pediatric department, the hospital's management and the representatives of the Architectural Faculty under the leadership of Assoc.prof. Dr. Eng.Arch. Dorota Winnicka-Jasłowska (Vive Dean for Students). The design task was to devise a conception for the interior as well as prepare visual information for the pediatric department which must be subject to renovation. Actions connected with the organization of the competition, described in the article, as well as the presentation of the final effects are an example of diversified initiatives: on the one hand, they are the result of a cooperation struck between the university and the social surrounding (in this case the health care facility), on the other hand, they constitute an exchange of experiences between students who major in architecture and interior design and the participants coming from the designed space – employees of the pediatric department. Assumptions of the competition gave character to the actions completed by the students, with extra importance attached to skills in team work as well as acquisition of knowledge on user preferences as well as their functional abilities. In the case of designs made for users such as children, this is of key importance in the making of a user friendly space. The following assumptions were accepted: a. education through experience - practical application of knowledge on the subject of designing health care facilities and the significance of social spaces in the real conditions, b. preparation of conceptual assumptions on the basic of focus meetings with the hospital staff, done by means of site inspection at the facility, c. acquisition of team work competence as well as the awareness of social responsibility in the profession of an architect: creation of space that connects the assumptions of the healing environment with the characteristics of social space intended for the patients of the pediatric departments and their carers. Contact and direct experience of the designed space, observation of the manner in which it is used both had a significant influence on the design approach in the competition works. The effects of the multidimensional actions which prepare for the design process shall serve as starting point for the development of interior conceptions and the visual information of the pediatric department of hospital.

Corresponding Author: Dorota Winnicka Jasłowska

HOUSING ESTATE GAME v.2.0 - IDEAS FOR DESIGN OF HOUSING ESTATES' DENSITY MODELS - THE CASE STUDY OF WORKSHOPS GAME CREATED FOR SCIENCE POPULARIZATION

Tomasz Bradecki

Silesian University of Technology, Faculty of Architecture, Akademicka 7, Gliwice 44-100, Poland

ABSTRACT

The article presents the main principles of HOUSING ESTATE GAME 2.0 - a game proposed by the author for the purpose of popularizing science among children and adolescents. The game allows you to creatively implement residential housing models according to predetermined rules. The accepted score and rules of the game coincide with the assumptions of the compact city idea and draw attention to the problems of modern housing estates implementation. Particular attention was paid to selected urban indicators such as: housing density, the amount of biologically active area, the number of trees, the number of parking spaces. The game in its current shape is the result of its several years of improvement. The game in version 2.0 was tested during the NIGHT OF RESEARCH at the Silesian University of Technology in Gliwice and while other editions of the game were presented during Science Festival in Katowice. The article discusses the main theoretical and methodological assumptions for the implementation of the game. The author present both a 'game manual' to popularize it, as well as conclusions from the next edition of the workshop, which may be useful for formulating educational assumptions about the creation of habitats. The principles of the game are common with the real life design principles and refer to true challenge: how to provide compact dense housing estate and high quality housing environment. The article shows contemporary challenges in hosing estates' design, the conclusions may be useful for architects, urban designers, academics in architecture and urbanism, public participation practitioners.

LINEAR LIGHTING IN ARCHITECTURAL INTERIOR AND EXTERIOR DESIGN: CURRENT TREND OR FUTURE

Barbara Uherek-Bradecka

Katowice School of Technology ul. Rolna 43 40-555 Katowice, Poland

ABSTRACT

Contemporary LED technology in lighting industry allows today for almost endless design opportunities in architecture. Since 2000 the LED strip lighting became available on lighting equipment market and slowly became affordable as the typical light source (bulbs) or linear light source (neon bulbs). Today it is implemented everywhere around the globe in exterior and interior design. Technological solutions are even more portable / easy-fixed and take less space and so linear lighting is not extraordinary or exceptional anymore. Although linear lighting became very common since ca 10 years it has been used in interior or exterior design before but had some limits due to technological reasons or have been implemented in other way. Design Lighting typology for interior and exterior design has been presented in the article along with several case studies that have been implemented. Limits and obstacles, advantages and disadvantages of the linear lighting have been discussed. Conclusions might be helpful for architects, interior designers, artists and light industry specialists. Author is a practicing architect with over ten years of experience in architectural and interior design with many implemented projects.

EXPLORING SENSORIAL STRATEGIES IN STORE DESIGN: CASE OF TURKISH LUXURY BRANDS

Lal Dalay, Selin Gulden

Izmir University of Economics, Faculty of Fine Arts and Design, Department of Interior Architecture and Environmental Design, Sakarya Cad. No.156 35330 Balcova, Izmir, Turkey

ABSTRACT

For the luxury clothing industry, stores can be defined as exhibition areas. The customers feel the space with their five senses, so the strategies need to satisfy their expectations, match with the brand identity and make the products even more valuable than they are. Lighting, colour, music, layout and even smells in the stores are some of the techniques that used by designers. Every luxury brand creates its identity related to their styles and while they are creating their identity, they use such techniques to be recognizable. The purpose of this study is to analyse the sensorial strategies in store designs and their application on Turkish luxury clothing industry. In order to reach this aim, a two-stage work was carried out. In the first stage, a literature review was done that analyses the sensorial strategies used in store designs and their applications on a universal luxury brand. The reason why Dolce & Gabbana was chosen to be analysed as an international luxury brand was its approach to the designs with combining the brand image and references from the local features. In the second stage, two case studies were done to find out how those sensorial strategies applied to luxury Turkish brands, Ipekyol and Yargıcı, including the interviews done with a responsible person from each brand and a designer/architect working with each brand. Store designers can use different sensorial strategies to affect costumer's perception. With this study, it was examined that which strategies applied and how, with comparing literature review, universal and Turkish luxury brands. As a result, when literature review and case studies compared, it is achieved that, all three brands use sensorial strategies in their stores. However, the layout strategies, use of colour and material, lighting, music and scents are different for each brand. When international and Turkish brands compared, it is found that the differences between strategies are mostly caused by differences of the customer profiles for the brands. With this study, it was also found that Turkish luxury brands develop their strategies by working with professional designers. These strategies are responding costumer's senses with special scent, music, colour palette selection, lighting and layout arrangements that create a brand image in costumer's mind.

Corresponding Author: Selin Gulden

REVITALIZATION OF BUILDINGS AND URBAN AREAS ON THE EXAMPLE OF GDAŃSK, VENICE, MILANO AND ZABRZE

Klaudiusz Fross, Anna Gumińska

Silesian University of Technology, Faculty of Architecture, Gliwice, Poland

ABSTRACT

Revitalizations are becoming a common activity giving new life to abandoned buildings, districts, degraded areas, etc. The necessity of such actions results, among others, from the changing needs of users of these spaces, climate change and new technologies used. These activities are a strategic element of urban policy. They also fit into the context of sustainable development, causing a change in the value, reception and perception of degraded spaces and objects. New functions give a new quality, but also affect the neighbourhood, improve the quality of the immediate environment. They also enable the elimination of spatial conflicts, as well as the introduction of ecosystem services that reinforce the multi-range potential of these areas and facilities. During the study trips, the authors analyse in detail interesting examples of successful revitalization. The revitalizations are discussed: the factory building in Venice on the Giudecca Island (Italy), the entire quarter in the old town of Gdansk (Poland), the mine shaft in the post-industrial (mining) city of Zabrze (Poland). The aim of the research was to analyse the effects of revitalization activities in these European cities. Relationships and correlations in these activities were analysed. The research also concerned the applied principles that may have an impact on the effectiveness of revitalization and its positive implementation. The quality of revitalized space and its impact on the surroundings was also analysed. Particular attention was paid to the importance of qualitative research at the revitalization programming stage. The analyses concerned various sizes and scope of revitalization activities, i.e. from the object to the building quarter. The research results indicate the existence of universal principles of successful revitalization, which are applicable at different scales of revitalization. At the same time, the applications indicate 10 golden rules for a successful revitalization. The importance of qualitative research at the revitalization programming stage is underlined. These studies constitute the success of revitalization. Qualitative research conducted at the stage of programming activities may ensure coherence of activities in various scales of urban space (from the object to the city's quarters) and prevent the transmission of conflicts and problems to other urban areas.

Corresponding Author: Anna Gumińska

MODERNITY IN ARCHITECTURE - TOKYO, OSAKA, DUBAI, GDAŃSK, KATOWICE

Klaudiusz Fross, Anna Gumińska

Silesian University of Technology, Faculty of Architecture, Gliwice, Poland

ABSTRACT

The article describes conducted observational studies of contemporary architectural objects in various parts of the world. Examples from Japan, the Emirates of Arabia and Poland - contemporary architecture of cities: Tokyo, Osaka, Dubai, Gdańsk, Katowice have been described. He evaluates them and draws attention to the essential elements. He conducts an original discussion on contemporary architecture. In the subjective assessment, two elements are always important: meeting the investor's goals and the needs of users. Observations of what is happening new in a built environment is an integral part of the architect's work. Of course, it is good to look at new architectural realizations of buildings and examples of space management, not only superficially, e.g. in terms of the overall aesthetic image or an interesting detail, but to make a somewhat deeper assessment. Evaluations, e.g. in terms of meeting the needs and satisfaction of users, efficiency and cost-effectiveness of solutions. In order for the assessment to be professional despite the fact that in the observational form (own observation) well as the architect knows the basics and techniques of qualitative research. Qualitative observational studies were aimed at identifying factors shaping contemporary architectural objects and the surrounding space. Due to globalization, the scope of research has been established to be very wide, taking into account different regions and cultures. The result of the research was to identify various types of elements affecting the quality of architecture. The main elements of this analysis include adapting objects to the various needs of users and investors. The universal principles of typical solutions of contemporary architecture related to the quality of this architecture were also defined.

Corresponding Author: Anna Gumińska

CONCEPT OF CREATIVE INDUSTRIES WITHIN THE CREATIVE CITY AND ITS IMPLICATIONS ON THE QUALITY OF PUBLIC SPACE

Marta Pieczara

Department of Architecture, Poznan University of Technology, ul.Nieszawska 13A, 61-021 Poznan, Poland

ABSTRACT

The goal of presented paper is to investigate the potential positive influence that integrating creative industries within the concept of the creative city can have on the quality of public spaces. The primary supposition is that the concerned idea can formulate important part of an integrated urban renewal strategy, bringing a response to the declining attractiveness of city centres as well as to the growing outward migration of their inhabitants. Particularly, situating creative industry plants within urban context can be considered as an action that can potentially lead to the economic revival of neglected neighbourhoods and, in consequence, can initiate their effective revitalisation process, leading to the urban landscape's vital improvement. The concept of such a strategy constitutes a substantive basis of the design task being commissioned to architecture students at Poznań University of Technology within the framework of regular training program. The exercise is to design a creative industry plant within an urban context and it has for its preliminary step to identify a district that needs a modernisation of its urban landscape. Then, by introducing heterogeneity of both architecture and use, the students' projects aim to diversify the functional profile of the neighbourhood as well as to create new public spaces or to revitalise existing ones. Concentrated mainly on the agglomeration of Poznan, the presented paper resumes the outcome of the concerned academic projects and investigates the prospective influence of the concept of creative industries within the creative city on the quality of urban space.

'FROM BATA TO PRADA': APPRAISAL APPROACH IN THE NEW RETAIL DESIGN

Fabiana Forte

University of Campania "Luigi Vanvitelli", Department of Architecture and Industrial Design, Abazia di San Lorenzo, via San Lorenzo s.n.c., 81031, Aversa (CE), Italy

ABSTRACT

Many of the contemporary architectural design projects, frequently characterized by the interaction among creativity, beauty and innovation, reflect the changes into the consumption models. Also with specific reference to retail spaces, the concept of store has developed into something that includes knowledge, discovery and seduction in addition to the traditional sale of product. The passage from material to immaterial culture in the Digital era, conduces to design spaces able to offer an *experience*, more than a product, as in the several projects for Prada'Stores. In this changing scenario, the worldwide famous brand Bata Co., with its very long tradition - founded in 1894 - constitutes one of the most successful example of how a smart management system finds into its spaces of production and distribution a creative correspondence. It is not a case that from Bata derives one of the most emblematic example to conceive the modern retail spaces, thanks to the projects of Le Corbusier. Nowadays, in the face of challenges of digital innovation, among the several typologies of retail spaces, the traditional store is living a deep transformation, in addition to becoming a strategic segment in the real estate market. In the last few years, in fact, Informative systems, Technologies, IT platforms, are radically changing the customers' purchasing process – the *customer experience* -, affecting more and more the re-design of spaces, processes and functionality of the store. Technological development not only is changing purchasing behavior but also is determining the need for face radical changes in the existent stores to make them more attractive for tenants and Real Estate investor. In this perspective the article, starting from the comparison between two different way to conceive the commercial spaces (functionalism in Bata and spectacle in Prada) and highlighting the role of the new consumer, deals with some evaluative aspects in the new retail design. An overview of the retail from the perspective of the real estate market, confirms as it is in constantly expanding in the international arena; in Italy, also if positive signs affect all kind of retail (high street, commercial centers, outlets, etc.), new challenges arise for the small and traditional retail stores. With specific reference to the project of the physical space of the new retail store, the business analysis involves some aspects, as the so called "soft costs" sustained for re-design the relationship with the customer/consumer, which deserve further insights in the new culture of Retail Design.

ADVANTAGES OF MODULARITY APPLIED IN ARCHITECTURE

Raquel R.S.C. Silva [1], Inês D.D. Campos [2]

[1] Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001, Covilhã, Portugal

[2] CIAUD, Lisbon School of Architecture. Rua Sá Nogueira, Polo Universitário, Alto da Ajuda, 1349-055, Lisboa, Portugal. & Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001, Covilhã, Portugal

ABSTRACT

This article intends to explore the concept of modularity, namely its advantages in the application to architecture projects. The world is constantly evolving, there are new needs, and architecture has to know how to respond to it. The choice of this topic rests on a very current theme - although modularity in architecture is not a recent concept, its use is becoming more and more widespread at an increasingly frenetic pace, in which time is quite valuable. Modularity is an interesting concept because of its effectiveness. There are many advantages of this working methodology - which begins at the design stage and is later reflected in its execution - and, therefore, this is an increasingly studied, developed and applied subject. When well applied, the use of modular systems proves to be quite effective. Planning is the keyword which ultimately translates into optimizing the time spent on a project and its execution, thus reducing expenses, through premeditation of problems, and the waste of raw material. The modular architecture is a very functional and appealing concept. Through a practical example in the application of the system in the rehabilitation of a street store to transform it into housing, a closed modular system - thought to be applied in rehabilitation works – is used in order to demonstrate these same advantages. This system consists of all the necessary parts for the rehabilitation of a space – a structure for the floor, the walls and the ceiling and it also includes all technical equipment - without being dependent on other constructive systems and with the advantage of being flexible and non-invasive. This article aims to raise the interest of the scientific community to this subject and to encourage the study and the application of modularity in the day to day so that in the future its use becomes the most common and not the exception.

Corresponding Author: Raquel Silva

FLEX REFUGEE SHELTER

Nadine M. M. Oliveira [1], Inês D.D. Campos [2]

[1] Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001, Covilhã, Portugal

[2] CIAUD, Lisbon School of Architecture. Rua Sá Nogueira, Polo Universitário, Alto da Ajuda, 1349-055, Lisboa, Portugal. & Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001, Covilhã, Portugal

ABSTRACT

In recent years, there has been a great number of disasters such as natural disasters and wars. Wars occur, mostly, due to political, religious and economic confrontations. Calamities or natural disasters, which are considered as inevitable manifestations of Mother Nature, become uncontrollable and unpredictable. When they happen, they leave thousands of people in emergency conditions since they have lost everything they owned and are left without support. The emergency architecture consists in the creation of temporary shelters to receive and protect the victims of these limit situations. This happens due to the need of minimum conditions of habitability these people have until being relocated. Disasters/wars, apart from the direct impact they have on the victims, also affect one of the main human factors: The Habitat. This type of architecture is perceived as transitory which requires fast solutions, cost-effective and easy-to-execute systems, thus focusing mainly on prefabricated or standard materials that enable a quick and low-cost assembly. However, in this type of architecture, one cannot only think of the quick solution of building/assembling shelters. Notwithstanding, it is also necessary to take into account that it functions as a humanitarian service in which human needs must be meticulously thought about. On the basis of this last statement, it is intended to meet, in the best possible way, the needs of the refugees who are victims of the wars that come into their lives and who are not likely to return to their territory. These victims are sent to refugee camps - controlled and delimited spaces with the minimum equipment - usually with random tents provided by the UN which do not provide comfort to these families while they try to organize their lives. The lack of comfortable shelters and the minimum housing conditions are essential for these victims who see their lives change drastically from one day to the other. However, while designing a temporary shelter, one has to take into account the fact that it is temporary, transitory and that people only take advantage of this space for a short period of time. Faced with this primordial factor, the transience, the proposed space corresponds to adequate and comfortable minimum areas which allow a good quality of life for a short period of time. This proposal consists in the creation of an emergency shelter, as previously mentioned, through the development of a modular system that is flexible and temporary. It can be allocated in different ways on the ground, thus allowing the creation of and its adaptation to different spaces according to the needs of the people. This model unit will have a primordial base structure which will facilitate the adaptation to the terrain and the stability of the shelter. The construction method was designed to be as easy as possible by using lightweight materials, so it can be implemented on the ground and having good thermal and acoustic capacities so that it can be adapted to different climatic scenarios. Corresponding Author: Nadine Oliveira

SEARCHING FOR A MODEL FOR THE DEVELOPMENT OF SOCIAL HOUSING IN THE POST-WAR PERIOD AND IN THE TRANSFORMATION IN POLAND

Mariusz Zadworny

Czestochowa University of Technology, Faculty of Civil Engineering, 42-200 Czestochowa, Dabrowskiego 69, Poland

ABSTRACT

The article contains issues of social housing and designing of residential buildings, implemented as part of social programs. The general development of the concept of social housing in the post-war period - from 1945 up to modern times, is presented. Area limits are limited to Polish conditions. The scope of the research covered the primary, completed architectural objects created in the above-mentioned period. Such a time frame shows the dynamics of building development and presents the concept of social housing in the so-called "late industrialization" in Central and Eastern Europe and the specific housing development situation in this part of Europe. The results of the research lead to the formulation of the basic idea that in Polish conditions there is a significant shortage of housing designed for the poorer sections of the population - easily accessible, meeting the criteria for flexibility of housing systems for different users. This is a necessary background to the contemporary understanding of this issue, especially in the countries undergoing political transformation after 1989, covering the area of Central and Eastern European countries, especially Poland. For there are visible attempts to change the model of use of social, urban, residential and private space. The problems of social housing development in Poland are supplemented with knowledge about the activities of new entities for creating the organizational framework of this type of construction (such as: Social Building Societies – “TBS” and others appointed by municipalities, social organizations and associations in urban and extra-urban areas) Poland in 1996- until now. Their participation in the creation of this type of architecture implies design and organizational solutions for the implementation of desirable residential buildings. Attention is also paid to the environmental effects of the designed architecture and adaptation to local conditions. It is important to recognize the current state of development of the design of this type of residential buildings to generate the form of such architecture in the conditions of transformation (social, political and economic, etc.) The emphasis here is on understanding the principles and specificity of designing a residential social architecture. The article calls for a wider application of new technologies and methods for the use of renewable energy sources in Polish conditions for social housing solutions. This approach to the design of environmentally sensitive architecture, in which new technologies for obtaining energy for social purposes play a key role, are becoming desirable in Polish conditions. The question of eco-efficiency of social housing solutions in Polish conditions is raised as an inseparable mechanism of organizational, design and implementation activities. The buildings and social estates currently designed in Poland are an example of searching for a pattern adapted to the new conditions in the 21st century.

FORMAL AND LEGAL FACTORS DETERMINING THE CONTEMPORARY MULTI-FAMILY HOUSING DEVELOPMENT PROCESS

Miłosz Raczyński, Miłosz Raczyński

West Pomeranian University of Technology in Szczecin, Faculty of Civil Engineering and Architecture, Department of Modern Architecture, Design Theory and Methodologies, Szczecin, Poland

ABSTRACT

It seems natural that the designer's creative concepts, taking into account relevant legal references, should play a superior role in development of contemporary surrounding environment. One of the legislative acts in Poland is the Spatial Planning and Land Development Act, which sets out the principles of local plan construction, with particular focus on its accuracy and necessity to define the planned function concerning the developed area. Furthermore, the Act provided the possibility to issue decisions on land development and management conditions on the basis of so called "good neighborhood" in cases where local development plan was not present. Paradoxically, the decisions issued on this basis, first and foremost, do not have to be consistent with the spatial policy of a given area, and secondly, future plans have to respect the decisions contained in these decisions. Developers interpreted this situation quite clearly: since there is no development plan, i.e. it is possible to construct everything what has been hitherto impossible to construct, on the condition that new constructions are adapted to the existing development. If it is compounded by possibility to make the decisions on land development and management by designers and authorized urban planners who operate on a free market basis and often try to meet the investors' expectations, the possibility to preserve the existing "spatial order" seems almost natural. Nevertheless, the framework seems to have been built to create and define contemporary environment. This is because the provisions included in land development and management plans attempt to define basic values in relation to the planned area, i.e.: build-up ratio, build-up density ratio, biologically active build- up ratio, build-up height, current build-up lines that cannot be crossed, number of parking spaces, etc. Therefore, having specified the character of the planned build-up as precisely as possible, the remaining part is left to the designer's creative concepts. Conducted studies and scientific research, and above all, professional experience, allowed for a collection of extensive research material in the form of own designs of multi-family housing completed over the past years, which were analyzed in detail in terms of multifaceted conditions, taking into account the relevant provisions of the applicable construction law, technical conditions and spatial planning as well as design standards based on which individual designs were created. They allowed to observe a number of conditions and relations, but also mutually exclusive factors at the point where construction law and spatial planning meet, determining de facto the multi-family housing development process. On this basis, with a reference to such diverse issues in the light of applicable commercial and economic realities, one can venture a statement that the possibilities of designer's creative work have been limited and the designer's creative space has been considerably narrowed down to the analysis and proper interpretation of a number of binding, often mutually exclusive, provisions. This results from the necessity to make compromises in terms of aesthetics, ethics as well as formal and legal requirements.

Corresponding Author: Miłosz Raczyński

NOVEL ARCHITECTURAL STRATEGIES TO ENSURE AN NZEB MEDITERRANEAN SCHOOL

Eva Crespo Sánchez [1], Juan Ramón Dacosta Díaz [2], Konstantinos Kampouropoulos [3]

[1] Av. Universitat Autònoma, 23, 08290. Cerdanyola del Vallès, Barcelona, Spain. EURECAT.
[2] Via Augusta, 202, 08021. Barcelona, Spain. Generalitat de Catalunya, Departament d'Educació
[3] Av. Plaça de la Ciència, 2, 08242 Manresa, Barcelona, Spain. EURECAT.

ABSTRACT

As a consequence of the European target of easing climatic change and the objective to design nearly zero energy buildings by 2018, Educational Department of Catalan Government has designed a new public school located in the town of Solsona, at the centre of Catalonia. The main goal of this is to minimize energy demand which is a key factor in reducing carbon dioxide emissions over the whole life of the building. The objective is to increase the envelope performance in order to reduce as much as possible the implementation and use of active heating and cooling systems. The presence of energy systems creates a great deal of carbon dioxide emissions as well as an important volume of waste, during all of the building stages: manufacturing, transport, implementation, maintenance, replacement and demolition. The most representative strategy of the building is the brick curtain wall, designed in analogy with glass curtain walls as a facade. It allows the use of thermal mass to cool the building passively during the night in summer time, helps to ensure airtightness in the envelope to minimize air leaks, and integrated the solar protections. This facade is complemented with an architectonical element that produces electricity based on photovoltaic panels. As a result of using the Design Builder simulation program to evaluate these architectural elements mentioned previously, a significant decrease of heating and cooling demand was achieved, with a value of 5,23 kWh/m²y, ensuring cost effectiveness. Besides, the use of energy simulation has allowed us to identify that using doubled pan glazing on the south façade provides solar gains though windows of 25,5% higher than using triple pan glazing. Nevertheless, the heating demand increases to 6% with a reduction of 5% in cooling demand, which is an important aspect to consider taking into account that there is not cooling system installed in the building. Last but not least, by increasing the heat recovery efficiency from 75% to 85%, the reduction in heating demand is 17% and the economic cost results increases by only 0,36% in relation to the total cost of construction. Based on the energy simulation results and waiting for the actual building construction, some relevant conclusions can be made. The architecture role has been crucial to ensure an optimal result, especially contributing on the reduction of the overheating hours and as a consequence minimizing of the cooling energy demand. This building does not required installation of a mechanical cooling system, even being located in the Mediterranean climate. In south orientations, doubled glazing seems to be efficient enough to achieve a low energy demand while, at the same time, optimizing the total economic construction cost. Photovoltaic production in schools must be combined with some other actions. The energy exportation to the grid, as well as the use of the energy for the recharge of electric cars are feasible options for the future.

Corresponding Author: Eva Crespo Sánchez

CASE STUDIES IN GEOMETRY-OPTIMIZED PANELING OF ARCHITECTURAL GLASS SURFACES

Marta Banachowicz, Krystyna Januszkiewicz

West Pomeranian University of Technology Szczecin – ZUT, Poland

ABSTRACT

In the last years the use of bent glass panels in buildings can be observed. In the 21st Century, new geometrical forms in architecture and ecological issues created an environment for searching for new materials and new structural solutions. Digital technologies CAD / CAM have radically changed conceptual approach not only in architecture but also in structural and material design. The fact is the increase in the number of construction projects with built-in bent glass. Architectural panels with a free surface can be produced using the chosen technology while respecting the intention and obtaining the desired aesthetic quality of the layout and surface smoothness. The application can in principle be a curve monolithic glass, laminated safety glass or insulating glass. The initial form generated using the parametric tools is limited only by the imagination of the designer, but ultimately it becomes the result of adjusting the material characteristics with their respective environmental constraints and load envelope. The final form is a implication of a process that must pass to exist as a whole. The first part of the article will describe the production process, types of glass bending and dependencies that occur between the material, the means of production and the geometry of objects. The second part of the article discusses the method of optimization of glass panels on the example of its own conceptual model, transformed into the needs of implementation. Changes in the shape of panels are due to various factors: the possibilities of means of production, material properties, and required resistance to environmental factors. Ultimately, the article defines the limitations that are currently imposed on free forms constructed from glass panels.

Corresponding Author: Marta Banachowicz

APPLICATION OF DIGITAL TOOLS IN THE CONTEMPORARY PRODUCTION AND PREFABRICATION PROCESS AND THEIR INFLUENCE ON THE DESIGN OF ARCHITECTURE

Anna Nowak

Department of Structure Design, Construction and Technical Infrastructure, Faculty of Architecture, Warsaw University of Technology, Koszykowa 55 Street, 00-659 Warsaw, Poland

ABSTRACT

Generative modelling methods are designing with the use of digital tools. The use of modern analytical tools in the design process leads to the creation of interesting architectural and structural solutions. The use of computers in the conceptual analysis allows to obtain a number of advantages influencing the quality of the design process. However, the use of new design methods partly requires a change in the traditional approach to architectural design. Through digitalization, not only the method of making and processing architectural drawings, but also the creative process, the role of the architect in the process of shaping architecture is changing. As a result, the architect, the designer, in search of the concept in a digitized way, determines the input parameters necessary to generate the designed element. Thanks to the use of digital tools, it is possible to analyze different variants of solutions that correspond to given criteria, which are generated by algorithms applied in computer programs. As a result, the process of searching for variants is significantly accelerated, and the designer chooses a favorable result or changes or specifies the input assumptions, looking for a solution to the assumed problem, which also meets additional quality criteria. Analysis of various examples and control of results is then a particularly important element. Contemporary tools also provide the possibility to optimize the solutions adopted in the process of single or multi-criteria analysis. As a result, it is possible to search for solutions that are effective in various respects, including those that are subject to architectural-construction criteria. The use of digital tools in the production process is particularly important. As a result of digitalization of production processes, numerically controlled machines are used. They make it possible to accelerate the production process, especially in the case of elements that require individual design and are not repeatable. Among modern solutions there are also visible prototype and pioneering concepts using not only CNC cutting, but also the use of numerically controlled robots or 3D printers. The article presents the results of studies showing the influence of new digital tools on architecture design, taking into account production processes.

Corresponding Author: Anna Nowak

UNDERSTANDING THE ARCHITECURAL FORM THROUGH DEFORMATION OF SOLID FORMS

Didem Gunes Yılmaz

Bursa Technical University, Yıldırım Yerleşkesi 152 Evler Mahallesi Eğitim Caddesi No:85, Bursa, Turkey

ABSTRACT

In early architectural education, students are often asked to develop forms based on the basic solid forms by applying variations. This is simply to teach the ways of deformation including dividing, extending, multiplying, extracting, adding, twisting, grading and so on. This is deemed the basic step to understand how a simple rational shape can turn out a scaled model and an actual building in the end. Doing this abstract exercise also makes students to see how a simple approach can become an effective or unattractive monument in architectural design. Beginners' studios often start with such applications and this approach can be exemplified and analysed on the world-renowned architects' buildings as well. This paper discusses the approach of deformation of forms and surfaces theoretically and provides some step-by-step deformation analyses through the examples of architects' buildings. The examples and critiques include Louise Khan, Alejandro Aravena, Steven Holl, Zaha Hadid, Toyo Ito, Frank Gehry and so on. The ways and steps of deformation are explained sequentially in examples and famous buildings are given critiques over the method. The paper aims to develop an understanding how this approach is applicable in many ways, how favourable in design world and how the last step of deformation appears as an influential form as an architectural piece.

THE MAIN TRENDS IN ARCHITECTURE FORMATION OF MODERN RESIDENTIAL COMPLEXES IN THE MARKET CONDITIONS OF KYRGYZSTAN

Kozhobaeva Saltanat Tolonbaevna

Kyrgyz State University of Construction, Transport and Architecture of the name N. Isanov. 720044, Bishkek, Bronirovannay St., 8, Kyrgyzstan

ABSTRACT

The evolution of the development of residential structures in Kyrgyzstan allows us to state that the level of development of technologies and changes in the format of public consciousness has a direct impact on the formation of the architecture of modern residential complexes in the new market conditions. The purpose of this study is to determine the main trends in the formation and development of the modern residential architecture complexes, based on a generalized analysis of the residential structure of Kyrgyzstan. Research objectives are analysis of domestic experience in the formation and development of the residential environment of Kyrgyzstan; to determine the prerequisites for the emergence and objective problems of the formation of residential complexes as a new social and residential unit; to determine the strategic principles of the perspective development of the architecture of modern residential complexes of Kyrgyzstan. The architectural and construction practice of recent years has shown that the residential environment of Kyrgyzstan is developing in the form of a hierarchy, the economic development, the political situation in the country and the social-demographic development of society directly influenced to the creating new concepts of residential architecture. However, the analysis revealed that an important role in the formation of modern housing is appear also the technical side, which is dictated by the era of modern information and technological advances, replacing the century of scientific and technological progress and discoveries. This affects all stages of the implementation to the architectural object, from the planning to the final touches of the design working- out. Based on this, have been conducted research the results of which showed features of changes in the development of the residential environment, which in architectural practice is commonly distinguished as historical periods. Connection with this, the relevance of this research is determined, associated to the main trends in the formation and development of the architecture of modern residential complexes in the market conditions of Kyrgyzstan. To achieve the goal and objectives of the research, were used such methods as historical and architectural analysis, field observation, the study of literary sources and scientific works. Was also used the complex method of analysis based on statistical data, functional planning, architectural and spatial, constructive and engineering solutions. Theoretical and experimental modeling of a modern type of residential education in Kyrgyzstan was developed.

PROBLEMS OF GREENERY ALONG EXPRESSWAYS AND HIGHWAYS – INTRODUCTION TO RESEARCH

Grzegorz Kukuła, Wojciech Bobek

Cracow University of Technology, Cracow, Poland

ABSTRACT

Shade trees have been planted in public spaces and along roads since antiquity. Planting along roads provided shade, were an orientation element in the field, raised the rank of the place, etc. Social, economic and environmental benefits from urban planting of urban areas or communication routes have been recognized for a long time. Nowadays, in the era of progressing urbanization, we appreciate their presence in our surroundings even more, including roads where roadside vegetation is designed to mitigate the negative impact of engineering structures on the landscape and environment. The development of the road system of national and international importance has continued in Poland for almost two decades. Along with the construction of new road corridors, many trees and shrubs were removed and green areas were reduced. At the same time, designed replacement planting solutions don't give the intended environmental and landscape effect in every situation. Moreover, the low quality of plantings is a bad prognosis to achieve integration of green infrastructure with landscape, raise roadsides landscape values and provide beautify for travellers. This result is caused by many factors both in the procedural phase of landscape policy, design policy, as well as in the construction phase and during maintenance. According to the authors' research and observations, despite the implementation of greenery guidelines by the central authority of national administration managing the national roads, the landscape and environmental effects of greenery are far from ideal. As reported in the literature, mortality of landscape trees regularly reaches 30% in the first year after planting and on the basis of the authors' research, in some cases on Polish roads it reaches even 79% if we sum up dead and destroyed plants. In the design process of highways used in Polish realities, there is a lack of provided iterative inputs to landscape design project after changes occurring due to other factors resulting from projects of other industries (eg changes in soil structure dictated by earthworks technology, changes in habitat conditions, reduction of planting area dictated by selected engineering solutions, etc.). Often, planting greenery is carried out in parallel to engineering works, which results in very poor conditions for plants at the critical moment of transplant shock. Another seen issue are devastations during maintenance works. In the authors' opinion, solutions that have been successfully used in the world for many years, eg in France (SETRA, 1994), Spain (COPT 2009) or New Zealand (NZTA, 2014) could also be used in Polish conditions in road greenery projects. This paper is an introduction to research on solutions that will contribute to the achievement of permanent integration of green infrastructure with landscape and greening the environment of expressways and highways.

Corresponding Author: Wojciech Bobek

SPACE SYNTAX AS SUPPORT FOR MITIGATION FROM THE URBAN MOBILITY COMPLEXITY: CASE STUDY OF LATIN AMERCAN

Vasco Barbosa

Universidad de La Sabana, Engeniering Faculty, Colombia

ABSTRACT

The study of urban mobility is a theme that has evolved with the development of the inventory and its cartography (mapping) to the application of geographic information systems in Latin America during the last decades. In terms of its components it is essential to understand the spatiality of urban mobility with the evolution of the territorial system, and thus the aim of this research is to analyze the organization of the territory with the spatiality of urban development in a chronological time. This theme is part of a current perspective of territorial resilience and development at international level to understand the evolution of spatial planning and its urban landscape. In this context, how space syntax can contribute to improve the planning of urban mobility? Then, given the relevance of the problem, was defined the study urban area of Bogotá city in Colombia. As methodology is proposed the theory of space syntax in scope to scale municipality and region as a test and innovation in transversal of that technique which is supported with a geographic information system. Also, to analyze the information trough the use of axial maps are developed the parameters of connectivity, proximity and interconnection for closed spaces. After applying the spatial syntax, it is expected to determine types of relationships that exist between the spatiality of urban mobility and the distribution of the urban complexity. The data showed the link between the spatiality of urban mobility in the space of time with the network of the complexity system. As conclusions, the possibility of measuring the efficiency of the urban organization and its major spatial changes in order to allow development of land management policies that will drive better sustainability and mitigation of the urban mobility complexity. As main conclusions, the results show the link between the urban mobility spatiality in a space of time with the network urban system to measure the efficiency of the organization of the territory, and its amendments.

EVOLUTION OF PRIMARY SCHOOL BUILDINGS IN POLAND: HISTORICAL REVIEW

Cezary Szpytma, Magdalena Szpytma

The Faculty of Civil and Environmental Engineering and Architecture, Rzeszow University of Technology, Aleja Powstańców Warszawy 12, 35-959 Rzeszów, Poland

ABSTRACT

Nowadays, there is a broad discussion on changes in the paradigm of modern education, which has not fundamentally changed since the 19th century. It seems that also the spatial layout of primary schools has not evolved significantly and remained unchanged. The aim of this study was a basic analysis in this area for implementation future conscious changes. The authors of this study examined the evolution of primary school architecture in Poland. The basic research method was comparative analysis according to two criteria: architectural form and internal spatial layout of primary school buildings. The analyses considered the chronology of the erection of Polish primary schools. They showed that the evolution of Polish primary school buildings is very superficial – it took place only on a formal level. The only commonly used spatial layout of Polish primary schools was the classroom-and-corridor layout. Its basic element remains the classrooms, within which there has been no significant evolution. Therefore, existing buildings of Polish primary schools preserve the obsolete model of education. The article shows the need for research aimed at finding a model of school architecture convergent with the new goals of education.

Corresponding Author: Cezary Szpytma

THE FREEFORM SHAPES IN ARCHITECTURE ON THE EXAMPLE MUSEUM POLIN IN WARSAW

Monika Sroka-Bizoń

Silesian University of Technology, Faculty of Civil Engineering, Department of Building Engineering and Building Physics, Division of Geometry and Engineering Graphics, Krzywoustego Street No 7, 44-100 Gliwice, Poland

ABSTRACT

One of the characteristic features of contemporary architecture, associated with the dissemination of design using CAD and CAM methods, is the possibility of implementing any forms and shapes of architectural objects. Buildings are covered with wavy roofs; curved walls shape the architectural space. The architectural space pulsates and waves like the sea. The possibility of relatively easy construction of a computer geometric model of a freely shaped form seems to give architects extraordinary freedom in the field of design. The Bezier, B-spline and NURBS surfaces enable designing extremely innovative forms and shapes. The possibility of constructing more and more perfect models of discrete shaped surfaces freely brings us closer to unlimited freedom of design. However, realization of the architectural object reveals the age-old problem of architects and constructors - how to build a beautiful, sophisticated shape. One of the newest Polish realization of museum objects, the POLIN museum in Warsaw is an example of the introduction of curved surfaces shapes freely to the architectural object. The aspect of geometrical surface shaping and issues related to the implementation of a curvilinear wall are the subject of the author's interest. The subject of the research is the methodology of designing a freely shaped wall appearing in the object in the context of the theoretical geometric model. The comparative analysis of the theoretical model of the wall and its physical implementation is the basis for distinguishing implementation problems related to the construction of this type of object. Particular attention was paid to the problem of surface segmentation in the applied geometric model and a further aspect of surface implementation in the physical model of a curved wall.

Session Title:

Architectural Historiography

IDENTITY CONSTRUCTION OF THE EUROPEAN MEDIUM SIZED CITY THROUGH THE MONASTICISM REPERCUSSIONS IN ÉCIJA

F. Javier Ostos-Prieto [1], Ana Costa Rosado [2], José Manuel Aladro Prieto [1], María Teresa Pérez Cano[1]

[1] Heritage and Urban Territorial Development in Andalusia (HUM700). Department of Urbanism and Regional Planning. Higher Technical School of Architecture. University of Seville, Spain
[2] CEAACP/Mértola's Archaeological Field (CAM). Research Center in Archaeology, Arts and Heritage Sciences, Portugal
[1] Heritage and Urban Territorial Development in Andalusia (HUM700). Department of Architectural History, Theory and Composition. Higher Technical School of Architecture. University of Seville, Spain

ABSTRACT

The monasticism that appeared during the dawn of Christianity has made a major contribution to Europe's culture and identity. The spread of the Christian faith throughout the continent was effected not only through a new morality and religion but also through art and convent architecture. The Middle Ages will be the peak of monastic production. Orders such as the Cistercians or Dominicans would appear mainly in France and Italy transferring their rules and ways of life. It is a phenomenon that transcends borders, kingdoms or geographical features, bringing together many peoples under the same identity. The standard of the Latin cross waved in the European Middle Ages. However, the reality of the southern Iberian Peninsula was different. Al-Andalus stood as a bastion of Islam in Europe long before the appearance of the Ottoman Empire. At the end of the Middle Ages, the Crown of Castile began to occupy the territories held by the Muslim Kingdom of Granada. The need to Christianise the new conquered lands would call a multitude of monastic orders settled in Europe to focus their attention on the new Kingdom of Seville. The main cities such as Seville, Cordoba, will be the most coveted for the new foundations. Nevertheless, Écija is situated in the valley of the Guadalquivir River in a hard situation on the border with the Kingdom of Granada. Actually stands out with barely 10,000 inhabitants in the 14th century, a large amount for those years. A city that despite its size and unapparent importance was an important attraction for Christian Communities, where according to its origin: 31% Italy, 22% France, 37% Spain and 10% Jerusalem. The study of Écija shows the crossing of existing continental relations through monasticism. How the influence of Christianity managed to cover an entire continent to the most remote place? Through the main average conventual city in Andalusia the keys of the monastic phenomenon can be generated in the urban construction. Always determined by the urban and patrimonial context forming a common European identity recognisable anywhere on the continent.

Corresponding Author: F. Javier Ostos-Prieto

ALCOBAÇA (PORTUGAL): FROM THE CISTERCIAN ABBEY TO THE CONTEMPORARY CITY

Ana Maria Tavares Martins

University of Beira Interior, UBI, Lab2PT, CIDEHUS, Department of Civil Engineering and Architecture, Calçada Fonte do Lameiro, 6200-001 Covilhã. Portugal

ABSTRACT

The first Cistercian monasteries appear in Portugal, in the 12th century, far from the urban context. It must be considered that the transformation and development of the territory has been responsible for isolated buildings and settlements which have gradually been absorbed by the expansion of the urban fabric. In Portugal, the foundations of the Cistercian Order were since the beginning, associated to objectives of occupation and administration of the territory, above all during the formation of the nation. The monastery has begun with a micro-scale situation in which it was compared to a self-sufficient micro-city, and reaches a macro-scale situation in which becomes an urban organism that has to adapt to a new situation. The monastic heritage acquires importance in the development of the contemporary city and consequently in the development of the territory. It is possible to find, in this type of architectural heritage, elements, values and ideals not only at a spiritual level, but also at a historical level or even at a cultural level. It is also important the development of the monastic heritage, its integration and interaction, while it takes a significant part in the making of the contemporary city itself. This paper starts from the supposition that the monastic space can be understood as a territorial organism in the way that it adapts the territory, modelling and altering it according to its needs (ex. the works of Cistercian hydraulic) but also as an urban organism in the way in that can be understood as having urban characteristics or even as making integral part of urban reality contributing to its development. These suppositions will be equaionated based on a Portuguese case and the city in which it is inserted (and with which it interacts): The Abbey of Santa Maria de Alcobaça (f. 1153).

BUILT HERITAGE RESEARCH AND HISTORY OF ARCHITECTURE: LIGHT AND ACOUSTIC IN THE CISTERCIAN MONASTIC CHURCH OF S. BENTO DE CÁSTRIS (PORTUGAL)

Ana Maria Tavares Martins [1], Miguel C. S. Nepomuceno [2], Jorge S. Carlos [3]

[1] UBI, Lab2PT, CIDEHUS. Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001 Covilhã. Portugal
[2] C-MADE. Department of Civil Engineering and Architecture, University of Beira Interior, Calçada Fonte do Lameiro, 6200-001 Covilhã. Portugal
[3] Municipality of Covilhã, Praça do Município, 6200-151 Covilhã. Portugal

ABSTRACT

The research on the Cistercian legacy in Portugal is an innovative multi-disciplinary study. Consequently, the results achieved in this research have many different approaches: the former monasteries and their architecture are the main subject concerning morphology, architectonic rehabilitation but also acoustics, thermal comfort, or natural light. This research, conducted at the Department of Civil Engineering and Architecture of the University of Beira Interior (DECA-UBI), was developed in connection with two other research centres - Lab2PT (Landscape, Heritage and Territory Laboratory) and CIDEHUS (Interdisciplinary Centre for History, Culture and Societies). In 2015 there was a curriculum design revision in the Integrated Master's Degree in Architecture of the University of Beira Interior. Consequently, it was needed the allocation of more time to the teaching of History of Architecture and the requirement to assign specific syllabus to the Portuguese History of Architecture, which is emphasized by the specific and multidisciplinary research performed linking with other sciences of engineering. The natural light in the Cistercian churches is closely linked not only with the liturgical requirements at the officium but also with the canonical hours based on the "ora et labora" dictated by the Rule of St. Benedict. The Cistercian Monastery of São Bento de Cástris (13th-19th centuries), in Évora, Portugal, includes a church, at the south-eastern corner. This church presents an unusual space setting with two choirs which seems to favour different positions for coral groups supporting liturgical and musical expression activities within the research scope of a research Project. As the light in the Cistercian Monasteries, mainly, in their churches, is mostly related to the fulfilment of liturgical needs, this paper analyses the relationship between daylight conditions within the monastic choirs located within the monastic church. The chant was a very important way of oration thus of the liturgy. This was the ORFEUS Project – "The Tridentine Reform and music in the cloistral silence: The Monastery of S. Bento de Cástris" which was based on a multidisciplinary approach around the Tridentine Reform with reflexes in the musical Cistercian feminine matrix between the 16th and 18th centuries on Cistercian Monasteries. This paper describes the objectives and methodology applied to the case study linking Built Heritage Research and History of Architecture, i. e., Research and Education.

Corresponding Author: Ana Maria Tavares Martins

SEARCH OF AUTHENTICITY IN SACRAL ARCHITECTURE IN THE TERRITORY OF WESTERN UKRAINE

Bohdan Cherkes [1], Oksana Diachok [1], Mykhaylo Kuziv [2], Mariya Markovych [2], Svitlana Volska [2], Zoia Matsyshyna [2],

[1] Lviv Polytechnic National University, Institute of Architecture Department of Design and Fundamental Architecture, Lviv, Ukraine
[2] V. Hnatiuk National Pedagogical University, Department of Department of Arts and Design, Ternopil, Ukraine

ABSTRACT

With the proclamation of Ukraine's independence, the revival of national culture, the restoration of existing and the construction of new religious buildings began. The process of active construction of temples continues today, so the searching of national features in temple construction is extremely relevant. The purpose of the research is to analyze the creations of Western Ukrainian architects, who, from the late 19th and early 21st centuries, made stylistic searches for national identity in sacral architecture, taking into account the latest trends in European construction. The process of transition from the tendency of reproduction of historically formed forms and images of the late 19th and early 20th centuries to modern experiments in the sacred architecture of the 21st century is shown for the first time. The data about modern architects and new most significant temples created by their projects was introduced in the scientific circle. The work was performed within the framework of the scientific theme "Art of Ternopil region" of the Department of Fine Arts and Design of the Ternopil Pedagogical University; research coordinator - professor of the Lviv Polytechnic National University B. Cherkes Analyzing the history of the development of the sacred architecture of modern Ukraine, we see that historical events in the country and in the world in the late 19th and early 20th centuries on the territory of Eastern Galicia have led to the national-social uplift and the search for a national identity in the construction of temples. It was established that architects took, as the basis the structure of the Byzantine temple, which corresponded to the traditions of the Ukrainian church ceremony and the Galician authentic architecture. It is proved that in the first stage of the creativity of architects, one of the main form-forming principles was stylization of folk art, eclecticism, and the treatment of historical prototypes. An important source for imitation in their work was the Baroque architecture of the Cossack era, the search for Ukrainian temple identity in modern realities at that time was a further direction of development. Experimenting with different historical styles, architects declared a new neo-Ukrainian sacred style, the planning and stylistic schemes of which are relevant up to now. With the advent of Soviet power in Western Ukraine in 1939, church construction was prohibited, many temples were destroyed. A new stage in the construction and restoration of churches began in 1990. The first temple buildings of this period affected the tendency to recreate the forms and images that were historically formed till 1939 using the stylistic characteristics of their architectural decisions, and experiments with the modernist form in sacred art began after 1995. The results of the study complement our knowledge on the history of Ukrainian architecture; can be used for further research, textbooks and manuals; will be used in the educational process in the preparation of designers and architects, in memorabilia activity.

Corresponding Author: Oksana Diachok

BIEDERMEIER AS A STYLE OF ARCHITECTURE AND THE STYLE OF EUROPEAN LIFE IN THE FIRST HALF OF THE XIX CENTURY

Nina Kazhar

Czestochowa University of Technology 42-201 Czestochowa , Dąbrowskiego Str. 69, Poland

ABSTRACT

Biedermeier originated in the German-Austrian culture in the first half of the XIX century and was widespread in many European countries. The article is devoted to the analysis of the peculi-arities of style and its influence on the urban culture of the considered era. After the victory over Napoleon in 1814-1815, the German Union was created at the Congress of Vienna. Here the industrial revolution unfolded in full, the bourgeoisie was ideologically deter-mined. The discoveries of science and technology actively influenced all areas of life. In this era of rapid development of natural science, technology and political change a contradiction arose: the desire to create a "new" and "modern" was accompanied by an interest in the "individual", in the "own little world" of the citizen-burgher. The name "Biedermeier" was formed only in the middle of the XIX century, when the style ex-hausted itself yet. In 1848 V. von Scheffel published in «The Flying Leaflets» two poems, in which the names Biederman and Bummelmeier were used. By combining these names, the poet Ludwig Eichrodt in 1850 published the poem "Biedermeier" and the later cycle of poems "Bied-ermeiers Liederlust". As a category of art history, as a designation of "style" the term began to be used at the turn of the XIX and XX centuries (August Schestag, Georg Hirth). For the art industry since the middle of the 1890s Biedermeier was a stylistic concept. At the same time, it began to be interpreted both as a principle of “bourgeois shaping in the housing area”, as well as a “style of use and functional justice” (A. Shestag). In architectural science of the XX century it was believed that the "Biedermeier" did not create its own monumental architecture. Today it is considered a feature and advantage that the main theme of the style was the creation of a living environment for the “burgher”, the coziness and comfort of private housing. The article discusses the elements of architecture and art, which determined the integrity of artis-tic culture of "Biedermeier". The role of style in creating prerequisites for the development of a number of ideas of artistic culture of the XX century is noted.

THE ISSUE OF EVOLUTION OF OPINIONS ON GOTHIC REVIVAL ADAPTATIONS OF THE ST MARTIN'S CATHEDRAL IN BRATISLAVA

Jana Pohaničová, Patrik Baxa

Slovak University of Technology in Bratislava, Faculty of Architecture, Institute of History and Theory of Architecture and Monument Restoration, Bratislava, Slovakia

ABSTRACT

The St Martin's Cathedral, one of the most significant medieval monuments in Bratislava, is the reflection of the intricate historical development of architecture and art. It reflects not only artistic styles characteristic for given period but poses an important testimony of history of local as well as regional architectural scene. From the point of view of broader European context and history of monument preservation in historic Hungary, it is important to mention the era of romantic historicism and gothic revival, which granted the opportunity to form opinions on and methodological approaches to monument restoration. Among the most pronounced interventions in the St Martin's Cathedral in Bratislava were its gothic revival adaptations in the 19th century. The contribution analyses the evolution of opinions on these interventions in the stylistic integrity of the cathedral, which strived to restore its original gothic appearance. Nevertheless, even then, the gothic revival restoration didn't have a single methodology and already, during the purism approach to the interiors of the cathedral some of the former methodological decisions from the foregone period were re-evaluated. At the beginning of the 20th century, there were efforts to restore the spire to its former gothic appearance, before the gothic revival restoration. These never realised tendencies of historicism were soon replaced by, likewise never actualized, thoughts of restitution of annihilated baroque furnishings, above all the high altar by G. R. Donner's workshop. In the second half of the 20th century, the great restoration of the cathedral, including removal of the most of the gothic revival interventions, was done, aspiring to restore the cathedral to its authentic gothic appearance. This approach disrupted the consistent style of the church and destroyed irretrievably the better part of one coherent cultural layer. The restoration continued in the 21st century, when all the developmental stages were considered of equal importance. The contribution, using the case study of the St Martin's Cathedral in Bratislava, analyses the evolution of opinions on gothic revival cultural layer on the medieval religious structure since mid-nineteenth century. At the same time, it introduces personalities involved in the restoration and illustrates further European context. Given time frame belong to those least explored periods of one of the most significant monuments of Bratislava in terms of the building history of the cathedral and its creators (architects, master builders, building companies, builders and artists).

Corresponding Author: Jana Pohaničová

THE SPATIAL ORGANIZATION OF ANCIENT GREECE CITIES: CASE STUDY OF PRIENE CITY FROM HELLENISTIC PERIOD (THIRD CENTURY BC)

Hadeel Al-Sabbagh, Manar Gorgees

College of Engineering, Department of Architecture, University of Salahaddin (SUH), Erbil, Iraq

ABSTRACT

The city of Priene is one of the most important historical cities and represents a basic reference of the gridiron plans which has applied in many contemporary cities in the world. Priene city was built on the slope of a steep topography with a rigid grid system, this contradiction made the city unique. However, urban studies did not give much attention to the spatial organization of historical cities by quantitative methods. This text investigates the main planning characteristics and the spatial organization of ancient Greece cities in term of axiality and convexity by generating axial lines of the city. The spiritual and mundane zones such as Agora, Acropolis and other civic buildings were located on the integrated spaces which are directly connected to the city gates. The spatial articulation between the religious and secular spaces was clear to enrich the spatial values of the city. Space syntax analysis has shown a lower degree of axial integration of convex spaces, a high degree of axiality, little deformation of the system, more synchrony, and moderate intelligibility.

Corresponding Author: Hadeel Al-Sabbagh

Session Title:

Architectural Heritage & Conservation of Historical Structures

INDUSTRIAL CALTURAL HERITAGE AS AN ALTERNATIVE TOURISM MODEL: CASE STUDY OF THE WIDER LAVREOTIKI AREA IN SOUTHEASTERN ATTICA

Georgia Cheirchanteri

13 Valtetsiou str., Chalandri Athens, 15231, Greece

ABSTRACT

The cultural heritage of a country includes monuments and historical sites, landscapes and a structured environment, collections, old and on-going cultural practices, knowledge and live experiences. It records the long history and identity of each nation and the collective memory of a place. In modern societies, history and culture have been transformed from process to product, thus becoming an integral part and a powerful reference point of economic life. Modern monuments, from the late 19th to the early 20th century, constitute dynamic systems of cultural heritage. The aim of this study is to demonstrate the potential development of the country's industrial cultural heritage for the diversification of the Greek tourist product and the complete promotion and renewal of the traditional tourist destinations in Greece. The development of the Greek tourist product beyond the coastal holiday, combining the monumental wealth of the country with the natural and historical, local and national environment where it is integrated, will create the necessary momentum for overcoming the structural problems of Greek tourism. Especially, the wider Lavreotiki area in Southeastern Attica, including the historic industrial complex, the French Mines Company of Lavrion, which was built in 1876, will be highlighted as an alternative touristic destination place.

SEISMIC ASPECTS REGARDS UPGRADING OF MASONRY HERITAGE FACILITIES

Amir Čaušević, Amina Mihmić

University of Sarajevo, Faculty of Architecture, Patriotske lige Nº 30, 71000, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Nowadays, masonry heritage objects usually experience changes during exploitation. In areas of emphasized seismic risk, in cases of extensions, alterations to the original dimensions, reconstruction (the removal of bearing elements, replacement of materials, introduction of new fittings), or the subsequent erection of properties close by, with a comparison of the foundation levels change of use, refurbishment, extension, or additional building to an existing facility, it is necessary to analyse the seismic aspect of such interventions in seismic prone areas. At first, we'll focus on the legal and technical regulations. For start we'll look back to UNESCO's Program on Masonry Heritage, then domestic and regional legal and technical regulations and with all of that define the first step of the process. Next step would be a detailed registration of the current state of the object, and also determining the characteristics of the embedded materials. The bearing structures of the building must also be accurately identified, with all relevant measurements and, in particular, a description of the building materials and their condition. This considers all detailed maps, plans, and details of the built in materials, and especially detailed record of all the damages on the structure. Even at this early stage of investigative works it may prove necessary to secure certain structural elements, or even the entire building, to prevent it from collapsing. As a rule, this requires not only the removal of the outer cladding or even of parts of a wall to determine the depth of cracks but also, if there is any suggestion of subsidence, excavations around the building or to the depth of the foundations. Calculations, based on the planned and current state of the object, will show whether the strengthening and rehabilitation are needed for the structure. The elements that need reinforcement or conservation can be identified during the initial visit, and provision can immediately be made to take the necessary steps to relieve the load. It is necessary to do all the steps regarding technical regulations, legal regulations, methods of approach, theoretical consideration, methods of calculation, and in the end to determine the needs of that object. Theoretical consideration regarding the determined state of structure, from all the above mentioned aspects, is next step to be done. This also includes evaluation of the viability of these interventions, regarding experience. The most sensitive issue, without doubt, is determining the condition of the foundations. With the general opinion of the building's stability in mind, this should be addressed with the utmost care.

Corresponding Author: Amir Čaušević

SEISMIC PERFORMANCE AND RECOMMENDATION OF STRUCTURAL INTERVENTION ON MASONRY HERITAGE CLOCK TOWERS: REPRESENTATIVE EXAMPLES IN BOSNIA AND HERZEGOVINA

Amir Čaušević, Amina Mihmić

University of Sarajevo, Faculty of Architecture, Patriotske lige Nº 30, 71000, Sarajevo, Bosnia and Herzegovina

ABSTRACT

The paper deals with the selected examples of clock towers in Bosnia and Herzegovina, representatives of high masonry heritage buildings made of stone, and explains the approach used in their preservation and restoration. The aim of this paper is to present a specific approach i.e. preservation method used on stone structures. Three clock towers from Bosnia and Herzegovina were selected as representative examples: Sarajevo Clock Tower from the 16th century is an example of well-preserved building; Clock Tower in Gradačac, the youngest building of this type in Bosnia and Herzegovina, is in poor structural conditions and in danger of collapsing; Clock Tower in Banja Luka, first clock tower in Bosnia and Herzegovina, was demolished in 1993 but the reconstruction project is planned for the current year. This paper addresses the structural properties of masonry clock towers from the Ottoman period, with special consideration to preservation, analysis, and strengthening. These tasks are still a challenge to masonry practitioners even if significant advances in research have been made in the last decades. The dynamic behaviour of the historical buildings is usually analysed to design repair intervention solutions and retrofitting. The structural behaviour is analysed using FEM modelling to examine at what extent the structural defects endanger the stability of the tower. The soil properties problem under the tower has been considered. Simplified yet effective procedures have been used as well. Results of the analysis have confirmed the largely insufficient performance of the structure under horizontal action and the need for improvement.

Corresponding Author: Amir Čaušević

SWISS CIRCLE OF MAGALLANES: EUROPEAN ARCHITECTURE IN CHILEAN PATAGONIA

María Victoria Correa Baeriswyl, Magdalena Montalbán Larraín

University of Santiago, Av. Lib. Bernardo O'Higgins 3677, Estación Central, Santiago, Chile

ABSTRACT

Valorisation of architectural heritage has achieved an important role in Chile in recent years. This process has been materialized in different initiatives, at both regional and national level, such as cultural projects and legal protection for buildings and sites. This article presents the results of a historical research regarding the Swiss Circle of Magallanes. This Circle was built in the 1920' in Chilean Patagonia, in the city of Punta Arenas. The Swiss Circle materializes a key part of the city´s history, related to the European immigration that took place in the region during the second half of the 19th century, and the beginning of the 20th century. The immigration process in Chilean Patagonia was led by the national government, through colonization policies. The aim of these policies was to consolidate the occupation and development of this remote territory, historically hard to populate: the distance from the economic populated centres, as well as a low temperature local weather, and the difficulties for agriculture, were some factors that made these lands hard to occupy. As a result of colonization policies, immigrant groups arrived at Punta Arenas, from northern Chile and from different European nations. Italians, French, British, Spanish, Croatians, Germans and Swiss were some of the population nationalities' that arrived to the city, some of those were organized in official settler groups. It is possible to determine the arrival of Swiss settlers to Punta Arenas since the 1870'. The establishment of the Swiss Mutual Aid Society in 1902, and the creation of the Swiss Circle in 1920, reflected the social organization of Swiss settlers and their descendants, many of whom stayed in the region. This social organization was finally materialized in the construction of the Swiss Circle of Magallanes, still preserved nowadays. The Swiss Circle was built in wood following European concepts, related to traditional Swiss chalets. This building represents the adaptation of foreign ideas and styles to a local context, related to the international immigration in Magallanes. For almost a century, the Circle has served the Swiss community and the residents of Punta Arenas. Even though some interventions have modified the building through time, the original design still remains, and it can be recognized as a Swiss chalet located in this southern Chilean city. The Swiss Circle of Magallanes bears witness to the colonization efforts made in Chilean Patagonia since the second half of the 19th century, as well as the complex social settlement process of immigrant groups at the time. This building also represents an interesting synthesis that combines foreign and local building techniques and styles. Nowadays, the Swiss Circle is a space of cultural dissemination for Swiss traditions and is associated to material and immaterial local memory. This building relates to Chilean national history of territorial occupation, and it's a relevant part of the city's particular character, built from immigration. In recent years, the Swiss Circle has been recognized as official heritage, and efforts have been made locally to plan for its future restoration.

Corresponding Author: María Victoria Correa Baeriswyl

INDUSTRIAL HERITAGE IN NORTHERN CHILE: THE CASE OF GUAYACÁN COOPER FOUNDRY

María Victoria Correa Baeriswyl

University of Santiago, Av. Lib. Bernardo O'Higgins 3677, Estación Central, Santiago, Chile

ABSTRACT

Chilean mining had an important development since the 18th century. During the first decades of the 19th Century, this activity was consolidated in the country, related to commerce freedom and the Independence process from Spain. At that time, local cities were openned to international trade through the Pacific Ocean. The industrial revolution began in Europe during the second half of the 18th Century. This process, was extended to other regions and countries, generating a huge international demand of raw materials for machinery and structures' production. Guayacán is a town located in northern Chile, and is related to this history. Guayacán is part of Coquimbo city, and its origin is connected to a mining-industrial settlement, initiated by Urmeneta & Errázuriz copper foundry. During the second half of the 19th Century, Coquimbo had an important development related to mining. The local railway was inaugurated in 1862, connecting mines and the city. Different metal foundries were set in order to process minerals, easily connected to local mines.This infrastructure allowed minerals transportation, to be processed and exported through the local port. In 1872, Coquimbo's port was the major infrastructure of this kind in the entire province. Since 1856 the foundry of Guayacán began to operate. Guayacán was initially developed as a separated town from Coquimbo, built around the foundry's industry and offices. Urmeneta & Errázuriz copper industry functioned with a local port, destinated to this specific mineral exportation, strategically connected through railways to the mines located in the region. During the second half of the 19th Century, this industrial site was set, and it was developed as the most important cooper foundry in the country, at that time. This article presents some results of an historical research, focused on Guayacán industrial site. This town is related to Chilean copper foundry history. This site was safeguarded as national heritage in 2005. The church of Guayacán was the first building of this town officially recognized as architectural heritage, in 1977. This neogothic church is a prefabricated metal building, imported from Belgium in 1889 by the industry owner of Guayacán industrial site. This church was commissioned to the Societé Anonyme des Forges D'Aiseau, transported by ship to Chilean territory, and located in the foundry yard of Guayacán. Even if some traces of the original site were lost after the industry closure in 1922, the town of Guayacán still preserves part of its industrial history. The original foundry yard is still preserved, and today is a public square in the front of the local church. Nowadays, Guayacán is part of the city of Coquimbo, and some elements of this settlement still connect present and past, giving us valious information related to local economical history. At the present time, Chilean copper production is recognized at international level. This production has a history, in which the industrial site of Guayacán had a relevant role.

THE THEATRE OF THE ROMAN CITY OF CASINUM: HISTORY OF A RESTAURATION

Arturo Gallozzi [1], Silvia Gargaro [1], Rodolfo M. Strollo [2], Michela Cigola [1]

[1] Università di Cassino, DiCEM, via G. Di Biasio 43, 04043 Cassino, Italy
[2] Università di Roma Tor Vergata, DII, via del Politecnico1, 00133Roma, Italy

ABSTRACT

Focus of the article are the archaeological area of the Roman town of Casinum, in southern Lazio; this area preserves traces of pre Roman and Roman period. Currently the principals' monuments are: the theatre (1st century BC - 1st century AD), the amphitheatre dated to the second half of the first century AD; the so-called tomb of Ummidia (1st century BC - 1st century AD), the Nymphaeum called Ponari, also dated to the 1st century AD. The theatre, the core of the Augustan town, was brought to light in the years 1935-36, damaged by bombing in 1944 and the subject of restoration around the 1950s and later in 2001. It has a semi-circular "cavea" which diameter is 53,50 mtpartially leaning on the natural slope of the hill. The scene is rectangular in shape and, on the back of the landscape masonry, there are traces of two porches. The research will start with a brief introduction on the Roman theatres in general and in particular with a study on Casinum theatre. Then will be developed a typological analysis on the theatres leaning on natural slopes in Central Italy. The second phase will focus on the Italian archaeologist Gianfilippo Carettoni (1912-1990), who was the most important scholar and researcher of Casinum theatre. Carettoni performed a systematic excavation and then a restoration of Casinum theatre from 1936 until the first decades of WW2.The last part of the study will cover the comparison between the graphic works of Carettoni andthe integrated digital survey made by our research group. This survey is the interaction and integration of three distinct methodologies: topographic, laser scanning, photogrammetric. Other focus of our study is the verification of some singularities and dimensional-constructive particularities, observed by Carettoni in the graphic elaborations of the archaeological survey.

Corresponding Author: Arturo Gallozzi

SAFETY IN MEASUREMENT ACTIVITIES OF BUILDINGS DONE WITH DIFFERENT METHODS AND EQUIPMENT

Joanna A. Pawłowicz

Institute of Building Engineering, Faculty of Geodesy, Geospatial and Civil Engineering, University of Warmia and Mazury in Olsztyn,10-724 Olsztyn, Heweliusza str. 4 Poland

ABSTRACT

Buildings that surround us in our space are different with regard to their geometry, shape, cubature and details. Some are older, other younger, there are these handsomer and those less interesting. Yet each element of infrastructure and of terrain is physically measurable on condition that appropriate method and equipment are used in order to obtain an expected result. An inventory of a building is one of activities allowing to learn abort its dimensions, surfaces or cubature. Additionally this activity, which as its final result, gives a re-created building documentation without which repairs or renovation of a building would be impossible. Collection of data about a building can be done by different methods and with the use of less or more advanced devices. However almost always the measurements in situ are time-consuming and labour-intensive and additionally can be connected with dangerous activities which may end up with an occupational accident. A choice of an appropriate method may influence on the time and accuracy of obtained results but also on safety of measurement activities. The paper presents measurement methods and tools which have been applied since the beginning of a mankind. Their accuracy and minuteness of detail depends on the requirements of the measurements and the advancement of the technology used by a worker. The paper pays special attention on the most modern method of measuring buildings i.e. the 3D laser scanning. Different aspects of making measurements with a scanning tool were presented, as well as the rules of its safe usage. Making measurements of a building is always connected with the risk of accidents, especially those of falling down from an altitude. The 3D laser scanner resolves this problem and additionally the result obtained is superior to other methods. Safety of doing all activities connected to building measurements is a significant issue. Buildings may be in different technical conditions and of different complexity, therefore a measurement method and tools should be chosen which enable not only to perform an inventory and to collect needed data but also to make the work easier and safer for the measuring team. As a result of the considerations presented in the paper, it can be stated that photogrammetric methods are not only precise and allowing to measure complicated structures but also relatively safe for workers and the object itself. It is especially important while measuring buildings which are especially valuable for historic or cultural reasons.

Corresponding Author: Joanna A. Pawłowicz

BARRACKS FROM THE IBERIAN RESTORATION WAR (1640-1668): HERITAGE VALUE AND CONTEMPORARY USE

Ana Costa Rosado[1], Daniel Navas-Carrillo[2], María Teresa Pérez Cano[2], Celia López Bravo[3]

[1] CEAACP/Mértola's Archaeological Field (CAM), Portugal / Heritage and Urban Territorial Development in Andalusia (HUM700). Escuela Técnica Superior de Arquitectura, University of Seville, Spain
[2] Heritage and Urban Territorial Development in Andalusia (HUM700). Department of Urbanism and Regional Planning. Escuela Técnica Superior de Arquitectura, University of Seville, Spain
[3] Heritage and Urban Territorial Development in Andalusia (HUM700). Department of Architectural History, Theory and Composition. Escuela Técnica Superior de Arquitectura, University of Seville, Spain

ABSTRACT

The 17th century military barracks built during Restoration War between Portugal and Spain (1640-1668) which survived until present time, became exceptional edifices inside the historic centres where they stand. Their constructive and patrimonial importance arises from their modular and rigorous dimensions, which were not only crucial for a quick and precise military construction, but also unique inside traditional Portuguese architecture. Furthermore, the towns where they were built are themselves in an exceptional situation: they share the common trace of being historical border towns, militarized in their essence, and facing nowadays important heritage treats. In a time when mass-tourism and gentrification of historical centres are perceived as the major heritage risks, these small peripheral historical towns are struggling with increasing social desertification and consequent physical degradation of their heritage structures. Which role can exceptional buildings, like 17th century military garrisons, play inside this context? This paper presents three cases in the Portuguese towns of Castelo de Vide, Estremoz and Moura, where barracks have today different uses and daily-life integration. After the War, military lodging use was maintained for only a short while and by 19th century these buildings were abandoned. Political decision-makers searched for solutions case-to-case, which included many demolitions. This research compares three distinct cases that are, respectively, in a situation of abandonment, used as social housing and used as commercial area, to understand the effects of divergent uses in the building's conservation and surrounding area revitalization. Social housing appears as the most interesting of all uses analysed. This function is quite adequate to former barracks as it maintains their primitive essence as a modular housing building. Indeed, 20th century social housing models would favour modular housing solutions. This modular housing essence appears to be the reason why, in Estremoz, barracks were naturally converted in public housing for underprivileged classes in early 20th century, a use that they have maintain, not without contestation, until today. Although the use is adequate to the edifice, both the current tenure model and policy of building's maintenance present problems. Is fundamental that those are reviewed and improved, much as it is necessary the adaptation of housing partitions to current lifestyle needs, for the benefit of both its inhabitants and the historical building conservation.

Corresponding Author: Ana Costa Rosado

RESEARCH ON TRANSFORMATION AND PRESERVATION OF NANJING HISTORIC CITY

Yang Jianqiang

School of Architecture, Southeast University, Nanjing, China

ABSTRACT

Nanjing, along with Beijing, Xi'an, and Luoyang cities, is one of the four prestigious ancient capitals of China. Nanjing is a city of historic and cultural prestige with over 2,500 years of city establishment history and over 460 years of capital building history, which lend it a rich cultural heritage and unique cultural sights. In terms of world history, the origin of Nanjing was 741 years later than Athens (B.C. 520), early form of western city, 599 years later than Rome (B.C.378) but 192 years earlier than Constantinople (A.D. 413), when Nanjing in the Southern Dynasty had developed for nearly 200 years. In terms to continuity of time, Nanjing is the only city built as a capital for a long time in 2000 years of the Chinese history, so urban construction continuity of Nanjing is unique in the urban construction histories of China and the world. Today, Nanjing is being in a rapid development and structural adjustment, where there are many tremendous pressure to her historic city. It is very important for us to understand fully the value of Nanjing and study how to preserve effectively the old city of Nanjing. Firstly, this paper analyses the characteristics and value of Nanjing historic city. It briefs historical development and evolution of ancient Nanjing city, and analyses her morphological characteristics and outstanding values from such perspectives as its landform, layout model, planning form, spatial organization and structural changes. It puts forth that the ancient Nanjing city is an outstanding representative of ancient Chinese capital city design and its spatial pattern is of unique charm. Secondly, this paper discusses some Issues and challenges facing Nanjing historic city. It investigates and analyses the overwhelming developmental stress and significant issues confronting the old city of Nanjing in this era of rapid development. It shall be fully understanding that, in the context of rapid development, the ancient Nanjing city is now threatened seriously by rapid urban expansion, highly conglomerated centre, super-large high-rise buildings and large number of dangerous house reconstruction. In the end, this paper studies objective and strategy of historic preservation of Nanjing. It puts forth strategic planning suggestions on the ancient Nanjing city conservation centring on target localization, old city dispersion, and overall pattern protection. It discusses and studies he holistic preservation of spatial layout and morphology, as well as the control and guidance of urban design. It proposes that we should improve the safeguard mechanism for Nanjing historic city from the perspectives of world cultural heritage protection and integral urban development. Base on above, it concludes that an appropriate spatial growth pattern shall be selected, integral protection on the old city pattern shall be enhanced, and a link between the old city protection and urban development be re-established to promote harmonious and sustainable development of the ancient Nanjing city.

INFLUENCE OF SOCIAL AND POLITICAL FACTORS ON THE ARCHITECTURE OF WOODEN TEMPLES IN WESTERN UKRAINE FROM THE END OF THE 18-TH BY THE BEGINNING OF THE 20-TH CENTURY

Bohdan Cherkes [1], Oksana Diachok [1], Oleksandra Kolodrubska [2],

[1] Lviv Polytechnic National University, Institute of Architecture Department of Design and Fundamental Architecture, Lviv, Ukraine
[2] Lviv National Agrarian University, Dubliany, Lviv region, Ukraine

ABSTRACT

The purpose of the scientific work is to highlight the influence of social and political factors on the territory of Western Ukraine, which have changed the architecture of authentic Ukrainian temples and gave it new features. To achieve the goal, empirical theoretical methods of research and generalization were used: natural surveys, comparative analysis, classification and generalization were conducted. The authors surveyed temples built or reconstructed in the late 19th and early 20th centuries in cities and villages on the territory of Western Ukraine. The architectural and artistic level of authentic temples is extremely high, some of the unique Ukrainian wooden churches of the Carpathian region are listed on the UNESCO World Heritage List. Researchers have proved that a certain canon has been developed in the architecture of wooden temples for centuries, as well as national features and own building culture. The topic of the research is relevant, because sacral architecture has an exceptional historical, cultural and artistic value, and the relation to architectural monuments is one of the important indicators of the culture of the nation. Scientists prove that even during the absence of Ukrainian statehood, Ukrainian sacral architecture, having undergone a difficult path of development, has managed to revive and preserve national features in architecture that best identify Ukrainians as a nation. The theme of the research remains relevant, since sacral architecture has an exceptional historical, cultural and artistic value, and the relation to architectural monuments is one of the important indicators of the culture of the nation. Historical events in the country and in the world changed the course of the development of the architecture of sacred complexes: on the ethnic Ukrainian territory, which was part of the Austrian and Russian empires, new types of churches of the "Terezian" and "synodal" style were distributed.

Corresponding Author: Oksana Diachok

APPLICATION OF TLS INTENSITY DATA FOR DETECTION OF BRICK WALLS DEFECTS

Czesław Suchocki [1], Jacek Katzer [2], Carles Serrat [3], Marcin Jagoda [4]

[1,2,4] Koszalin University of Technology, Faculty of Civil Engineering Environmental and Geodetic Sciences, Śniadeckich 2, 75-453 Koszalin, Poland
[3] Universitat Politecnica de Catalunya-Barcelona TECH, Department of Mathematics, IEMAE-EPSEB, Barcelona 08028, Spain

ABSTRACT

Terrestrial Laser Scanning (TLS) is a well-established technique for remote acquisition of geometrical data of a tested object. For the past two decades it has been commonly used in geodesy, surveying and related areas for acquiring data about spacing of civil engineering structures and buildings. An average TLS apparatus, apart from 3D coordinates registers radiometric information of laser beam reflectance. This radiometric information of the laser beam reflectance is usually called intensity and has no meaning for solely geometric measurements. Nevertheless, the value of intensity depends mainly on physicochemical properties of scanned material such as roughness, colour and saturation. Keeping these facts in mind, authors suggest using changes in value of intensity to locate various imperfections on a brick wall. So far, authors have conducted a thorough and successful research programme dedicated to detection of saturation and saturation movement in brick walls. Based on this experience a new research programme was conducted focused on various aspects of detection of brick wall defects. The main aim of the paper is to present the possibility of using the intensity value in for the diagnostics of the technical condition of brick walls. Advantages and limitations of harnessing TLS for detection of surface defects of brick walls are presented and discussed in the paper.

Corresponding Author: Czesław Suchocki

RAILWAY SETTLEMENTS IN WROCŁAW AND ZBĄSZYNEK IN THE SPIRIT OF THE IDEA OF GARDEN CITES

Alena Kononowicz [1], Marta Dylewska [2]

[1] University of Zielona Góra, Faculty of Civil Engineering, Architecture and Environmental Engineering, Department of Architecture and Urban Planning, 65-417 Zielona Góra, ul. Licealna 9, Poland
[2] Town Hall of Zbąszynek Department of Municipal Property and Geodesy, 66-210 Zbąszynek, ul. Rynek 1, Poland

ABSTRACT

The aim of this article is to show the influence of Howard's garden cities on the formation of settlements and cities connected with railways. Workers' settlements became a fertile ground for instilling social ideas from the turn of the 19th and 20th century in Zbąszynek (Neu Bentschen) and Brochów (Brockau, Landkreis Breslau), formerly a railway town near Wrocław (Breslau), now a settlement within the city limits. In Zbąszynek, a picturesque estate of single-family terraced houses with access to basic services such as a school or a community centre was established for railway workers. In Brochów there were several enclaves of residential buildings, starting from villas for high railway officials, through semi-detached houses to multi-family blocks with access to water and sanitary facilities in the staircases. Sir Ebenezer Howard's idea, which was born in Great Britain, has developed almost simultaneously in Germany, evolving and creating its own style. It worked very well with urban complexes for workers (compare Hellerau once near Dresden for furniture factory employees and Staaken once near Berlin for armaments factory employees). The association with the Railways and the name of the Garden City in both Zbąszynek and Brochów were a huge encouragement and promotion of prosperity, placed on advertising brochures and contributed to the significant development of these towns until the outbreak of World War II. In both cases, the occupational profile of the inhabitants changed significantly over the years, but it seems that Zbąszynek, thanks to small urbanization processes, has better preserved its individual identity. Unfortunately, Brochów, absorbed by the expansive Wrocław in the middle of the 20th century, is losing its individual small-town character every year, due to the intensive efforts of developers and the lack of a well thought-out spatial policy of the city.

Corresponding Author: Alena Kononowicz

THE IMPORTANCE FOR THE ENERGY REHABILITATION OF THE FACADES OF THE HISTORICAL HERITAGE, OF HANDMADE BRICK, OF THE EVALUATION OF THE HUMIDITY

María Soledad Camino-Olea[1], Alejandro Cabeza-Prieto[1], Alfredo Llorente-Álvarez[1], María Paz Sáez-Pérez[2], María Ascensión Rodríguez-Esteban[3]

[1]University Valladolid, Avda. de Salamanca, 18. 47014 Valladolid, Spain
[2] University Granada, Campus Fuentenueva, avda. Severo Ochoa s/n, Granada, Spain
[3] University Salamanca, Campus Viriato, avda. Cardenal Cisneros, 34, Zamora, Spain

ABSTRACT

For some years now, there has been a need to intervene in buildings in such a way that less energy is consumed in thermally conditioning them, while more importance has been given to the rehabilitation of existing buildings than to the construction of new buildings for the same reason – energy efficiency – because more energy is consumed. Building new buildings rather than conditioning the existing ones emits more CO2 into the atmosphere. In the case of the old brickwork facades, in which this material is seen, you cannot act by incorporating a sheet of insulating material, which is usually the most common solution. Therefore, you have to look for other proposals. These facades are built with thick walls of very porous materials: handmade brick and lime mortar, which can absorb significant amounts of water both from the ground and from the rain, which make the thermal conductance of the facade vary considerably, since when the facade is wet the conductance reaches higher values than when it is dry. In order to evaluate this difference, laboratory tests have been carried out on test pieces of walls constructed with handmade bricks from different origins, measuring the thermal flow that passes through them when the opposite faces of the specimens are located in environments with different temperatures. The tests are carried out first in saturated state and then allowing the specimen to dry completely by desorption, with the aim of obtaining information that allows, together with non-destructive tests carried out "in situ", to evaluate, for each case, the energy saving that can be supposed a facade that does not get wet.

Corresponding Author: Alfredo Llorente-Álvarez

TEST PROCEDURE TO EVALUATE THE EFFECTIVENESS OF HYDROFUGATION IN THE PROTECTION AGAINST RAINWATER OF HANDMADE BRICK WALLS

María Soledad Camino-Olea [1], Alfredo Llorente-Álvarez [2], Alejandro Cabeza-Prieto [3], José María Olivar-Parra [4]

University Valladolid, Avda. de Salamanca, 18. 47014 Valladolid, Spain

ABSTRACT

The entrance of rainwater into the brick walls of the cultural heritage can be the source of various injuries due to the processes of migration and crystallization of salts, the formation of ice inside them in times or rainy and cold areas, as well as the growth of organisms in humid areas. The ancient handmade bricks and the mortar used in the construction of these walls are porous materials in which water penetrates easily and is therefore very exposed to these deterioration processes. One of the most usual solution to avoid it is to apply a surface treatment by hidrofugantes to prevent the entry of rainwater. The handmade bricks are orthohedrons with more or less flat faces, which do not present grooves, recesses or perforations like mechanical bricks, so at the interface between brick and mortar there may be discontinuities that facilitate the entry of rainwater. The values of water absorption and brick and mortar are high, which also favors the entry of direct rainwater through the materials. The hydrophobic facade treatments are usually applied by projection on the surface of the façade and the discontinuities that the surface of the façade presents could have the result that the application of the water repellent would not be effective. For this reason, a test procedure was designed that was executed on four walls built in a garden. Above them, water was projected imitating the rain on them, a data capture was made by infrared thermography and humidity probes to analyze the efficiency and hydrophobicity and to study if the test method was valid.

Corresponding Author: Alfredo Llorente-Álvarez

PRE-EXISTENCE AND PROJECT – ÁLVARO DE CAMPOS MUNICIPAL LIBRARY

Filipe Lacerda Neto

University of Beira Interior, Calçada Fonte do Lameiro, Edifício II Engenharia, 6200-001 Covilhã, Portugal

ABSTRACT

The Portuguese architecture – from traditional architecture to nowadays – is universally famous for the attention that gives to its territorial implementation. The way the architecture is placed in a particular location, as well as the way the location is changed by the presence of the architecture – the way it is redefined – are questions inherent in any architecture, particularly the Portuguese architecture, which has responded with special care in general terms. This document aims to investigate the pre-existence in architecture, to see it as a starting point and an essential tool that allows the creation of unique projects. The purpose is to obtain a more comprehensive and deeper understanding of the topic in question, in order to understand the processes that create buildings and city through ruins. Tavira is a Portuguese city in the district of Faro, region and subregion of Algarve, and one of Algarve´s cities that has a strong tradition regarding its built past. It is in this context of a strong urban identity that Álvaro de Campos Municipal Library is implemented. The architectural proposal is born in the old prison of Tavira, built in the 20th century and converted into a municipal library. Thus, we intend to study and investigate the potential of Álvaro de Campos Municipal Library and, based on its analysis, to substantiate the explanation of the project, its architectural strategies and solutions.

RECTANGULAR PLATES WITH A TRAPEZOIDAL CROSS-SECTION SUBJECTED TO THERMAL LOAD

Anna Szymczak-Graczyk

Poznań University of Life Sciences, Piątkowska 94E, 60-649 Poznań, Poland

ABSTRACT

The method to calculate rectangular tanks as a system of bi-directionally bent plates with the use of separated plates methodology is a widely known and currently most often used approach to verify numerical calculations obtained from computer software supporting the design process, in which spatial operation of tanks is taken into account. In these calculations, due to their static scheme, it is possible to distinguish supported plates, plates fixed on four edges and plates with one edge free and three fixed. The subject literature contains publications on plates or tanks with walls of constant thickness, but there are very few publications about plates or tanks with walls of linearly variable thickness. The wall plate of a tank is subject to hydrostatic load or soil pressure and may be exposed to thermal load in the case of, eg., filling it with hot liquid or during climate action. The article presents the results of static calculations of rectangular plates with linearly variable thickness, with a trapezoidal cross-section, three fixed edges and one edge free , subjected to permanent, hydrostatic and thermal loads Trapezoidal cross-section walls are optimal when used in structures where load distribution is triangular in shape (hydrostatic load). For tanks recessed in the ground, the load on the walls increases with the depth of the foundation and achieves the highest value in the bottom part of the wall. Trapezoidal or triangular load distribution causes that the largest bending moments in the vertical cross section occur at the point where the wall connects to the bottom, while the upper free edge of the tank takes zero value. The above statements lead to the conclusion that structural and economic considerations should determine the choice of walls with a thickness increasing with the depth of the tank because material usage in such walls is lower. The impact of thermal load is often neglected during designing which may cause operational problems and even a threat to use safety. In addition to the numerical analysis, the article presents the results of model tests of a plate with a linearly variable thickness made of resin subjected to thermal load The convergence of the obtained results indicates the correctness of calculations and tests performed. This also contributes to the recognition of statics in rectangular plates with a trapezoidal cross-section.

SURREALISTIC HISTORICAL PARK IN RABKA

Krzysztof M. Rostański

Silesian University of Technology, Faculty of Architecture, Akademicka 7, 44-100 Gliwice, Poland

ABSTRACT

Rabka Zdroj (Spa) is a popular Polish resort. The Silesian Rehabilitation and Spa Centre built here in 1949 was designed by Stanislaw Gruszka in the international style, which was still innovative at that time. The park surrounding the spa building has interesting tree specimens planned according to a simple geometrical principle with free fillers. In the west part, the path arrangement is geometrical with three symmetrical gardens on rectangular terraces. Whereas in the south part, its form of abstract winding paths is quite unique, resembling a totem placed horizontally. The research conducted shows that the shapes applied here and deformed symmetry may refer to the works of Miro or Hans Arp. The project's author was related to the community of Warsaw artists fascinated with futurism and surrealism in the 20 years of Poland's independence after World War 1. In the late 1940s the destructive influence of the communist ideology did not yet manage to leave its mark on the architecture of the structure discussed, and thus the place was given its unique beauty. Surrealistic aesthetics reached its apogee in Poland in the 1960s and 1970s, when communist terror was eased. Nowadays the park is being revitalized following the project designed by the author of the article and his team and its implementation has gained financial support from the EU. The leitmotif for the revitalization is to emphasize its surrealistic forms. In the surrealistic garden, there will be created a multi-layered narrative structure with emphasized outline of plant field paths and surrealistic benches and deckchairs especially designed. Educational paths are designed to discuss various topics, like history of modernist spa buildings in Malopolska province (in the south of Poland), history of Polish poster design between WW1 and WW2, as well as the park's natural aspects. Another abstract idea will also be found in the Rabka Code, a game enabling to develop tasks of one's choice to be solved in the field. The present article discusses the research carried out on the history of the structure and its formal relations as well as the design decisions already taken. It should be stressed that a surrealistic path layout is a very rare solution in the history of park architecture. Even if parks may have surrealistic sculptures, the surrounding area usually retains its modernist, simple geometrical form. In the future surrealistic sculptures may also appear in the park in Rabka Zdroj. Nowadays, however, it is more important to maintain its unique aesthetic values both in the park plan and in the detail of decorative structures.

REGENERATION OF THE INDUSTRIAL HERITAGE IN THE CENTRAL AREA OF ORADEA, ROMANIA

Ioana Francesca Prada, Constantin Bungău, Ivett-Greta Zsak

Technical University of Cluj-Napoca, Str. Constantin Daicoviciu nr. 15, Cluj-Napoca, Romania

ABSTRACT

This paper addresses the phenomenon of topicality, the desire to recover the declining or abandoned urban areas. It focuses mainly on the central area of the cities, where most of the time, industrial units of historical and cultural value have been forgotten. The study refers to the context of Romania joining the European region, with the impressions of the past since it was under the influence of the Soviet Union, a period in which a rapid industrialization took place. The period of change of the 21st century favoured the decline of many large industries, producing nowadays buildings and enclosures awaiting for a change. The object of study consists of the industrial units and their premises situated in the central area of Oradea; considering a special situation in which the historical tissue intertwines with the residential and the fragmented former-industrial one. Urban regeneration is one of the most important strategies for cities with irregular development that want to survive the "urban sprawl" phenomenon. Sustainable development goals can be achieved by changing policies and the direction of development, while pursuing economic and social progress. In the case of industrial heritage, old abandoned structures can turn into strengths. These holes become opportunities for changing the rhythm and direction of the development, offering flexibility to a rigid tram. It has been carried out an analysis of the strategies applied to areas having characteristics as close as possible to the fragments of the proposed site. Also examples of good practice having a favourable effect on society, economy and environment were considered. The aim of this paper is to emphasize the importance of preserving the industrial heritage and to present various methods by which it can be converted and used for the benefit of contemporary society, while preserving its character and identity.

Corresponding Author: Ioana Francesca Prada

THE MONASTERY COMPLEX OF THE PREMONSTRATENSIAN ORDER IN THE POLISH LANDS - IMBRAMOWICE IN THE PAST AND TODAY

Joanna Gil-Mastalerczyk

Faculty of Civil Engineering and Architecture, Kielce University of Technology, Kielce, Poland

ABSTRACT

The historical urban and architectural assumption of the Norbertine Sisters monastery in Imbramowice near Cracow is a valuable treasury of the centuries-long spiritual and cultural heritage of the Premonstratian Order in Poland. It is a special religious and pilgrimage place as well as one of the oldest Norbertine monasteries and one of the two existing Norbertine houses in Poland. His story reflects the rich and painful history of Poland. The monastery complex was founded in the 13th century with the foundation of the bishop Iwon Odrowąż. Then it was rebuilt in the XVII and XVIII centuries and continues to function to this day. For over 780 years, he has been managed by the Norbertine Sisters and supported by benefactors and volunteers. As a result of the initiatives undertaken, construction works carried out, the overall functionality of the complex has been increased. The old monuments provide all interested people with numerous opportunities to enjoy their diverse wealth.

THE IMPACT OF TIMBER ROOF FRAMEWORK OVER HISTORICAL MASONRY STRUCTURES

Eugen Onescu [2], Iasmina Onescu [2], Mosoarca Marius [1]

[1] Polytechnic University of Timisoara, Romania
[2] Centre for Research and Sustainable Development for Timisoara City, Polytechnic University of Timisoara, Romania

ABSTRACT

Romania is a European country, crossed by Carpathian Mountains and Danube River, with two important seismic zones. First and most dangerous one is Vrancea zone, near the capital of the country, Bucharest. The second most important seismic area is Banat, characterized by shallow earthquakes and a peak ground acceleration a_g=0.2g. The most important city located in the second seismic zone is Timisoara, a city known in the past as Castrum Regium Themes which dates from 1212. Timisoara has been influenced by many cultures, such as Ottoman, Hungarian and Austrian, influence that can be seen also through the architecture of the city, especially in the historical zones, characterized by 1-4 storey masonry buildings with very complex and elegant timber roof framework. The dominant architectural styles are Secession and Art Nouveau. During the life period of the historical buildings, there were registered few seismic events, but the actual state of the buildings is a good one, with small problems caused by lack of proper maintenance or time-passing over construction materials. The global good behaviour of the buildings from the historical areas of Timisoara, despite the small seismic site-source distance and epicentral depth, remained a subject of interest for years. This article studies if and how the existence of such a complex timber roof framework influence the seismic behaviour of the masonry structure and entire building. The study was made based on non-linear analysis obtained with Tremuri software, determining the seismic vulnerability of the case study buildings with and without considering the timber roof. In the context of Timisoara European Capital of Culture 2021, the assessment of the seismic vulnerability of the most important buildings of the city is highly relevant. In the same time, considering the actual trend of replacing the historical timber roof framework with more modern structures, there is mandatory to understand how this specific timber structure contributes to the structural integrity of the historical masonry buildings.

Corresponding Author: Iasmina Onescu

CONTRIBUTIONS FOR THE REHABILITATION OF THE CASTRO DA SENHORA DO BOM SUCESSO - MANGUALDE (PORTUGAL)

Marcelo V. Gomes Rodrigues[1], Luís M. Ferreira Gomes[2], A.B. Cabral de Carvalho[13]; Cláudia Beato[1]

[1] University of Beira Interior, Covilhã, Portugal
[2] Department of Civil Engineering and Architecture, University of Beira Interior, Covilhã, Portugal
[3] Viseu, Portugal

ABSTRACT

Portugal is par excellence, a destination for the practice of Nature Tourism, containing a vast and rich natural, historical and cultural heritage. The Castro da Senhora do Bom Sucesso, is a place where the surrounding landscape emerges, having several mountain ranges around it, in an environment with fauna and flora typical of the region. The whole history of the place, send to a certain period of the past, making it valued and able to make even better the experience that one can have through Nature Tourism.Being one of the places with a high altitude in the central region of Portugal, it makes the place for many people, a special site of relaxation.In that place, hundreds of years ago, there were between 80 and 100 houses of ancient people and in particular of a Celtic culture. Later, due to the abandonment by the Men, those houses quickly entered disuse and decay, the walls and roofs collapsed, making the paths impassable and the place covered with vegetation. Thus, in this work, in methodological terms, based on bibliographical research, collection of cartographic elements of the place, and field and office studies, allowed to develop an investigation on the Military Heritage of the region, in order to analyse in very detail, the relation of the nature of the place with the Architecture. This work resulted in a proposal for the site of the old Castro do Bom Sucesso, in order to create an Ecotourism Park, around Celtic culture and autochthonous nature, organized in the following main equipments: i) Reception of the EcoTourism Park; (ii) "Celtic Bungalows"; iii) Celtic Interpretation Center; iv) Biological pool and v) Camping. This paper presents the main elements developed, from the concept to the form and location of those equipments that are believed to be built to boost the economy of the region from a scientific, didactic, cultural and sustainable tourism.

Corresponding Author: Luís Manuel Ferreira Gomes

LISBON'S TOMÁS TAVEIRA COLLECTIVE DWELLING (1973-2004)

Vanda Matos, Carlos Alho

Lisbon School of Architecture, University of Lisbon, Rua Sá Nogueira, Pólo Universitário da Ajuda, 1349-063, Portugal

ABSTRACT

From the 16th to the 1st half of the 18th century, the division of the city's spare land in urban plots correlates to careful planning of the area and to the appearance of the building to let, 16th century-1976. However, the typology of a building vertical organized for different families evolved until the present. Through the work of Tomás Taveira, an architect of Lisbon's School, we will go through his projects of collective dwelling built in Lisbon (1970s-2004). These buildings are reference and significant buildings. and are representative of an architectonic culture that differs from the North to the South of Portugal. In Taveira´s architecture the colour is a major element. For him colour is a mean of communication with the individuals, to give form and substance to environments, conveying a cultural and psychological message for the individual and to the group. Condado Quarter (1975-1978 and 1975-1985), was built like a "living organism", in a metabolistic addition and accumulation logic. Originally were chosen strong colours However the stigma associated to the population, to specific parts of the urban ensemble and the surrounding territory led to the demolition of parts of the original project and the modification of the color palette, raising questions regarding its sustainability and authenticity. In Olaias urban ensemble (1973- 2005), colours were experimented as a laboratory of colours. The Avenida Óscar Monteiro Torres urban ensemble (1977), resembles the previous two projects and presents a pure modern type plan. Amoreiras Tower Center (1980-1988), combines a shopping centre with offices and collective dwellings. Its references are Ricardo Boffil and Michael Graves Post Modern´s Architecture combined with the inspiration in the Portuguese medieval tradition. Their dwellings are organized in left/right dwelling, the T3 typology presents a contiguous spouses privatization. The Oriente Building (2002) and the Inoqual Building (2004) were built in the terrains of Expo Park. The dwellings of Inoqual Building, as well as Oriente Building T3 and T2 have a contiguous spouse's privatization. Both buildings use "normal" colours to please a great variety of future dwellers. Thus Taveira uses withe ceramic revetments in façades and public areas, combining them with strong colours in plastered surfaces, creating contrast, atmospheres and sensations (Oriente Building), or using strong coloured structural tree like columns (Inoqual Building). Regarding the historical-constructive periods they cover the periods of *c.1960 - c.1980,* c.1980- c.1990, c.1990- c.2010, corresponding to the buildings with a reinforced concrete structure of the 2ndphase, of 3rd phase, and buildings of reinforced concrete and sustainable construction, respectively. A fundamental key to the environmental and urban sustainability of Lisbon is the Urban Rehabilitation of the city´s heritage, a built resource that must be preserved in order to achieve an efficient and sustainable city. The collective dwelling is part of that heritage. Some of them coexist with social and degraded areas (Portugal Novo Quarter in Olaias). The urban rehabilitation is fundamental to assure quality of the human and the built environment in those areas. Urban rehabilitation and heritage safeguard are two sides of the same coin.

Corresponding Author: Vanda Matos

PRESERVING HISTORICAL MONUMENTS: FROM 3D SCANNING TO 3D PRINTING

Călin Mariana[1], Iliescu Alexandru[1], Păunescu Vlad[1,2], Moscovici Anca[3], Sălăgean Tudor[2,4], Șuba Elemer[2,4], Manea Raluca[1]

[1] University of Agronomic Sciences and Veterinary Medicine, 59 Marasti Blvd., District 1, Bucharest, Romania
[2] Technical University of Civil Engineering, 124 Lacul Tei Blvd, District 2, Bucharest, Romania
[3] Politehnica University Timisoara, 2 Traian Lalescu Street, Timisoara, Romania
[4]University of Agricultural Sciences and Veterinary Medicine, 3-5 Mănăștur Blvd., Cluj-Napoca, Romania

ABSTRACT

Digital preservation of heritage monuments is a particularly challenging application for 3D modelling. Objects and heritage sites differ greatly from one another and a maximized fidelity of the 3D model is an essential requirement. One of the main purposes of cultural heritage is the preservation of monuments. Current 3D technology makes the work much easier, including 3D printing. Terrestrial laser scanning is a technology that has become more and more popular in recent years for documenting, providing dense 3D points on the surface of an object with high precision. Moreover, the resulted 3D scans can be used for digital documentation as well as various analyze, and then with the help of 3D printing technology they can be "rebuilt". Studies conducted so far shows that: 3D printing can produce up to 30% less material waste, use less energy and fewer resources enable in-situ production. This paper presents the 3D modelling of the Cesianu House, one of the many historical monuments from Bucharest, Romania, without loss of details or accuracy. Cesianu House is an illustrative exemplary of a boyar house from the beginning of the 19th century. In this article, terrestrial laser scanning technology and 3D printing technology were used on a smaller scale to illustrate their usefulness in preserving cultural heritage monuments. In this paper we presented the use and combination of the two technologies, the exemplification of the working methods and the real-world transposition of the 3D model in a precise way that can represent the "building and rebuilding" technology of the future decade.

Corresponding Author: Călin Mariana

SCAN TO BIM BEYOND A FINAL BIM: WHY, WHEN AND HOW

Juan Corso Sarmiento, Adrià Marco Bercero, Jordi Casals Fernández, Pilar Garci-Almirall

Virtual Innovation in Modelling Architecture and the City (VIMAC), ETSAB, Polytechnic University of Catalunya (UPC), Diagonal 649 -1, 08028, Spain

ABSTRACT

Building Information Modeling (BIM) has become a must in architecture when it comes to new buildings, but in heritage buildings and in rehabilitation projects, it is still a debate if it's useful or efficient to make a BIM model. In this paper we analyze and propose When, How and Why modeling in BIM should be a standard process for rehabilitation projects in which an architectural survey has been performed. In the field of heritage architecture, archeology and rehabilitation, to create an as-built model to work on, it is needed an architectural survey using a laser scan or/and photogrammetry, which captures dense 3D measurements of the building, so architects can make studies of its geometry, detect pathologies and use it as a base for their new designs. However, even though the 3D surveying techniques have evolved in the recent years, and well-known are the best and most reliable information to work with; it is yet to develop a methodology for the Scan to BIM process for it to increase its use and efficiency in the field of architecture. Therefore, it is necessary to convert this 3D information as point clouds to a more common file like 2D vector drawings in CAD. For this process, it should be question if and how modeling in BIM from the point cloud (scan to BIM) helps to this purpose, without taking into the account that modeling in BIM you get a BIM model, which in rehabilitation and heritage is still not common enough to work with it. Analyzing the information of the point clouds, the typology of the building, the timings, the precision required, and how works a BIM software and its libraries; we have seen that in some particular projects, as far as technology and architecture field are nowadays, to make a useful documentation for rehabilitation modeling the building in BIM in a specific Level of detail (LoD) directly from a point cloud (scan to BIM), it is an upgrade in the process beyond the fact of having a BIM model, that is to say, you can get the same documents, but with better quality results, in a more efficient way and less time spend. We ended up with a list of characteristics a building must have for this scan to BIM process to be an efficient step and how this should be performed. We have explored this Scan to BIM workflow through two different case studies in this paper: a large scale building with repetitive elements (old military hospital in Valencia) and a small one with unique elements (classified single family house in Barcelona).

Corresponding Author: Juan Corso Sarmiento

HISTORIC BUILDINGS AND THE ISSUE OF THEIR ACCESSIBILITY FOR THE DISABLED

Dominika Kuśnierz-Krupa

Faculty of Architecture, Cracow University of Technology, Podchorążych St. 1, 30-084 Cracow, Poland

ABSTRACT

This article addresses the problem of the accessibility of historic buildings, such as The Badeni Palace in Bejsce, Świętokrzyskie Voivodeship in Poland, for the disabled. The palace complex in Bejsce is under the statutory form of monument protection, since it was inscribed in the voivodeship monument register. The palace is situated in the palace park located in the centre of the village. The building was erected by Marcin Badeni, according to the design by Jakub Kubicki in 1802. It is worth mentioning, that Jakub Kubicki was an eminent Polish architect at the turn of the 18th and 19th century, a representative of classicism and the creator such buildings as e.g. the Belvedere in Warsaw. The selected example reflexes the complexity of the discussed issue. On the one hand, historic buildings representing outstanding cultural values, such as the classicist Badeni Palce in Bejsce, should be under absolute conservation protection so that, in keeping with the idea of sustainable development, it could be preserved intact for future generations. On the other hand, a Nursing Home has been functioning in the palace for decades, due to which the building requires modernisation. The Nursing Home serves a socially necessary function, which requires ensuring suitable living conditions for its residents. It demands fulfilling the requirements concerning the buildings' accessibility for the disabled, included in the regulation of the Minister of Infrastructure. It should be added that the commune does not have financial resources to build a new nursing home to which residents could be moved, so that the palace could serve a more formal function of e.g. a museum or an art gallery. The situation poses a conservation dilemma, whether adding a lift for the disabled for safety reasons should be allowed in the palace building or next to it. What is more important: the value of historic substance or cultural landscape of the place? In the context of currently relevant problem of adaptability of historic buildings for the disabled, those and other questions will be discussed by the author of the article.

CONTEMPORARY RECONSTRUCTION OF OLD TOWN IN POLAND AND GERMANY IN THE 21ST CENTURY

Piotr Fiuk

West Pomeranian University of Technology, Szczecin, Poland

ABSTRACT

Article present issues of current reconstruction of the selected historical cities in Poland and Germany.
After the period of post-war dominance of modernist ideas in urban planning and architecture, ideas became outdated and obsolete. Modernistic projects based on the idea of the Athenian Charter of 1933, Bauhaus and C.I.A.M. were regarded as disharmonious for old town, especially layouts of detached houses, repeatability of buildings and disharmony with the historical landscape. In modern cities, it is necessary to restore the cultural values of historical districts. Reconstruction of creative city centers, in addition to restoring cultural potential, will result in: rebuilding of the proper structure of historical districts, economic recovery, restoring social trust, and returning residents to their homelands. The first part will present the results of research on the causes of economic decapitalization of old town and disharmony of cultural values in their landscape. The analysis includes urban planning and the architecture of historical cities of several dozen old town complexes in Germany after 1945 (Dresden, Frankfurt am Main, Hamburg, Hildesheim, Lübeck, Cologne). The second part will present contemporary urban and architectural solutions of reconstruction of historical centers, restoring their former commercial and tertiary position, which harmonize the old town landscape in Poland (Elbląg, Poznań, Wrocław). The next part will present theoretical and conceptual solutions prepared for Szczecin at the end of the 20th century and implementations from the beginning of the 21st century, along with original authorial projects. Contemporary urban and architectural structures in the Szczecin's historical center aimed to restore the cultural potential of the city, revive the economy and regain the status of a center in the modern agglomeration. In the last chapter there will be conclusions and proposals for the contemporary development of old districts, economic progress of historical cities, restoration of lost artistic values, creation of modern functional architectural solutions and process of evolution of architectural art in Europe.

Corresponding Author: Name Surname

FROM KNOWLEDGE TO DESIGN: THE RESTORATION OF SAN ROCCO'S ORATORY IN SORAGNA (PARMA, ITALY)

Federica Ottoni, Sofia Celli

Università di Parma, Dipartimento di Ingegneria e Architettura (DIA), Italy

ABSTRACT

This paper presents a study conducted with the final purpose of restoring and revitalizing a XVII century cloister located in Soragna (Parma, Italy). After last century's consistent and mostly destructive transformations, the building has been left in a state of dangerous abandonment. Starting from the historical and structural analysis of the complex, the project of reuse herein proposed has dealt not only with structural and safety issues, but also with the "use" choice, which descends directly from social and territorial aspects. The significance of this intervention is hence related both to its compliance with the principles of the "integrated conservation process" - as defined by Roberto Di Stefano in the 80's -, and to the actual architectural and strengthening project, developed on the bases of a throughout historical research. With regard to the former topic, it should be noted that the first guarantee in terms of conservation of historical heritage primarily lies in the identification of its most appropriate use, rather than in the selection of the most suitable restoration techniques, which, however, represents the very next step in the process. Indeed, the reuse of these ancient spaces necessarily involves a deep interaction between social and functional aspects. By gathering the needs and requirements of the local community, the restoration process has turned into an opportunity for sharing, aggregating and assisting. The outcome is the creation of a territorial health structure, that has been integrated with some complementary socially-relevant uses (e.g. a laboratory of employment training for autistic people). As for the latter mentioned issue, the study of historical documentation has shed light on forgotten information that, in the project phase, have turned into design opportunities. The ancient trace of a demolished wing of the complex has become an occasion to place a new portion of the building which, at the same time, meets two different objectives: an efficient functional distribution and the reinforcement of the structure. The final aim is thus to show that structural strengthening should always be related to the historical analysis, in order to acquire a thorough understanding of the effects caused by the changes that shaped the building over time (R. Di Stefano, 1981). At the end of this path, in balance between structural strengthening, functional renewal and preservation of built heritage, the monument will increase its cultural and economic value, gaining a new (social) life.

Corresponding Author: Sofia Celli

DETAILS OF KRAKOW'S MODERNIST TOWNHOUSES

Beata Makowska

Cracow University of Technology, Cracow, Poland

ABSTRACT

The aim of this paper is to present key features of façade details typical of townhouses erected in Krakow in the period 1918-1939. It emphasizes the importance of townhouse details for Krakow's cultural heritage and the pressing need to document them. Since the funds of the Social Committee for the Renovation of Krakow's Monuments are allocated in first priority to overhauls of public utility buildings and registered monuments, modernist buildings have little if any chances for renovation. Meanwhile, they continue to fall into disrepair, which makes the documentation efforts even more urgent. Only a few, most precious buildings from the interwar period are listed in the register of monuments. The remaining ones are not awarded appropriate legal protection. Based on the analysis of the influences of a variety of trends on the development of Krakow's townhouse façades and their details in the period 1918-1939 three basic groups of façades were identified: the first one relied on the historic style, the second, and most numerous one, combined historic and functionalist forms, while the third one emerged under explicit influence of functionalism. Key elements of historic stylistics include: symmetry and division of the façade into three parts (bossage on the wall base, vertically articulated main part, finial), strong emphasis on the entrance portal, conspicuous cornices and decorations. In townhouses combining historic and functional forms, the prevailing stylistic elements include simple poles, lesenes (often worked in the plaster texture), enhanced with decorations (coats of arms, friezes, etc.). The ornamental-stylistic current typical of the 'Krakow school' comes in several different iterations. Few townhouses were explicitly influenced by European functionalism. Designers aimed at simplifying detail forms and their geometrization, producing an effect that revealed more deeply the functional content of the mass. The functionalist current in Krakow differed artistically from the avant-garde European projects. Nonetheless, it shared similar rationalist objectives – usability, economy and simplicity. Façade details often served as a link between contemporaneity and previous periods; they took account of features typical of Krakow's historic architecture.

THE IMPACT OF THE CULTURAL VALUE TO THE SEISMIC VULNERABILITY OF A HISTORICAL BUILDING

Iasmina Onescu [1], Eugen Onescu [2], Mosoarca Marius [1]

[1] Polytechnic University of Timisoara, Research Centre in Architecture and Urban Planning, Romania
[2] University of Timisoara, Romania

ABSTRACT

Romania is a country located in the Estern Europe. It has two important seismic areas, Vrancea and Banat. Vrancea seismic region is located close to the biggest city of Romania, Bucharest, which is also the capital, while Banat seismic area is located in the western part of the country. The most important city from Banat area is Timisoara, which was also elected to be European Capital of Culture 2021. Beside the general seismicity of the area, which is characterised by shallow earthquakes of crustal type, Timisoara city presents also two seismic faults that cross the western part of the city. The peak ground acceleration is considered to be a_g=0.20g, while the maximum recorded magnitude was M_W=5.6-5.8. The paper is part of a larger research work which aims to assess the seismic vulnerability of the historical buildings in Timisoara city and their specific failure mechanisms, through both empirical simplified and mechanical numerical analysis. This study presents a new methodology that was previously proposed by the authors in their work and that considers also the influence of the cultural value in the process of assessing the seismic vulnerability. The consideration of the architectural, artistic, urbanistic and social elements can considerably influence the seismic vulnerability of a building. The highest the cultural value, the highest the need of rehabilitation work. The study is focused on one of the most important historical buildings of the city, Elite's Palace and compares the results of the empirical seismic vulnerability assessment with and without considering the cultural value. This kind of research could provide valuable information for the local authorities and could represent the base of a prioritization list for future rehabilitation work.

Corresponding Author: Iasmina Onescu, iasmina.apostol@upt.ro

TOWNPLANNING AND ARCHITECTURE OF COLONIZATION VILLAGES: FROM THE SPANISH 60s TO GRANADA'S MEADOW 2018

Gabriel J. Fernández-Adarve, F. Javier Lafuente-Bolívar, Juan M. Santiago-Zaragoza

Higher Technical School of Building Engineering. University of Granada. Campus of Fuentenueva. 18071. Granada, Spain

ABSTRACT

The town council of Láchar (Granada, Spain) signed an agreement with the University of Granada allowing the staff and students of the Higher Technical School of Building Engineering to do research about Peñuelas, a small village belonging to the town of Láchar, which is an example of the villages planned and built during the 50s and 60s of the XXth century by the National Institute for Colonization (INC) in Spain. In the province of Granada, it had two main areas of development: The Mediterranean coast and the one linked to the new irrigated land in the High Meadow of Granada and the Cacín chanel, where Peñuelas is placed. These last were better planned and the group of settlements larger. This paper shows the researching results. First of all, it is deeply analyzed the urban shapes planned by the teams of architects and engineers of the INC. It is also analyzed the criteria of urban composition for the new settlement related to ground topography, roads, plots for crops and the landscape milestones of the farms developed in Spain in mid twentieth century. Secondly, it is studied the new towns of colonization in Granada. All of them projected by the architect José García-Nieto. These new urban shapes were developed from singular buildings that were milestones to identify settlements as El Chaparral, Fuensanta and some others by that architect. It is followed by the study of housing planned by García-Nieto for Peñuelas through his plans for the different floors, facades and sections of each typology and its different versions. Apart from this, it is analyzed the simple architecture of the houses of this colonization town. The main buildings of Peñuelas are studied through a deep analysis of building typologies of urban furnishing. Finally, the study of Peñuelas after half of a century from its inauguration. From a general analysis the research focus on a deep knowledge of the composition rules followed in the Peñuelas project showing the keys for its growing, then describing the plot transformations of size and shape and the main changes of buildings affecting volume, colour and constructive items. Conclusions claim for the value of those colonization villages, specifically Peñuelas. Its protection is a final proposal as Site of Cultural Interest that is, historic place that means the main protection in Spanish and Andalusian regulation, obliging to draft a protection plan.

Corresponding Author: Javier Lafuente-Bolívar

Session Title:

Sustainability in the Built Environment

LIFE-CYCLE ASSESSMENT OF SUSTAINABLE FOUNDATION SYSTEMS OF BUILDINGS

Michal Kraus, Ingrid Juhásová Šenitková

Institute of Technology and Business in České Budějovice, Department of Civil Engineering,
Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

According to laws in force, the construction process is required to be as efficient as possible in terms of energy. The reason is that the building sector is growing and more and more energy is needed. Buildings are responsible for 40% of energy consumption and 36% of CO_2 emissions in the member states of the European Union. Sustainable foundation systems of buildings are not only energy efficient but also environmentally friendly. According to the research project Heartland Green Sheets, the recommended criteria for evaluating sustainable buildings materials are low embodied energy, recyclable, use renewable resources, locally or regionally produced, energy efficient, low environmental impact, durable, minimize waste, positive social impact and affordable. This study focuses on selecting the most sustainable foundation system based on life-cycle assessment (LCA) and sustainability assessment of alternate shallow foundation systems. The multi-criteria analysis of the most used and modern foundation systems with sustainable materials in term of life cycle assessment is presented within the paper. Sustainability assessment of alternate shallow foundations is performed based on three pillars of the sustainability (environmental, economic, and social). The variants are assessed in terms of labor, time and financial demands, energy and environmental performance. A total of 8 criteria are evaluated. Variants are evaluated from the point of view of thermo-technical parameters, economic costs, time-consuming and labour-intensive and environmental aspects. Environmental assessment includes Global Warming Potential (GWP), Acidification Potential (AP), the share of used recycled and renewable materials, the share of recyclable materials and the specific weight. The green design strategy of building construction has great potential to provide the solution for lot of environmental challenges. Residential building foundation systems are the basis for sustainable building design. The careful and responsible selection of sustainable building materials and construction methods minimize the environmental impact in all life cycle significantly.

Corresponding Author: Michal Kraus

GENDER DIFFERENCES IN PERCEPTION OF INDOOR ENVIRONMENTAL QUALITY (IEQ)

Michal Kraus, Petra Nováková

Institute of Technology and Business in České Budějovice, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

There are many factors creating the internal environment of the building. These factors could be biological, physical, or chemical, and they determine the indoor environmental quality. This contribution investigates the gender differences in occupants' perception on various aspects of indoor environmental quality (IEQ). There are many studies, how the conditions of the indoor environment affect the users' performance, health, or comfort. Generally, women are more likely to have symptoms of SBS, such as fatigue, headache, irritated or dry eyes, nose and throat, and skin symptoms. Assessments of user´s perception were carried out at the Institute of Technology and Business situated in the city of České Budějovice, South Bohemia, Czechia. The panellists (students) indicated their immediate evaluation on eight continuous scales regarding air acceptability, odor intensity, thermal comfort, humidity comfort, visual comfort, color comfort, noise load and total satisfaction. Then the percentage of dissatisfied (PN) was estimated. The gender differences in perception of indoor environmental quality are analysed. This knowledge is necessary and useful to develop appropriate strategies to create and maintain a sustainable internal environment for education and training. Understanding the perception of the quality of the inner environment by students is essential to increase the performance and productivity of not only students but also the academic staff. The long-term low indoor environment quality can lead to poor productivity, performance and ability to learn. It is also necessary to take into account the health of students and also academic staff in the context of the hygiene of the internal environment.

Corresponding Author: Michal Kraus

MATERIAL VOC EMISSION AND INDOOR AIR QUALITY SIMULATION

Michal Kraus, Ingrid Juhásová Šenitková

Institute of Technology and Business in České Budějovice, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The contribution reports on a simulation study of indoor air quality in relation to different ventilation rates specified for 3 categories of the indoor environment according to EN 15 251 (2007). Indoor air quality and energy management are often at the opposite ends of the building management spectrum. The buildings are polluted by occupants building themselves. The indoor air quality can be expressed at the required level of ventilation or Carbon Dioxide (CO_2) concentration. Actually, the indoor air quality is influenced by emission from building surface materials and furnishing, occupants and their activities. VOCs play an important role in the indoor air quality evaluation process. VOC emissions adversely affect both occupant comfort and health. Most of the health hazards associated with VOC emissions occur during the first few weeks of building use. The Indoor Air Quality Emission Simulation Tool developed by National Research Council is used for simulation the VOCs emission impact of selected materials based on the amount of materials used and the ventilation rates in a model room in this case study. IA Quest predicts the emission of VOCs from building surface materials and furnishings, helping to select low-emission materials and effective ventilation strategies. The results showed the benefit of removing the increased amount of TVOC generated in time of the unoccupied period. The differences in TVOC concentrations was not obvious between two higher ventilation conditions (2.00 and 1.40 l/s.m^2). More significant difference was estimated between categories A, B and category C (0.80 l/s.m^2).

Corresponding Author: Michal Kraus

COLOR AS A PSYCHOLOGICAL AGENT TO PERCEIVED INDOOR ENVIRONMENTAL QUALITY

Michal Kraus

Institute of Technology and Business in České Budějovice, Department of Civil Engineering, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Achieving suitable and comfortable indoor environmental quality comfort via innovative, sustainable, energy efficient approaches is a contemporary research aim world-wide. The indoor space and its perception are influenced by three basic components: the surrounding factors (temperature, noise, odor, noise and lighting), structural factors (architecture, color, materials, pattern, and structure) and social factors (occupants). The relationship between IEQ and wellbeing is complicated. A range of indoor factors such as thermal, visual, acoustic, and chemical can impact the wellbeing, performance and health of the occupants. Colors are an interesting and well-studied psychological phenomenon. Colors, combinations, saturations and shades are the focus of advertising creators, interior designers and exteriors, architects, psychologists and many others. Specific colors and patterns have a direct influence on health, emotions, behavior, and performance of building users. Color is one of the basic properties of objects and environments. Colors have a great impact on our perception and evaluation. For example, it is proven that long-term stay in a deeply painted room is very nervous on the nervous system or that red and yellow tend to be seen as warning signals. A color's hue is determined by its wavelength [nm]. Long wavelengths are associated with warm colors, with red (~ 625–800 nm) being most extreme followed by orange (~ 590–625 nm). Short wavelengths are associated with cold colors, with violet (~ 430–500 nm] being most extreme followed by blue (~ 430–500 nm). In this study, the impact of indoor color use and indoor enviromental quality is examined. The focus of this contribution is to establish a link between the color as IEQ parameter and health and well-being of occupants.

GREEN TECHNOLOGY FOR MOTORWAY OVERPASSES

Jaroslav Žák

Department of Civil Engineering, Institute of Technology and Business in České Budějovice, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

Overpasses can play an important role in ensuring permeability of motorways for wildlife. Width and length are the principal technical parameters affecting overpass effectiveness. It is very important to ensure correct technology and a proper water management on its surface. Wildlife behaviour and their requirements for the mentioned technical parameters of overpasses also have been examined. In all cases, overpass functionality grows with increasing width and declines with growing length. The objective should therefore be to find a balanced compromise enabling sufficient functionality while maintaining reasonable costs. Data envelopment analysis (DEA) provides a way to identify good solutions in the sense of sufficient overpass functionality with reasonable total costs. Overpass functionality calculations were based on the original methodology developed by the author. Total costs were established according to actual construction work prices in the Czech Republic, including prices for preparations, design, construction, maintenance, and demolition. The results indicate that DEA has been found to be a suitable tool for finding good solutions and can be useful when planning measures to ensure motorways are permeable to wildlife.

DEFECTS OF ROOFING AND ROOF STRUCTURE – APARTMENT HOUSE KAPLICE

Martin Dědič

Faculty of Technology, The Institute of Technology and Business, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The aim of paper is to provide information on the defects of roofing and roof structure on Apartment house Kaplice. Roof cover is Beronit fiber-cement template cover. The roof template is 400 x 400 mm (square with corrugated corners). The roof was laid according to design documentation and documented invoices 10 years ago. The roof as a whole, as a result of very serious defects, does not fulfill its function (protection of the object from weathering). The rainwater penetrates into the attic and affects the wooden elements of the roof structure. Wooden elements of truss construction, in particular formwork and rafters in the ridge area, are infested with mold. The Czech Mycological Society confirmed the attack of wood mold elements, testing the samples taken. One sample from the inside face of the roof formwork has higher mold values, and the other sample has even high mold values. The attic space can only be ventilated through the opening windows and the roofing is designed as unpaved. During the ten-year lifetime of the roofing, one repair was carried out, which further aggravated the condition. The detected state of the roof is emergency and the implemented measure in the form of capturing penetrated water into plastic containers is not enough to stop the deepening of destructive roof processes. Temporary repairs to roof roofing did not benefit, and on the contrary, it is one of the main factors causing cracking and shading of roofing patterns and thus the penetration of rainwater into the soil.

DISORDERS WINDOW OPENINGS - FAMILY HOUSE IN LIPNO NAD VLTAVOU

Martin Dědič

Faculty of Technology, The Institute of Technology and Business, Okružní 517/10, 370 01 České Budějovice, Czech Republic

ABSTRACT

The aim the paper was to assess the state of the window openings and the height positioning of the sliding window HST portal (heroal S 77 HI) and the design of the repair in family house in Lipno nad Vltavou. During the construction-technical survey it was found that this is an unfinished (unconditioned) new building of the family house. It is a freestanding detached family house, the object is partially recessed into the terrain. The building is built of brick technology with a wooden roof structure. It has been found that the windows are visibly damaged by the connection gap, especially from the interior side in the lower corners of the windows. At this point, the cleaner APU strip was detached from the plaster and the plaster was severely damaged. Further, meansurements were made to reveal the frames of the windows and their glass fillings towards the interior. In addition to all fixed windows, the rest of the windows fitted also showed a slight deflection and lack of anchoring. Fitting the HST portal against the owner´s requirements to a zero transition between the clean floor of the interior. In addition to all fixed windows, the rest of the windows fitted also showed a slight deflection and lack of anchoring. It was also found that the windows do not meet the manufacturer's guaranteed air permeability. Fitting the HST portal against the owner´s requirements to a zero transition between the clean floor of the interior and the minimization of the staircase towards the terrace of the building.

WOOD - POLYMER COMPOSITES AS AN ALTERNATIVE TO THE NATURAL ENVIRONMENT

Elżbieta Stanaszek-Tomal

Chair of Building Materials Engineering, Faculty of Civil Engineering, PK Cracow University of Technology, 24 Warszawska Street, 31-155 Cracow, Poland

ABSTRACT

Along with the growing consumption of wooden and wood-based products, the amount of waste generated during both production and consumption of these products increases. These wastes constitute a rich raw material base, the appropriate use of which can significantly reduce the use of natural wood raw material. Unfortunately, a significant proportion of them, especially of post-use and wood-based origin, end up in landfills. It seems necessary to find ways to use the generated waste. One of them is to use them in the form of strengthening polymer-wood composites. Composites with a wood filler can be a competitive product for materials with an inorganic filler. The wood filler is characterized by lower cost, higher availability and definitely lower density than glass fibers. An additional advantage of composites with wood fiber is their easy recycling and a smaller amount of waste products remaining after combustion. The use of a polymer matrix provides flexibility to the composite and has a positive effect on the ability of the material to stretch under the influence of temperature. The main advantage of the matrix in the form of a polymer is also to provide the product with resistance to the effects of the external environment, especially moisture and water. The main centers for the production of polymeric and wood composites are North America and Europe. Mainly floor, wall and roof platings are created. In addition, they are used as fences, windows and doors as well as additional equipment for platforms, landscape architecture, floor materials and panels.

ECOLOGICAL CITY—TYPES OF WASTEWASTER TREATMENT PLANTS IN POLAND. THE INFLUENCE OF TECHNOLOGY ON SPACE

Agnieszka Wójtowicz-Wróbel

Cracow University of Technology, ul. Warszawska 24, 31-155 Kraków, Poland

ABSTRACT

Newly designed structures that provide technical services to cities gain new spatial forms. In terms of their functional and spatial structure they often also fulfil new, additional functions. This is possible thanks to, among other things, new technical and technological solutions. A departure from the typical approach based on merely associating engineering structures with an envelope of technical solutions of sorts, without care for architectural form, detail or site development, brings positive effects in terms of spatial relationships. In the case of pro-environmental structures this also has a functional dimension—oftentimes these structures start fulfilling additional functions, e.g. as a part of ecological education. Simultaneously, we can observe that some structures that provide the engineering infrastructure to the city gain a new architectural form, new site development of the space that surrounds them or are being equipped with new, additional functions, more frequently than others. Without a doubt, influence on which structures are being transformed in accordance with the abovementioned directions, and which remain on the sidelines of new spatial, architectural and functional solution, is exerted by the primary function of the structure—which is in itself obvious. However, within the group of structures with the same functions we can also observe significant differences. One example of this are wastewater treatment and water purification plants. The goal of this article is to find the answer to the following questions: is the form of a structure and its site development determined by various types of technological solutions in wastewater treatment and water purification plants—and if so, then in what manner? Furthermore, do differences in technology have an impact on the immediate surroundings of the plants and—on a wider scale—on the space of the city? The study covered thirteen wastewater treatment and water purification plants located in nine Polish cities. The results of the study will advance knowledge concerning the dependencies between technological solutions and architectural form, as well as spatial relations within the functional and spatial structure of cities.

EFFICIENT IMPROVEMENT OF THE VISIBILITY OF PEDESTRIANS ON JUNCTIONS IN TEMPO–30 ZONES

Alicja Sołowczuk

West Pomeranian University of Technology in Szczecin, Poland

ABSTRACT

Tempo-30 zones are used with increasing frequency as a traffic calming measure. They are intended primarily to make the drivers slow down and increase the safety of traffic. In the Tempo-30 zones the drivers must pay particular attention to vulnerable road users (VRU) who can travel across the street at any place. The drivers are warned of the traffic calmed area by the specific street and junction geometry and the street furniture, compelling them to reduce speed. One of the most often used design measures used for Tempo-30 junctions is narrowing of junction legs and extending their corners. Reducing the driving speed enhances visual attention of the drivers who can quicker and easier spot pedestrians about to cross the roadway. Curb extensions on the junction corners (bulb-outs) shorten the pedestrian crossing distance and offer a better view to any oncoming vehicles. The corner bulb-outs are usually combined with on-street parking lanes dedicated to local residents. Taking the above facts into account, the author carried out speed measurements on a chosen downtown street located in Tempo-30 zone. In the survey several speed measuring devices were deployed to automatically measure and record the operating speed and volume of traffic at different test locations at the same time. At least 100 measurements were taken per location and per direction of traffic. During the survey the weather was dry and such was the pavement surface. The results were subjected to statistical analyses. The statistical inference part of research included, inter alia, nonparametric test of independence and median test performed to confirm the null hypothesis H_0 – "that the measuring result did not depend on the location". The alternative hypothesis H_1 –was confirmed in almost all cases, "this meaning that the vehicle speed depends on the measurement point location". The measurement points locations were chosen considering the direction of traffic, bulb-out location and the approach and departure sections. The measurement data and statistical test results confirmed that in Tempo-30 zones corner bulb-outs have an actual effect on speed reduction on the approach to the junction enhancing the driver's ability to spot any pedestrian about to cross the street. With the bulb-outs in place, the vehicles parked before the junction do not impair the visual attention of pedestrians' enhancing their ability to spot any oncoming vehicles.

THE EFFECT OF PEDESTRIAN REFUGE ISLANDS ON CALMING OF TRAFFIC IN THEIR VICINITY

Alicja Sołowczuk, Dominik Kacprzak

West Pomeranian University of Technology in Szczecin, Poland

ABSTRACT

Pedestrian refuge islands are one of traffic calming measures used in small towns and villages located on through routes. Their main function is to protect vulnerable road users from safety hazards and reduce the 85th percentile speed v_{85} upstream of the island. In order to determine the efficiency of the pedestrian refuge islands in obtaining reduction of v_{85} speed to the desired level upstream of the islands the authors measured the speeds both upstream and downstream of the islands of different width in specific locations along the stretch i.e. in the transition, village centre and in the departure zones. The pedestrian refuge islands were typically 2 m wide imposing a 1 m deflection of the vehicle path. Other deflections, namely by 2.5 m and 3 m were imposed by two of the analysed islands. In one case the vehicle path was not deflected, namely at the half-island located on the departure lane. The research covered in total ten different cases of crossings in villages on regional roads. Most of the analysed pedestrian islands were accompanied with hatched areas downstream and upstream of the island with a conventional 1:5 taper rate. All the islands are located in a residential areas, yet with different types of adjacent developments. In all the analysed cases the maximum permitted speed during daytime was 50 km/h. Speed measurements were carried out with special instruments equipped with automatic traffic speed and volume recording function. The analyses considered free-flow average and v_{85} speeds. In a few cases buildings were located close to the roadway edge right downstream of the refuge island. In the other cases the road was surrounded by arable land or forest. In two cases the island was followed by a horizontal curve reducing the sight line. The desired speed reduction or reduction down to statutory speed for residential areas upstream of the island was not obtained in all the analysed cases. In a few cases average speed under free-flow conditions of ca. 50 km/h and v_{85} speed of 55 km/h were obtained for the islands located in the village centres with houses located close to the road edge. Without residential buildings located close to the road edge upstream of the island and with restricted view on the further course of the route reduction of both speeds was obtained downstream of the island. Smaller speeds were noted also on the road sections with greater imposed vehicle path deflections. The greatest speed reduction along the island was noted on the sections with reduced sight line or with residential building located close to the road edge. The degree of deflection was found to have a smaller effect.

Corresponding Author: Alicja Sołowczuk

THE EFFECT OF TRAFFIC CALMING MEASURES IMPLEMENTED ON THE APPROACH TO THE TEMPO–30 ZONE ON THE DEGREE OF SPEED REDUCTION

Alicja Sołowczuk

West Pomeranian University of Technology in Szczecin, Poland

ABSTRACT

Tempo–30 zones are implemented primarily to calm the traffic by reducing the operating speed to the desired level of 30 km/h. To this end, various traffic calming measures are installed. With the purpose to determine the traffic calming measures that are the most effective in terms of speed reduction speed measurements were conducted on a few chosen Tempo–30 zone approach sections containing various traffic calming measures: traffic circles, speed tables, raised junction, bumps/ humps and alternating curb extensions on speed table sections. Another factor differentiating the sections chosen for the research was the Tempo–30 zone entry feature, such as a small roundabout or a simple or signalled junction. The measurements were carried out under free-flow traffic conditions during peak hours. During all the measurements the weather was dry and such was the pavement surface. The 85th percentile speed v_{85} and the average speed were calculated. For simultaneous measurement on the respective measurement points P1, P2, …, P*n* SR4 electronic speed and traffic volume measuring systems equipped with automatic recording function were used. The measurement data were analysed and the results show that the obtained operating speeds were below 30 km/h (that is below the maximum permitted speed in the Tempo–30 zone) only on a few sections. The most sustained speed reduction effect was obtained on two research sections containing several vertical traffic calming measures, including raised junctions, speed cushions or speed bumps/ humps. Effectiveness in speed reduction was ascertained for combined use of different traffic calming measures imposing vertical and horizontal deflections of the vehicle paths. However, the most effective arrangement was a series of vertical traffic calming measures provided on the Tempo–30 approach section. Conversely, a small roundabout, traffic circle or signalised junction at the entry to the Tempo–30 zone had only a minor speed-reducing effect. The same applies to repeated small horizontal deflections on the approaches to raised junctions.

THE PROPOSAL OF DETERMINING THE FOCAL LENGTH OF A NON-METRIC DIGITAL CAMERA FOR UAV

Volodymyr Hlotov [1], Khrystyna Marusazh [2], Zbigniew Siejka [1]

[1] Department of Geodesy, University of Agriculture in Krakow, Poland
[2] Department of Photogrammetry and Geoinformatics, Institute of Geodesy, Lviv Polytechnic National University, Ukraine

ABSTRACT

Unmanned Aerial Vehicle - UAV, commonly referred to as drones are vehicles unique in the field of mechanics that can fly in the air without a human operator on board. In recent years, they have become a new interdisciplinary area of science and research. Because they combine photogrammetry, aviation engineering, navigation and automation. Modern UAVs are synchronized with GNSS signals and are remotely piloted or carry out autonomous flights. They can simultaneously perform very complex operations for the implementation of many different civil and military tasks. Currently, drones play an increasingly important role in the modern battlefield and are therefore included in the equipment of all modern world armies. They also find a great potential in civil applications. They are used in many fields of economy, technology and science. Acquiring geoinformation from unmanned aerial vehicles is currently used in the work of many services related to the functioning of the state. In the geomatics, the UAV platforms equipped with specialized sensors, are used to acquire images and photogrammetric and remote sensing data. Photogrammetric projections made by UAV are currently used to generate orthophotomaps, among others for the needs of cadastre. As we know, cadastral measurements, due to their importance, require high accuracy and reliability. They can only be guaranteed by correctly and precisely determined calibration parameters of non-metric cameras. The paper presents a method of determination of the focal length, of a digital non-metric photogrammetric camera. The experimental tests carried out confirmed the usefulness of the proposed calibration method carried out in laboratory conditions.

Corresponding Author: Zbigniew Siejka

PERFORMNACE OF ELECTROCHROMIC GLAZING: STATE OF THE ART REVIEW

Kheira Anissa Tabet Aoul, Lama Al Ghatrif, Daniel Efurosibina Attoye

Department of Architectural Engineering, United Arab Emirates University, UAE

ABSTRACT

Globally, buildings are responsible for about 45% of energy consumption, 40% of atmospheric emission, 30% of water usage, and 30% of waste generation. This significant negative impact of buildings on the environment and our social life has warranted research, and improved building component design and development. Architects are primarily responsible for a major stake in the design of the built environment; professionally mandated to achieve environmentally friendly, functional, structurally stable and aesthetically pleasing designs. Adopting innovative solutions, which do not compromise these conventional, building requirements, is therefore crucial to promoting sustainability in the built environment. In this regard, this paper addresses electrochromic (EC) glazing as a dynamic environmentally responsive building element through a review of its types, properties, energy savings, cost analysis and architectural design considerations. The findings indicate that EC glazing can reduce electricity demand by 7-8% for moderate size of windows and 14-16% for large windows. Based on building type, 6 to 11% and 8 to 15% savings are possible for commercial building and residential buildings respectively. However, comparative Life Cycle Cost (LCC) analysis shows that the net saving and LCC span for EC glazing is negative. This study recommends that reductions up to 50% are necessary for this technology to raise the economic value of EC windows and compete in conventional product markets. Based on their performance and market success, alternative strategies such hybrid EC windows with PV cells are presented. Further research areas are then deduced based on this review, which may provide both design, energy and cost saving benefits. Conclusively, these three aspects, as well as social acceptability of suggested strategies among designers are capable of providing a clear solution towards reducing the negative impact of buildings on the environment.

Corresponding Author: Kheira Anissa Tabet Aoul

MODERN INSTALLATIONS IN THE FIRST NEARLY-ZERO EMISSION BUILDING IN POLAND

Ewa Figiel, Dorota Leciej - Pirczewska

West Pomeranian University of Technology, Szczecin, al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

In Szczecin is constructed mixed use complex Posejdon. It will be the first NZEB (Nearly-Zero Emission Building) in Poland that meets the strict ecological standards that all buildings will have to meet after January 2021. Compared to a similar buildings constructed with traditional techniques, the building has 76 % lower CO_2 emissions. The project was presented at the COP24 United Nations Climate Change Conference in Katowice. Posejdon service complex consists of two hotels, modern offices and a small commercial section. There are very interesting and modern installations in the complex which are presented in the paper. The building uses passive geothermal energy system for the needs of heating and cooling, which is composed of 48 vertical heat exchangers located in 300-metre long ground boreholes under the foundation slab, connected with over 900 highly efficient, inverter heat pumps. The decentralized system of heat pumps in such a big building is unique yet in Europe. Electrical energy necessary for operation of the entire system will be obtained by 342 photovoltaic panels located on the roof of the building. There is also a prospect of undertaking researches on the working installations.

Corresponding Author: Dorota Leciej - Pirczewska

COST AND ENERGY- EFFICIENT ENVELOPE SYSTEMS FOR A SINGLE FAMILY HOUSE IN TIMISOARA, ROMANIA

Ionut Ciprian Maties, Daniel M. Muntean

Polytechnic University Timisoara, Piata Victoriei 2, 300006 Timisoara, Romania

ABSTRACT

Over the last decade, Romania has faced a rapid expansion in the residential sector. The need for housing has increased significantly next to the ever-developing urban areas. One of the main targets for our country is to reduce the total energy consumption stipulated by the Energy Performance of Building Directive (EPBD). The main purpose of the study is to determine a comparative solution of the building envelope for a single-family house with a given net area and interior volume suited for a family with two adults and two children. The study is applied on a masonry two story house with continuous concrete foundations and a flat roof. This kind of scenario fits the local seismic building codes and currently, is the most accessible solution on the market. According to the national energy efficiency building requirements two different envelope systems are considered: monolithic wall (autoclaved aerated blocks) and multilayered wall (large ceramic blocks with additional insulation), both having the same U value required by the above-mentioned code. Because the monolithic wall solution should have a shorter execution period than a multilayered component, we intent to compare cost-efficiency scenarios of the two systems given local building standards. In both cases, the masonry acts as the main structural component of the system with similar concrete components. Due to the fact that, in Romania, the most used thermal envelope system is based on polystyrene (EPS), a material with high embodied energy, the paper studies alternative solutions for residential buildings, with lower impact on the surrounding environment.

Corresponding Author: Ionut Ciprian Maties

LANDSCAPE PROJECT FOR THE ENVIRONMENTAL RECOVERY OF A QUARRY

Teodoro Semeraro [1], Stefano Arzeni[2], Alessio Turco[2], Stefano Margiotta[3], Giuseppe La Gioia[4], Roberta Aretano[5], Pietro Medagli[2]

[1] University of Salento, Department of Biological and Environmental Sciences and Technologies, Italy
[2] Ofride srl, Department of Biological and Environmental Sciences and Technologies, Italy
[3] Environmental consultant, piazza Mazzini 72, Lecce, Italy.
[4] Or.me: Ornithology in Puglia. via saponaro n 7 Lecce, Italy
[5] Environmental consultant, via S. Leucio 15, 72100 Brindisi Italy

ABSTRACT

The growth of urban populations causes cities, and their suburbs, to spread, expand, and replace agricultural and natural lands. Urbanization brings land-use change, altering the relationship between human societies and environmental resources. Therefore, the management of natural resources connected to the urban expansion has become one of the most important challenges in attaining sustainable landscape. Quarrying is a crucial component of local socio-economic development providing key materials for infrastructures and buildings. However, like many other human activities, quarrying causes a significant impact on the environment. In Mediterranean countries, quarrying activities exert increasing pressure on limited soil and water resources, thus accelerating erosion processes and subsequent destruction of existing arable lands. Quarrying operations can profoundly alter pre-existing ecosystems and perturb hydro-geological and hydrological regimes (Khawlie et al., 1999; Shaban et al., 2007). They can profoundly modify the substratum (Stehouwer et al., 2006), change landscape patterns and integrity (Jomaa et al., 2008), destroy natural habitats and interrupt their natural succession (Khater et al., 2003; Khater, 2004), as well as alter genetic resources (El-Fadel et al., 2000; ESCWA, 2001). The resulting situation is seriously compromised by anthropic regeneration processes on degraded sites after the end of quarrying activities, which are not focused on the potential natural vegetation that these sites could develop considering surrounding ecosystems. In this work, we propose a landscape regeneration project developed as part of an Environmental Impact Assessment procedure on quarrying activity located in municipality of Lecce, South Italy. This project aims to integrate environmental and landscape aspects with the economic and social ones in order to guarantee the sustainability of the proposed intervention. The new project modifies the one presented at the start of the quarrying activity that planned the planting of trees directly on the bottom of the quarry, (about 40 meters deep from the ground level and three meters above the groundwater level). The new project foresees the partial filling of the quarry using waste material compatibly with the environmental legislation. This allows to better protect the groundwater and to create a microclimate more suited to the development of natural vegetation. The quarry filling activity represents an economic activity for the company and therefore can guarantee the development of jobs for at least 5 years. In addition, the proposed project aims to reconstitute the pre-existing vegetation to the development of the quarry, consistently with the surrounding ecosystem. This will allow the development of the priority habitat *6220: Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea (Directive 92/43/CEE), producing a landscape of recognized ecological value not detached from the surrounding landscape. In this way, the closed quarry can act as stepping stones and play a significant role in regulating green infrastructure in landscapes.

Corresponding Author: Teodoro Semeraro

OUTER WALL WITH THERMAL BARRIER - BARRIER PARAMETERS DETERMINING HEAT LOSSES AND ENERGY PERFORMANCE

Ewa Figiel, Dorota Leciej – Pirczewska

West Pomeranian University of Technology, Szczecin al. Piastów 50, 70-311 Szczecin, Poland

ABSTRACT

New demands for lowering energy consumption of buildings lead to many new solutions resulting in, amongst others, the introduction of outer wall thermal barrier for both heating and cooling effect. The analysed thermo-active-wall-barrier is a water based system, where the pipes are embedded in the wall construction. It enables the use of a low-temperature barrier medium for space heating, thereby increasing the efficiency of all potential energy supply systems using renewable energy sources. The pipes form an active thermal barrier for heat transfer between the outer and the heated space. There are many possibilities to place the pipes in the wall for example in the case of energetic thermo-modernisation. Our research and calculations have shown, that thermo-active-wall-barrier is sensitive to the location of pipes and the barrier temperature. The following paper also provides a study of the impact of thermal barrier on a building's energy performance. The analysis was conducted for a single-family house in a temperate climate based on parameters taken from one of the Polish meteorological databases. Also a proposal for a simple calculation of heat-transfer coefficient U of the wall with thermal barrier is given. Calculations using current procedure of evaluating building energy performance show, that the thermal barrier can contribute to significant reduction of transmission energy loss.

Corresponding Author: Ewa Figiel

CITIUS ALTIUS FORTIUS (PRECIOSUS?)

Bartosz Dendura

Cracow University of Technology, Faculty of Architecture, ul. Warszawska 24 31-155 KCracow, Poland

ABSTRACT

The Olympic Games are the biggest global event, attracting billions of people to their TV sets, hundreds of thousands of spectators to sports stadiums, tens of thousands of athletes, coaches, masseurs and staff members, hundreds of presidents, prime ministers as well as kings, queens and princes with their courts. Preparations take up 8 to 9 years and consume billions of dollars, euro, pounds, real or yen. And all of this with a forty-day-long event in mind, held once every four ears. However, along with the closing of each edition of the Games, there comes the true test for the governors of cities that host them. It is then that it turns out whether they actually had a plan for the use of all the infrastructure, and if they did, then how well said plan worked. The role of architecture in the context of the Olympic movement and its positive or negative impact on the image of host cities has undergone significant change over the past 120 years. It is difficult to believe, but up to the 1990's the problem of the use of stadiums after the Games was of only marginal significance in terms of their overall final assessment. After much criticism that pointed to the overestimation of development projects and the lack of long-term plans for their use, in 2003, after 107 years since the start of the modern Games, the International Olympic Committee introduced provisions to the Olympic Charter that addressed the post-Games life of Olympic venues. Great events such as the Olympic Games and their accompanying development projects have become a method of revitalising post-industrial areas. The significant initial costs of such efforts has only rarely been analysed over a greater time period. The legacy of contemporary summer Olympic Games presented in the paper makes it possible to distinguish three major strategies that differ in terms of the scale of their interference with the city's tissue and infrastructure (the use of existing infrastructure; the construction of some sports venues with minimal impact on the structure and infrastructure of the city; large-scale projects) as well as a taxonomy of buildings that takes into consideration their actual costs, which include their long-term operation, as well as their social and environmental cost. This makes it possible to define categories and strategies for conducting beneficial and profitable development projects that are dreamt of by the authorities and stakeholders of cities that are candidates for the hosting if this international event.

HOW RELEVANT IS ENERGY EFFICIENCY IN THE MARKETING OF HOMES? EVIDENCE FROM REAL ESTATE AGENTS IN SPAIN

Carlos Marmolejo-Duarte [1], Silvia Spairani [2], Consuelo del Moral [3], Luis Delgado, Aitziber Egusquiza[3], Ai, Chen[1]

[1] Centre for Land Policy and Valuations, ETSAB, Universitat Politènica de Catalunya, Spain
[2] Universidad de Alicante, Spain
[3] Universidad de Granada, Spain

ABSTRACT

In order to foster informed transactions, the Energy Performance of Buildings Directive has made it mandatory to get an Energy Performance Certificate in the marketing of the Communitarian Real Estate. Due to energy savings and environmental preservation, it is expected that efficient buildings do receive an increased willingness to pay. The evidence coming from a number of statistical studies has confirmed the existence of such premium. Nevertheless, such finding is contradictory in relation to the conclusions of opinion-based studies. This paper seeks to study whether energy efficiency drives market price and the marketing of homes in Spain. In doing so, a survey applied to realtors across the country has been implemented. The results are in line with other opinion-based studies pointing out that energy performance has a negligible impact on the marketing of homes. Furthermore, real estate agents suggest that companion policies in the sphere of subsidies and fiscal exceptions are needed in order to bring energy efficiency to the first line of elicitation attributes in the residential market.

Corresponding Author: Carlos Marmolejo-Duarte

SUSTAINABILITY IN ARCHITECTURAL DETAILING

Ana Maria Dabija

Ion Mincu University of Architecture and Urbanism, Bucharest, Romania

ABSTRACT

When discussing about sustainability in building we usually refer to the Brundtland Report, to the energy consumption that has increased dramatically… We take into consideration the environmental – natural and anthropic - agents, resources – human as well as materials – life service of the building etc. Nobody, however, discusses about architectural detailing, although the details are the ones that, beyond paper drawings, keep the building together and ensure the expected service life and life cycle of the building. “God is in the details”- as Mies van der Rohe stated more than 50 years ago – applies to a less spectacular side of our profession but, nevertheless, the one that contributes significantly to the spectacularity of the architectural object (if applied in buildings, of course). This paper refers to architectural details and their perenniality in history.

HOW DIFFERENT ARE THE DWELLINGS WHICH ENERGY EFFICIENCY GAINS RELEVANCE IN PRICE FORMATION?

Ai Chen, Carlos Marmolejo Duarte

Centre for Land Policy and Valuation, ETSAB, Universitat Politècnica de Catalunya, Spain

ABSTRACT

Housing energy-efficiency has become a relevant issue since it is mandatory to exhibit an Energy Performance Certificate (EPC) when transacting real estate in the European Union. A number of studies have focused on energy-efficiency marginal prices using hedonic models from cross-sectional and longitudinal perspectives. Some of them have found that the increase of relevance of EPC ranks (i.e. marginal prices) is not the same for all the A-G classes. This study aims to explore the differences in terms of architectonic and location attributes between the apartments depicting an increase of EPC ranking marginal prices regarding those where energy efficiency seems not to play a role in price formation. In doing so, firstly a pooled spatial error hedonic model is done departing from listing selling information for multifamily housing in Barcelona for the years 2014 and 2016. Next, it is identified which EPC ranks do exhibit an increase in terms of marginal prices in the period studied. Finally, we compare the architectonic and locative attributes for the set of homes where the energy efficiency has increased in terms of price importance to the set of homes where it has not increased. The results suggest that dwellings with high and medium EPC ranks (e.g. A for 2014; and B, C and D for 2016) are more expensive, larger and boasting better architectonic qualities than the remainder of homes where EPC ranks failed to have a role in price formation. On the contrary, the location attributes are different: while A-ranked in 2014 dwellings are located on peripheries where new housing completions are placed; B, C and D-ranked in 2016 homes are located in more centric locations. These findings have implications for future analysis regarding the energy-premium and energy poverty, since specific characteristics in different submarkets may have a different impact on housing prices.

Corresponding Author: Ai Chen

EVALUATING THE AESTHETICS AND ECOLOGY OF URBAN GREEN SPACES: A CASE STUDY OF LATVIA

Maija Veinberga, Daiga Zigmunde

Latvia University of Life Sciences and Technologies, Department of Landscape Architecture and Planning, Jelgava, Latvia

ABSTRACT

The current situation of planning and managing urban green spaces in Latvia suggests that there is a necessity for new concepts for improving the aesthetic and ecological quality of public green spaces developed in the Soviet era. Urban green spaces with high qualities in both characteristics are assumed to be more attractive for local residents and to provide better conditions for ecological processes. Thus there is much discussion on how to balance aesthetics and ecology in the urban environment – and whether both can be optimised or whether there are trade-offs. The aim of this research was to consult experts from different scientific fields and to clarify and rank criteria used for assessing the aesthetics and ecology of urban green spaces. Twelve criteria were selected for the landscape assessment from different theories of aesthetics and ecology: *compositional unity*, *uniqueness*, *coherence with architecture*, *condition of constructed elements*, *decorative quality of plants*, and *maintenance and upkeep*. For the assessment of ecology *naturalness*, *landscape typicality*, *wilderness*, *the presence of wildlife*, *vegetation structure* and the *use of local plants*. These were assessed and analysed through a combination of a Delphi study and in-depth interviews of twelve Latvian and foreign experts from different fields (architecture, landscape architecture, biology, environmental science). The data obtained from the research were processed with mathematical statistics methods such as determination of descriptive statistics and Mann-Whitney U test. The results include a summary of expert statements of definitions, assessment methods and characteristics of selected criteria. The correlation of criteria showed differences in the experts` opinions. *Naturalness* was one of the most important criterions according to both, Latvian and foreign experts. Foreign experts more likely ranked *Presence of wildlife* as important compared to the Latvian experts. The results also showed differences on how experts could express criteria related to their research field. The final assessment of criteria confirmed the interconnections between the selected 12 criteria. Results of the criteria ranking discovered that all the experts got consensus on the most important criteria, while on not so important criteria experts shared different views. This research prepared criteria for the assessment of aesthetical and ecological values of green spaces according to definitions and rankings given by different experts.

Corresponding Author: Maija Veinberga

THE DILEMMAS OF CHOOSING A SUITABLE TECHNOLOGY FOR LOW ENERGY AND PASSIVE HOUSES IN THE CONTEXT OF THEIR OVERHEATING ISSUES

Alicja Karaś [1], Robert Idem [2]

[1] Gdansk University of Technology, 5B Sienna Street, Gdańsk 80-705, Poland
[2] 14/25 Cieszyńskiego Street, Sopot 81-881, Poland

ABSTRACT

In compliance with European Union directives, numerous countries are introducing increasingly stricter legal limits on the estimated energy consumption of newly designed residential buildings. However, the fact that regulations and designers' efforts are focused on decreasing energy consumption (and consequently carbon dioxide emissions) only at the post-occupancy stage may lead to a significant increase in the carbon footprint of the buildings during their entire life cycle. A frequent criticism levelled at low-energy and passive buildings is that they are susceptible to the phenomenon of overheating. The reduction of overheating through the choice of "heavy" technologies, materials with high thermal capacity as well as a high heat dispersion coefficient, stands in opposition to the requirement to choose the technologies that ensure a low ecological footprint (i.e. timber frame technologies). The development of a tool facilitating decision making in this issue seems to be a challenge. Life Cycle Assessment (LCA) is a well-known optimal method for forecasting buildings' carbon footprint, however, it is an expensive and time-consuming method. Life Cycle Assessment (LCA) is a method dedicated to large investments. In practice, such analysis is not carried out for a residential building. The purpose of this paper is to analyse the foregoing problem on the example of detached single-family houses and to propose a method and tool that can assist architectural design in this regard.

Corresponding Author: Alicja Karaś

ANALYSIS OF PHOTOVOLTAIC PANELS ON THE ROOFS OF LOW-RISE AND MULTI-STOREY SHOPPING CENTERS IN İZMIR BY USING COST AND BENEFIT ANALYSIS METHOD

R. A. Nurdan Kasul, Kutluğ Savaşır

Dokuz Eylül University, Faculty of Architecture, Kaynaklar Campus, 35390, İzmir, Turkey

ABSTRACT

The fossil fuels we use today are sources that pollute the environment and are continuously consumed without the possibility of renewal. The problem of depletion of fossil fuels, causing global warming and polluting the environment have led people to research and use renewable resources. The main source of renewable energy is the solar energy that also forms the main source of fossil energy and warms our world. Since the sun will continue to radiate for millions of years, it is an eternal source of energy for our world. The energy from the sun to the world by the sun's rays is 170 billion MW/sec. This value is 15,000-16,000 times the total energy that humanity is using today. Turkey has the potential of solar energy is quite high due to its geographical location. The average annual receiving sunlight potential in Turkey is 2,640 hours and Turkey's potential to obtain electricity from solar energy is high. There are different methods and techniques used to generate electricity from solar energy. Photovoltaic systems are one of the useful systems for obtaining electricity from solar energy because they are easy to install, long-lasting, can be installed almost anywhere and operating costs are low except for installation costs. The aim of this study is to compare the two shopping malls that are horizontally and vertically built, according to the energy needs of structure and the amount of generated energy from photovoltaic panels by using cost-benefit analysis method. In recent years, shopping centers have been fairly common type of structure produced in Turkey. These structures are constantly in use and consumes a lot of electricity. A large part of the electrical energy that we use today and is distributed from a single center is lost on the wires until it reaches the user. From this point of view, it is important to design structures that provide their own energy. Despite the high consumption of electricity, shopping centers are suitable for the integration of enough number of photovoltaic panels to produce their own energy thanks to the large roof areas. In the scope of the study, two shopping center examples including low-rise (Forum Bornova) and multi-storey (Ege Park) in İzmir province were determined and benefit from Turkey's high potential of solar energy, effectiveness of photovoltaic panels that are integrated to roofs of these two shopping malls is discussed. In this study, information about photovoltaic panels and shopping centers is given by making a literature review and it is discussed photovoltaic panels to be applied to the roofs of shopping centers by using cost-benefit analysis method whether to meet the energy needs of the structure. As a result, according to the findings obtained, it is determined that the energy production capacity of shopping centers, which are built on a horizontal basis, is high due to the large roof areas.

Corresponding Author: R. A. Nurdan Kasul

STUDY ON BASIC DESIGN FOR A GREEN ROOF BUILDING AIR-CONDITIONING SYSTEM CONTAINING A HEAT STORAGE PLANTER

Toshio Otaka

Kokushikan University, 4-28-1, Setagaya, Setagaya-ku, Tokyo, 154-8515, Japan

ABSTRACT

In recent years, urban areas in Japan have been experiencing a phenomenon called the heat island effect, which causes the temperature in cities to increase to a few degrees warmer than the surrounding suburban areas. It has attracted attention as one of many environmental issues. The heat island effect is a phenomenon in which atmospheric temperature is elevated due to increases in artificial heat releases and artificial land surfaces. In urban areas, the heat release rate is high because of the higher energy consumption rate. Additionally, since the coverage of artificial land surfaces such as roads or concrete buildings is extensive in urban areas, these materials act as a thermal storage medium through energy consumption, causing temperature increases in these areas. As a preventive measure, attention is being given to green roof projects that allow for a reduction in asphalt or concrete surface coverage in urban cities and are expected to promote the transpiration effect of plants. Consequently, various types of green roof units have actually been made available for practical use. In addition to the remedial measure against the heat island effect, green roofs are also expected to provide other positive impacts including prolonging a building's life span and saving energy consumption as a result of reductions in air conditioning usage, since it increases building insulation. One of the global environmental problems of importance is global warming. To suppress global warming requires a decrease in load in the power plants. Thus, increasing the energy efficiency of electrical equipment is an important policy. From these facts, the author and other staff have been conducting fundamental researches by focusing on a combined system of a green roof and air-conditioning for buildings. Current building air-conditioning systems are operated under excessive heat loads, and when a green roof unit is used as a thermal storage tank, the excessive heat can be utilized by establishing an energy saving type air-conditioning system which produces efficient energy use. However, a combined system of a green roof and air-conditioning is currently not on the market. By utilizing the green roof units as thermal storage tanks and combining it into the building air-conditioning system which has an auxiliary heat source apparatus, a new air-conditioning system with low energy consumption can be designed, and there is the possibility that this technology could provide a solution to both the heat island effect and global warming. This paper relates to a thermal characteristic of a planter which is contained within the green roof building air-conditioning. Experimental Apparatus Experiment was performed in which heat energy stored in the thermal storage unit is recovered on a reduction model apparatus of the green roof building air-conditioning system, revealing thermal storage properties of this unit. We perform a function usability test of this reduction model apparatus, and report the result because utility was confirmed in this apparatus. These results demonstrate that the green roof building air-conditioning system is one of the promising candidates as a new building air-conditioning system.

LIFE CYCLE ASSESSMENT AS A TOOL FOR LOW WASTE BUILDING SYSTEMS, CASE STUDY: BUILDING EXTERNAL WALL

Renata Androsevic [1,2], Maurizio Brocato [2], Nerman Rustempasic [1], Dzenana Bijedic [1]

[1] University of Sarajevo, Faculty of Architecture Sarajevo, Patriotske lige 30, 71000, Sarajevo, Bosnia and Herzegovina

[2] Paris-Est University, GSA Laboratory – Geometry-Structure-Architecture, National Graduate School of Architecture Paris-Malaquais, 14 Rue Bonaparte,75006 Paris, France

ABSTRACT

Life cycle assessment (LCA) is defined as decision making method for buildings from “cradle to grave”. Considering the fact that the construction industry produces 38% of total waste and 40% of total CO2 emissions and uses 50% of all natural resources, according to EIB 2015, the building industry has to change this way of thinking to the concept “cradle to cradle”. According to European Commission (Directive 2008/98/EC 2008), the first and preferred option is waste prevention and the second option are other types of recovery. The waste should be prevented in the design phase and LCA should help a lot in this stage. The main goal of this paper is to show how the LCA can be used as a tool in design phase to help decision process in building design of one of the building systems and make that part circular and, if possible, without waste. External wall, as one of the systems of a building, is taken as case study in its different materialization to show LCA use in the construction waste elimination in building practice. If we lower the waste production of external walls of buildings, the total waste during the total life cycle of buildings will be reduced. The external wall is the system of a building which is the most exposed to external factors, as extreme weather conditions and human vandalism. Very often, the wall is damaged before other systems of a building. If we find the model to design and build external wall that will produce less waste, it will be a huge step in construction waste management. The LCA software is used to compare two chosen case studies. The first one is prefabricated wooden wall for low energy houses. The second one is the wooden wall made for Green Design Center in Mostar. The first results show that in the second case study, the wall made for reversible and transformable building, and designed according to circular building principles, has better chances to last longer, and produce less waste during its transformations and aging. The paper shows main principles for designing the low waste wooden walls and also some remarks how to upgrade the software to be more helpful in the design phase of the wall systems.

Corresponding Author: Renata Androsevic

SUSTAINABILITY IN INTERIOR DESIGN: INTERDISCIPLINARY RESEARCH USED FOR EXPLORING RELATION BETWEEN BUILT ENVIRONMENT AND HUMAN

Veronika Kotradyová, Markéta Kučerová,Eva Mazancová

Faculty of Architecture, Slovak University of Technology in Bratislava, Námestie Slobody 19, 812 45 Bratislava, Slovakia

ABSTRACT

Paper presents achievements and results in the projects based on Platform of BCDlab (Body Conscious Design laboratory) and Institute of Interior and exhibition design of Faculty of Architecture, related to sustainability. The studies are related to the collection of 11 features of supportive environment for contemporary human – "cultural animal". These postulated have been generated during last years of research or relation between human and its natural and built environment in BCDlab. Each postulate is illustrated with some of its design outputs. Presence or lack of supportive environment has impact to contemporary behaviour, well-being, social and interpersonal interactions and in a long-term interaction also to personal and environmental integrity, belonging to community and local culture and especially to public health. There is also evidence of interrelation to sustainability approach. Paper presence studies that are emphasising importance of material choice by spatial design, role of local growth materials in its authentic and truthful form and surface. To bring local identity into material culture – into the design of buildings, interiors and products – is too a part of socio-cultural well-being and sustainability. In the contemporary era of globalisation and unification in material culture, it is very important to maintain and apply elements and concepts that are special and unique for single regions. Cultural identity and tradition are inseparable parts of every society and can influence the character of local built-environment and its elements. This "DNA" of society indirectly affects the typology/morphology and semiotics of crafted products and architecture, and it creates the basics of the design language of a country or region. Local identity can be understood as the essence of a cultural heritage and genius loci and plays a very important part in self-identification. This is unfortunately very often misinterpreted in the design of contemporary building or products. Although there exist many research studies from ethnography, cultural anthropology, history and archaeology, they are very rarely available and understandable for architects, designers, investors, producers and services providers directly in the regions. Preserving local identity is a big challenge also for local industry and eco-tourism. To help to improve the situation since 2017 there has been at the Faculty of architecture, STU in Bratislava a contemporary project - IDENTITY.SK – a common platform of design, architecture and the social sciences. The paper presents first results of the project in form of priorities, guidelines and regional concepts for products and services, coming from interdisciplinary literature and field research and storytelling.

Corresponding Author: Veronika Kotradyová

THERMAL PERFORMANCE GAP INVESTIGATION USING INFRARED THERMAL IMAGERY IN UAE RESIDETIAL BUILDINGS

Rahma Hagi , Kheira A. Tabet Aoul, Rahma Abdelghani, Boshra Akhozheya, Yasmin Abdou, Noor Suleiman

United Arab Emirates University, Architectural Engineering Department, P.O.Box 15551, Al Ain, UAE

ABSTRACT

The construction sector accounts for the largest percentage of the total final energy use and carbon emissions Worldwide. The energy share consumed in buildings stands at a massive 70% in the United Arab Emirates (UAE). The building envelope acts as an interface between the livable air-cooled indoor environment and the local extreme hot climate. The local government initiated several actions to curb the energy usage and CO2 emission, notably through the energy building code and the minimum insulation values of the building envelope. However, research indicates that construction quality is among several causes which lead buildings to perform differently to what was defined in the design stage, commonly referred to as 'energy performance gap'. Hence this paper aims to test thermal deficiencies during building construction through thermography assessment. The purpose of these tests is to enable early identification of performance issues in new residential buildings that compromise energy performance. The results showed thermal discrepancies within the blockwork that hinder thermal integrity of the exterior walls. Understanding the generation process and effects of thermal defects on the energy efficiency of buildings can feed into recommendations to strengthen the construction quality and insulation strategies and thus contribute to the achievement of the intended energy performance targets.

Corresponding Author: Rahma Hagi

TOWARDS IMPROVED BUILDING INSPECTION AND DIAGNOSIS IN SPAIN

Cristina Jiménez-Pulido, Ana Jiménez-Rivero, Justo García-Navarro

Universidad Politécnica de Madrid, Research Group Sustainability in Construction and Industry giSCI-UPM. ETSIAAB, Av. Puerta de Hierro, 2-4, 28040 Madrid, Spain

ABSTRACT

Analysis and actions on the existing building stock contribute to reach the EU climate and energy targets. At least 40% of these existing buildings were constructed before the 1960s, which determines the environmental impacts from the construction sector. Actions should thus target the renovation and maintenance market, which in turn should be in line with the EU strategies, including the Europe 2020 Strategy for smart, sustainable and inclusive growth. To start with, enhancing the knowledge of the buildings to undergone renovation is here proposed as a mean to facilitate the decision-making process. By considering that the use of advanced tools can help in capturing and storing this needed knowledge, the ROBIM project, a four-year project (2016-2020) supported by the Spanish Centre for the Development of Industrial Technology (CDTI), focuses on the development of a new inspection technology. The new technology will be capable of collecting detailed and faithful information of the construction systems in buildings and their pathologies. This paper presents current points of consensus in the Spanish building renovation market, based on a two-round Delphi consultation designed to explore the views of construction agents on building inspection and diagnosis, being part of the first milestone of the ROBIM project. The survey sought the identification of current priorities and needs, to better address the design of the new technology. Within this Delphi, 52 agents participated during the period September-December 2017 (80% response rate), rating on a 5-point Likert-type scale statements related to sectorial, security, environmental, economic, social and legal aspects. Statements are classified into five different domains, covering themes from design to maintenance of the building life cycle. The results show that 12 statements reached a broad consensus among participants (≥90% of agents rated them ≥4), within 26 statements that attained moderate or broad consensus (≥75% of agents rated them ≥4). The stage “Design and construction” stand out among the points of major interest, followed by the areas “Inspection and Diagnosis”, “Information management”, “Techniques and Technologies” and “Environment Conditions”. The analysis of the consensus statements enables the identification of markets of interest for the Spanish renovation sector, to direct the developments of the ROBIM project, and points to issues to be tackled.

Corresponding Author: Cristina Jiménez-Pulido

INDOOR ENVIRONMENTAL QUALITY IN HEALTHCARE FACILITIES: A LITERATURE REVIEW

Başak Güçyeter, Orkun Alptekin

Eskisehir Osmangazi University, Faculty of Engineering and Architecture, Department of Architecture, Eskisehir, Turkey

ABSTRACT

Indoor environmental quality (IEQ) is one of the most significant factors that affect the performance of a building and its occupants. IEQ comprises occupant comfort related factors in a building, such as air quality, lighting, thermal and acoustic conditions. IEQ is directly related with the health and productivity of building occupants. Adequate levels of indoor environmental quality improve indoor experiences of occupants and minimize the risk of building-related health problems. Various studies were conducted to investigate physical measurements and subjective surveys on the factors of IEQ with the intent to determine optimal IEQ conditions for an improved built environment. Given the health and comfort related scope above, it is essential to address the significance of indoor environmental quality levels in healthcare facilities. IEQ is important both for patients and healthcare professionals. Indoor environment quality in healthcare facilities depends directly on the use of various medical compounds and processes, healthcare activities, the intense presence of patient and attending individuals and building materials, layout and services. In this respect, the present study attempts to conduct a comprehensive and systematic literature review, to completely delineate (a) the indicators and characteristics of IEQ, (b) to clarify the assessment, measurement and evaluation procedures related to IEQ and (c) to determine the gaps and future research potentials for IEQ studies in healthcare facilities. The present comprehensive and systematic literature review is expected to establish the extent to which IEQ performance evaluations were carried out, to recognize and consider improved environmental considerations in healthcare facilities, and to provide a procedural framework for further research in terms of IEQ audit, measurement and assessment processes.

Corresponding Author: Başak Güçyeter

POSSIBILITIES OF ENERGY EFFICIENCY EXPERIMENTAL RESEARCH USING MLBE BUILDING'S AUTOMATION AND CONTROL SYSTEM

Anna Romańska-Zapała [1], Marcin Furtak [2], Małgorzata Fedorczak-Cisak [2], Mirosław Dechnik [2, 3], Karina Grzywocz [1]

[1] Cracow University of Technology, Faculty of Electrical and Computer Engineering, Warszawska 24, 31-155 Kraków, Poland
[2] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Kraków, Poland
[3] AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Biomedical Engineering, Mickiewicza 30, 30-059 Kraków, Poland

ABSTRACT

Due to the increasing requirements in the field of buildings' energy saving, impossible to meet only due to the thermal insulation of the building envelope, it is necessary to pay attention to the energy efficiency of technical installations and application of automatic control systems. Computer simulations on the building structure or functioning of its individual installations in the context of limiting its energy consumption, performed by Design Builder – type computer programs, are a very useful tool. However, in the case of simulation studies on the impact of automatic control systems on energy efficiency, the results are often overly optimistic – they are overestimated in comparison to results achieved in actual environments. Therefore the results obtained should be validated in an actual environment. This paper presents the Małopolska Laboratory of Energy Efficient Building (MLBE) of Cracow University of Technology, which provides an opportunity to perform experimental actual scale research of building automation systems to improve buildings energy efficiency and occupants' comfort. This paper includes a detailed description of MLBE's building automation and control system. Furthermore, this paper presents possibilities and an example methodology of energy efficiency's experimental study using BACS system.

Corresponding Author: Anna Romańska-Zapała

MULTI-SOURCE COOLING SYSTEM CONTROL IN THE MLBE BUILDING – A PILOT EXPERIMENTAL STUDY

Anna Romańska-Zapała [1], Marcin Furtak [2], Małgorzata Fedorczak-Cisak [2], Mirosław Dechnik [2, 3], Karina Grzywocz [1]

[1] Cracow University of Technology, Faculty of Electrical and Computer Engineering, Warszawska 24, 31-155 Kraków, Poland

[2] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Kraków, Poland

[3] AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Biomedical Engineering, Mickiewicza 30, 30-059 Kraków, Poland

ABSTRACT

Computer simulations of buildings in the context of improving their energy efficiency, performed by Design Builder – type computer programs, are a very useful tool. However, in the case of simulation studies on the impact of automatic control systems on energy efficiency of buildings, the results are often overly optimistic. Energy savings are overestimated in comparison to results achieved in real environments. Therefore the results obtained by simulations should be validated in a real environment. The Małopolska Laboratory of Energy Efficient Building (MLBE) of Cracow University of Technology provides an opportunity to perform experimental real scale research of building automation systems to improve buildings energy efficiency and occupants' comfort. This paper presents a part of multi-source cooling system with selected cooling sources and room's cooling methods, implemented in the MLBE building. The purpose for the summer research was to verify work of selected technical equipment and installations that realize the cooling process in an actual conditions. A gas heat pump and a passive cooling system using the cooling capacity of the soil were used. Furthermore, fan coil units and surface systems were used at room level. Together with the possibilities of the building automation and control system implemented in MLBE, the results shown in this paper will become – in future planned research – a base for creating optimized algorithms for controlling the researched system in the context of search for energy-efficient installation and programing solutions. The obtained results will form the basis to develop more effective control strategies for tested cooling system, both in the economic context as well as in context of the required users comfort.

Corresponding Author: Anna Romańska-Zapała

POWER QUALITY IN ENERGY EFFICIENT BUIDLINGS – A CASE STUDY

Anna Romańska-Zapała [1], Karina Grzywocz [1], Mirosław Dechnik [2, 3]

[1] Cracow University of Technology, Faculty of Electrical and Computer Engineering, Warszawska 24, 31-155 Kraków, Poland

[2] Cracow University of Technology, Malopolska Laboratory of Energy Efficient Energy Building, Warszawska 24, 31-155 Kraków, Poland

[3] AGH University of Science and Technology, Faculty of Electrical Engineering, Automatics, Computer Science and Biomedical Engineering, Mickiewicza 30, 30-059 Kraków, Poland

ABSTRACT

Energy-efficient buildings are increasingly equipped with modern automation and control systems that enable significant energy savings by providing energy in the exact place and time of the demand. Moreover, high-performance LED light sources are used as interior lighting. Since the automation system controllers and LED light sources require a voltage lower than the mains voltage, the buildings use a large number of power electronic converters adjusting the power supply conditions for the devices being serviced. Operation of this type of strongly non-linear receivers leads to an increase in transmission losses of electrical energy related to reactive power flow and generation of higher harmonics. Striving to reduce energy consumption in buildings leads to increasing use of these devices, which in consequence will aggravate the problem of insufficient quality of electricity. The paper discusses the provisions of standards for the quality of electricity. The paper presents the results of research on the quality of electricity in the Malopolska Laboratory of Energy Efficient Building – an experimental building equipped with a building automation and control system.

Corresponding Author: Anna Romańska-Zapała

ANALYZE OF THE RUNOFF IN GILORT WATERSHED

Pisleaga Mihaela, Badaluta – Minda Codruta, Eles Gabriel

Polytechnic University of Timisoara, Romania

ABSTRACT

In recent years, the climate changes have determined the increase of the frequency flooding, and concurrently, negative effects of these weather phenomena were amplified by other factors (the deforestation, needs of the hydro technical works, etc.). Floods represent a natural phenomenon that cannot be prevented. However human activities contribute to the probability and the magnitude of the negative impact of floods. In the first part of the paper is characterized, catchment Gilort, from point of view the hydro morphological and morphometric. Further, the paper presents the hydrologic analysis of atmospheric precipitation and liquid runoff in the catchment for 2007. For estimation of the character' excedentar of the flow of liquids in the studied area, was determined the discharge coefficient. Finally the paper presents the conclusions and some considerations on water resources management from catchment Gilort.

Corresponding Author: Mihaela Pisleaga

ACHIEVEMENT OF THERMAL COMFORT IN THE BUILDING THROUGH INTERACTION WITH EXTERNAL FACTORS

Nurin Zecevic [1], Ejub Dzaferovic[1], Azrudin Husika[1], Amira Salihbegovic [2]

[1] Faculty of Mechanical Engineering, University of Sarajevo, Bosnia and Herzegovina
[2] Faculty of Architecture, University of Sarajevo, Bosnia and Herzegovina

ABSTRACT

Building envelope has significant role in the building sector. It represents immediate interaction between outside and inside environment, and in dependence of its characteristics and opposed requirements, it affects on achievement of the thermal comfort of inside area and closer environment. Existing standards in the building sector dictate air tightness of the envelope, limiting air infiltration with the aim to save energy, but also influence on the inside environmental quality in situation when optimal air quality cannot be achieved due to the insufficient ventilation of the room. Besides that, building envelope in dependence of its characteristics, under the influence of Sun light, can less or better absorb heat flux and cause the temperature rise on the surface of the building. Specific characteristic of material to absorb and retain solar thermal heat, in urban environments, contribute more and more to the presence of the phenomenon known as urban heat island. For interaction of the building envelope with the environment factors, the building of Mechanical Engineering Faculty was chosen as a case study, on which the measurement of the surface temperature was performed with the aim to empirically confirm presence of higher temperatures on building envelope. At the same time, the measurement of indoor air quality parameters, as carbon dioxide concentration, inside air temperature and relative humidity was performed, to estimate ventilation efficiency of inside area. Results of the measurement have shown the presence of higher surface temperature on the building's envelope, which is the in accordance with the earlier researching about the existence of higher surface temperatures in dependence of its characteristics and environment. Measurement of indoor air quality parameters shows higher carbon dioxide concentrations, especially in winter semester, which values exceeded by 60 % of recommended ones. Higher carbon dioxide concentrations are result of insufficient ventilation of the room, and it is indicator that optimal cooling system with frequent ventilation is necessary criteria that needs to be fulfilled to achieve quality internal environment, from the aspect of the comfort, productivity and health of users. In the recent years, there has been noticed evident increase of the outside temperature, especially in urban area due to the construction and characteristics of applied materials in buildings, resulting also in the climate change. It is necessary to emphasize that planners and designers in the conceptual stage of construction or renovation of the buildings, incorporate solutions and decisions about the materialization of the envelope, which will affect on the reduction of urban heat island, considering as one of the energy efficiency measures.

Corresponding Author: Nurin Zecevic

A CONCEPTUAL FRAMEWORK FOR POST OCCUPANCY EVALUATION OF GREEN HEALTHCARE FACILITIES

Aslıhan Ergin, Işılay Tekçe

Faculty of Architecture and Design, Ozyegin University, Turkey

ABSTRACT

With the raising awareness of creating a sustainable environment, to reach a sustainable society, economy, and environment the greening practices is also on the agenda of the healthcare sector. In terms of improving the health and well-being of building occupants and enhancing a healthy indoor environment, sustainability also becomes a major concern the healthcare facilities. As a result of these efforts to enhance sustainability level in the healthcare environment, green healthcare buildings have been promoted. Particularly, green certification tools including LEED, BREEAM, GREEN STAR, and DGNB have been developed to assess and identify healthcare buildings' sustainability performances. However, in terms of the actual sustainability performance of healthcare facilities in-use, solely receiving a green certification does not guarantee that healthcare facility has enhanced sustainability. However, by using healthcare specific Post Occupancy Evaluation (POE) operational phase sustainability performance of healthcare facilities can only be realistically evaluated from different occupant' perspectives. The primary aim of this paper is to develop a healthcare specific POE conceptual framework for green healthcare facilities. An integrated POE approach which includes all occupants feedback holistically for eliciting operational phase performance data is essential to provide added value decisions actions for a real green healthcare facility management. In this study, to understand the green healthcare sustainability existing healthcare certification tools were reviewed and analysed in terms of main evaluation criteria. Nevertheless, for defining the attributes, methods, and perspectives of the conceptual framework of healthcare-specific POE, a literature review was performed in terms of POE practices. Hence, a conceptual framework for healthcare-specific POE approach is proposed. This framework has emphasized that to achieve sustainability in green healthcare facilities, green healthcare certification tools which are solely do not assert in-use sustainability performance has to take into account with healthcare specific POE approach.

Corresponding Author: Aslıhan Ergin

SOCIAL SUSTAINABILITY ISSUES IN RENOVATION COLLECTIVE DWELLINGS

Mirela Szitar-Sirbu

University Polytechnic Timisoara, Piata Victoriei 2, Timisoara, Romania

ABSTRACT

Around 60% of the urban population in Romania and 40% of the inhabitants of Timisoara live in blocks of flats made of prefabricated panels, built between 1960 and 1990. Interventions on these buildings are a highly debated topic in order to achieve the 20-20-20 EU targets. Less discussed is the part that makes these interventions truly sustainable on a long run, not only from the ecological perspective, but also from the social perspective. In search of the optimal solutions for the residential blocks built during the communist period, the ecological, social and economic aspects of a sustainable intervention were considered. A solution adapted to local conditions must have the following qualities: to be affordable, to address properly the density level of the neighborhood, to improve both the urban quality and the living conditions and comfort of the existing apartments and to enhance the sense of belonging to a community for the inhabitants. The paper focuses on defining social sustainability criteria related with the quality of life as it is perceived by the inhabitants in order to propose viable renovation solutions, adapted to the specific context. Starting with the criteria used in European standards related to social sustainability, continuing with the analysis of the specificities of the Romanian housing stock made of prefabricated panels and ending with the analysis of the quality of life as it is perceived by the inhabitants using a social inquiry, the methodology aims to define common problems that can be taken into account when it comes to finding solutions to different scales: the apartment, the common spaces of the buildings and also the common spaces of the neighbourhoods. The part dedicated to the specificities of the Romanian housing stock among other European countries offers a broader perspective for understanding some important issues, while the one dedicated to the local conditions of Timisoara offers a focused view, necessary in order to find the proper solution for the context. In order to define the local priorities from the social perspective for rehabilitation the collective dwellings a survey was made among the inhabitants of three typical neighbourhoods. The most important aspects of the social inquiry are related to the quality of life as is perceived by the inhabitants and the relevant indicators that define social sustainability, based on the standards mentioned. The results show similar issues regarding the apartment and the buildings in the three analysed areas, but there are some variations regarding the perception of outdoor spaces, as these neighbourhoods have different characteristics. This study proves that the social pillar of sustainable development is as least as important as the ecological one when it comes to housing refurbishment and retrofitting. An integrative approach should not leave out any of the issues discussed in order to be successful.

A SUSTAINABILITY ASSESSMENT TOOL FOR RESIDENTIAL BUILDING RENOVATION USED IN THE DECISION MAKING PROCESS

Mirela Szitar-Sirbu, Daniel Grecea, Iasmina Onescu

University Polytechnic Timisoara, Piata Victoriei 2, Timisoara, Romania

ABSTRACT

Sustainability assessment tools are valuable instruments not only for the certification systems and in the research area, but especially when used in the decision making process. That means there is a need to develop simplified tools that can be used in feasibility studies in order to compare solutions and to choose the one that is best suited to the specific context. The present paper presents a building sustainability assessment tool developed for residential building renovation projects, complying with the Romanian standards and regulations. It has 7 categories and 23 criteria and it is based on SB Tool, Protocollo Itaca and the European standards related to sustainability in construction – ISO TC 59 series. An assembly of blocks was chosen as a case study for collective housing renovation project in order to prove the idea that using such tools can be crucial for comparison and choosing the most suitable solution. This is composed of T770 sections made of prefabricated panels, a typology used on large scale in Timisoara and Romania between 1970 and 1989. Three different solutions were proposed for renovation: a basic one, the cheapest (the type of projects that are currently carried out), the second one - that tries to balance the various aspects of sustainability and the third one – an interpretation of the project developed by the team UpTim for Solar Decathlon 2014. The final output presents the analysis of each solution in a form of radar diagram with 7 rays or as a graph. In these graphical forms the different solutions can be compared very easily in order to understand the strengths and weaknesses of each of them and to define the most balanced one. As a conclusion, for proposing alternative solutions, all the pillars of sustainable development in construction have to be considered and also the adaptation of the solution to the economic and social environment. Solutions that are suitable for other European countries may be inappropriate for Romania and vice versa, due to differences in ownership structure or financial aspects.

Corresponding Author: Mirela Szitar-Sirbu

THE LOST STREAMS OF ANKARA: A CASE STUDY OF BENTDERESI

Işıl Kaymaz

Dept. of Landscape Architecture, Faculty of Agriculture, Ankara University, Keçiören, 06120, Ankara, Turkey

ABSTRACT

This paper aims to provide a critical overview of the management of Ankara's streams in the historical context of the city's urbanization process, and focusing on one particular example Bentderesi (Bent stream). Prior to Ankara's declaration as a capital city and during the early periods of the young Republic of Turkey, the streams and creeks of the city were the significant destinations for public recreation and they were also used for freshwater supply and fishing. However, ironically, these streams had caused the most damage to their surroundings due to floods several times. For instance, in 1957, the flood along the Hatip Stream affected many areas along it's bed, including Mamak, Saimekadın, Gülveren, Bentderesi, Dışkapı, Kazıkiçi Orchards and Akköprü which led to many casualties and huge physical damage. At the same time, some of these streams had been highly polluted and literally had become open sewers. These all led to a drastic change in the urban landscape of Ankara; many streams and creeks were channelized and paved over. Bentderesi was one of them. Actually, Bentderesi (meaning barraged creek) is part of the Hatip Stream. It takes this name near the old settlement area, the Ankara Castle. According to the literature, Bentderesi name comes from the dam structures on the creek built in Roman times. Unfortunately, the ruins had not been protected or conserved and are invisible today. Currently, vehicle traffic flows along "Bentderesi Street" which was built overtop the channelized river. Although the first plans for the newly established capital made use of Bentderesi and its surroundings as green spaces for leisure and ecological benefits, it became a slum area after it had been channelized. Today, Ankara is facing with water supply problems and the global climate change scenarios do not seem promising as well. Furthermore, there has been a rise in floods occurring in the urban fabric due to the increased impermeable paved surfaces overtop the creek and streams and their beds. Restoring and re-discovering the lost stream landscapes of the city would be a major, but at the same time an incredibly exciting challenge for Ankara and its urban landscape in terms of both ecological and social sustainability. In this regard, this paper will address to the conflicts between policies and the need for conservation of water surfaces of Ankara within the specific example of Bentderesi.

INFLUENCE OF COAL WASTE ON VOLUMETRICS AND MECHANICAL PROPERTIES OF HOT MIX ASPHALT

Katerine Carreño, Gilberto Martinez-Arguelles, Luis Fuentes

Universidad del Norte, Km.5 Vía Puerto Colombia, Metropolitan Area of Barranquilla, Colombia

ABSTRACT

The growing demand for virgin aggregates in maintenance and construction activities of roads, added to the concern for their impact on environmental sustainability, has generated the need to evaluate alternatives materials and waste in order to reduce the carbon footprint related to the production of asphalt mixtures and later application in road maintenance and construction. One of the materials showing particular high potential to partially replace the use of natural aggregates is coal waste (CW) mining. Achieving a reliable incorporation of this kind of waste in the production of hot mix asphalt (HMA), may assure a significant reduction in the use of natural aggregates, energy and emissions associated with the aggregates production. Therefore, this paper aims to evaluate the influence of the use of the aforementioned waste as partial replacement of the fine fraction of aggregates and mineral filler in the production of HMA. For the development of the study, a representative sample of the CW was obtained from a mining Region in Colombia (Norte de Santander), and physical and chemical properties of this material were evaluated. Physical characterization included: gradation, specific gravity, absorption, among others. On the other hand, the chemical and morphological characterization was based on the scanning microscopy SEM and X-ray fluorescence (FRX). Additionally, the Marshall Mix design was carried out, evaluating the influence on the volumetric properties of three carbon contents: 5, 10 and 20% in relation to the weight of the natural aggregate. It was found that CW does not significantly modify the volumetric properties of the HMA. In addition, since dynamic point of view, resilient modulus was evaluated, observing that at a higher temperature the behavior of the modified mixtures showed increases in stiffness of up to 58%. The aforementioned results prompt to continue testing this kind of waste considering more complex dynamical test, in order to achieve a road infrastructure more sustainable.

Corresponding Author: Gilberto Martinez-Arguelles

ASSESSING THE SUSTAINABILITY PRINCIPLES OF PRISHTINA, KOSOVO

Adelina Tahiri [1], Lucija Ažman Momirski [2]

[1] Faculty of Architecture, AAB College, Bregu i diellit 2, Blloku 14 # 13, Prishtina, 10000, Kosovo
[2] University of Ljubljana, Faculty of Architecture, Zoisova 12, 1000 Ljubljana, Slovenia

ABSTRACT

Prishtina is the capital city and at the same time the fastest-growing city of Kosovo, which is an eastern European country that is both a developing country and a post-conflict country dealing with poverty and underdevelopment. Kosovo separated from Yugoslavia in 1999, and since then it has experienced various development stages, transformations, and radical changes regarding urban planning, society, and the political system. Urban planning in combination with local politics that had no visionary urban strategies resulted in the failure of Prishtina's planning to direct massive growth towards sustainable urban development. To confirm this hypothesis, Prishtina is studied using a set of fifteen principles of green urbanism, which serves as a tool to assess Prishtina's sustainability principles. The results show that postwar urban development patterns have been unsustainable thus far. Prishtina lacks the majority of sustainable city principles, but there have also been positive aspects of city development. The question remains whether Kosovo as a developing country should follow the same unsustainable steps as developed countries to catch up with them, or whether it could use other means such as universities, which can act as think tanks for transforming cities. The findings of this study can be used as a reference for existing development patterns and can provide guidance for future sustainable urban planning and developments in Prishtina.

Corresponding Author: Lucija Ažman Momirski

EFFECTIVENESS OF DIFFERENT RAP REJUVENATORS OBTAINED FROM TESTS ON MARSHALL SAMPLES

Sorociak Wojciech [1,2], Grzesik Bartłomiej [1]

[1] Silesian University of Technology, Faculty of Civil Engineering, Akademicka 5, 44-100 Gliwice, Poland
[2] Eurovia Polska S.A. Bielany Wrocławskie, ul. Szwedzka 5, 55-040 Kobierzyce, Poland

ABSTRACT

Sustainable development is a basic principle of modern world society. One of important aspects of sustainable development is care of natural resources, To achieve this goal it is obligatory to use within building materials those from recycling. In terms of road engineering it refers to all reclaimed materials from pavement construction, however, one of the most valuable of them is reclaimed asphalt pavement (RAP). Its use in production of new hot mix asphalt (HMA) is promoted due to environmental issues but it also causes concerns among road administrators. Aged bitumen, being an ingredient of RAP, poses a threat to new HMA, decreasing its cracking resistance regardless of its source. Aged bitumen is more brittle than the` virgin one, thus high RAP content may lead to the same sort of problems within HMA. To enable high RAP content in HMA there are additives (rejuvenators) introduced onto aged bitumen (RAP) to restore its characteristics. Choice between applied rejuvenators is crucial task along with its content in accordance to amount of aged bitumen. The aim of the paper is to pinpoint differences between effects obtained after use of different rejuvenators on mix consisting of 100% RAP. The effect was shown on void content determination and Marshall stability test. Results showed significant differences between 4 rejuvenators of different types, making some of them more effective in comparison to others. Tests confirmed possibility of further investigation on 100% RAP mixes made of confirmed-quality RAP.

Corresponding Author: Sorociak Wojciech

INFLUENCE OF DIFFRENT KINDS OF PAINTS ON SELF-CLEANING PROCESS OF THE FACADE COATING

Marcin Małek [1], Ewa Sudoł [2]

[1] Military University of Technology in Warsaw, Faculty of Civil Engineering and Geodesy, Warsaw, Poland
[2] Building Research Institute in Warsaw, Construction Materials Engineering Department, Warsaw, Poland

ABSTRACT

This work summarizes assessing the durability results of facade coatings in the area of their resistance of the self – cleaning effect. To characterize this feature three different types of samples were chosen: silicone paint, photocatalysis effect paint and lotus flower effect paint. Test samples were exposed on natural conditions and artificial weathering process in laboratory at the same time. After this research, durability effect of self – cleaning properties and stain resistance by established criteria were obtained. LM and SEM micrographs, contact angle and profilometry were used widely to measure this factor. In conclusion, all of tested facade coatings based on silicon exhibit the highest effect of self-cleaning.

Corresponding Author: Marcin Małek

Session Title:

Urban Planning

UTILIZATION OF SCIENTIFIC METHODS TO IMPROVE URBAN SAFETY

Vojtěch Stehel, Radimír Novotný, Aleš Kaňkovský, Veronika Sedláková

Institute of Technology & Business in Ceske Budejovice Ceske Budejovice, Czech Republic

ABSTRACT

There are more than 6,000 municipalities in the Czech Republic, where concept of the municipality is understood as a territorial self-government unit. Thanks to operation possibilities of the local government, it is possible to solve the local problems in these municipalities, including example: construction of various public spaces, transportation, security, etc. This solution is often better than would be in the case with the central management. However, this management has its limits associated with the budget parameters of the given municipalities and it is very closely related to the political struggle in the given locality. It is very common for the people who have no experience with the management of public spaces and finances to be elected to the new positions of representatives and mayors. This state of affairs may also lead to erroneous decisions that may have a long-term negative impact on the citizens of the given municipalities, in view of their efforts to identify against previous political competition. The article makes extensive research into the application of scientific methods, approaches, experiments and their validation that can be used in the context of urban safety. The focus of these methods will be concentrated mainly on the municipalities (around 10,000 inhabitants). Applied methods will also be discussed with view of limited resources (budget, personnel, territorial, etc.). Part of the research article will be examples of good practice that have been used primarily in foreign countries. There will also be a discussion on the implementation and impact of these examples of good practice in cities in the Czech Republic. Implementation will be discussed in two examples of specific cities (Milevsko, Chotěboř) with regard to their budget constraints, state of roads and sidewalks and many other parameters. The aim of the article is to get a basic overview of possible ways of solving local problems with a view to maximizing the benefit for the citizen. The study was developed as part of the research project TL02000559 and will be followed by further research with application potential.

Corresponding Author: Vojtěch Stehel

IMPACT OF PARTICIPATORY PLANNING APPROACH ON THE QUALITY URBAN DESIGN OF FORMER RIVERBANK BROWNFIELD SITES

Zuzana Ladzianska, Vladimír Ondrejička, Silvia Ondrejičková, Milan Husár

Spectra Centre of Excellence of the EU, Slovak University of Technology in Bratislava, Vazovova 5, 812 43 Bratislava, Slovakia

ABSTRACT

Processes of brownfield sites redevelopment are very well known and welcome especially by city councils. The new trend of reurbanization with focus on derelict and brownfield sites has reached the Central-East European space too. City investors are reacting in prompt manner in order to attract new users of the redeveloped sites by good design of public spaces achieved and communicated by public hearings. Topic of participation processes in any development has solid theoretical framework, but the implementation phase often tends to fail. Successful and effective public participation uses properly chosen and appropriately applied tools and methods of participation at the most suitable time of the development process. The aim of the paper is to present how a good participatory planning can have a direct impact on the urban design quality. This participatory approach is explained on case studies of former brownfield sites situated on riverbanks in city of Trenčín and Bratislava. In both former riverbank brownfield sites the approach of public participation has been used in different phases and manners. The outcome varies due to the different stages of projects, but nevertheless both can provide a high quality urban design outcome.

Corresponding Author: Milan Husar

ECOSYSTEM SERVICES AND WILDLIFE ASPECTS IN THE LINEAR TRANSPORT INFRASTRUCTURE DEVELOPMENT PROCESSESIN CARPATHIAN COUNTRIES

Maros Finka, Milan Husar, Vladimir Ondrejicka, Lubomir Jamecny

Spectra Centre of Excellence of the EU, Slovak University of Technology in Bratislava, Vazovova 5, 812 43 Bratislava, Slovakia

ABSTRACT

The Carpathian Mountains present some of the most preserved natural habitats for wildlife species in Europe. These natural environments provide a great amount of ecosystem services for the whole Europe and their protection is in the interest of all stakeholders in the territory, from local and regional state authorities, NGOs and private sector actors. Many regulations in form of various formal and informal documents exist and these are different from country to country which creates one of the key issues when protecting this vast natural area. Unified system of protection recognized in all Carpathian countries is rather missing and for this reason the Framework Convention on the Protection and Sustainable Development of the Carpathians (Carpathian Convention) had been formed with objective to foster the sustainable development and the protection of the Carpathian region. One of their activities is to support the legal procedures aimed at protecting the Carpathian Mountains and INTERREG-supported TRANSGREEN and CONNECTGREEN project is one of its main activities, of which this paper is one of the main outputs. The paper deals with an analysis of the planning systems of the Carpathian countries (Slovakia, Czech Republic, Ukraine, Hungary and Romania) with focus on ecosystem services and their provision with focus on how and where the wildlife aspects have to be integrated in the general process of the linear transport infrastructure development processes. The objective is to map out the formal legal instruments, such as binding documentation and law acts on international, state, regional and local level, as well as informal support documentation in relation to the ecosystem services. The second part of the paper is dedicated to exploring the best practice solutions, innovative approaches, instruments and tools, and their transferability to other European countries, together with examples of bad practice. Final part discusses the weaknesses, threats and problem areas for integrated management of ecosystem services, leading to identification of the gaps in available knowledge, accessibility and availability of data. In the concluding section the paper deliberates recommendations to fill the gaps and policy implications for local, regional, state and Carpathian level.

Corresponding Author: Milan Husar

CONSTRUCTING THE SPATIAL IDENTITY: A READING ATTEMPT OF THE URBAN MEMORY OF JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (JUST), CAMPUS BY COGNITIVE MAPPING

Bsma Adel Bany Mohammad

Jordan University of Science & Technology, Faculty of Architecture / Department of Architecture, Jordan

ABSTRACT

The University campuses are a small city containing basic city functions such as educational spaces, accommodations, services and transportation. They are spaces of functional and social life with different activities, different occupants, it changes and grow like cities so it is memorized with the same manner. Campus memory is the ability of individuals to maintain and reveal the spatial components of designed physical spaces, which form the understandings, experiences, sensations of the environment in all. “Cognitive mapping" is used to decode the physical interaction and emotional relationship between individuals and the city; Cognitive maps are created graphically using geometric and verbal elements on paper by remembering the images of the urban Environment. In this study, to determine the emotional urban identity belonging to JUST Campus, architecture students. Asked to identify the areas they interact with in the campus by drawing a cognitive map. "Campus memory items "are identified by analyzing the cognitive maps of the campus, then the spatial identity result of such data. The analysis based on the five basic elements of Lynch: paths, districts, edges, nodes, and landmarks. As a result of this analysis, it found that Spatial Identity constructed by the shared elements of the maps. the memory of most students listed the gates structure- which is a large desirable structure, located at the main entrances within the campus defined as major landmarks, then the square spaces defined as nodes, in addition to both stairs and corridors defined as paths. Finally, the districts, edges of educational buildings and service spaces are listed correspondingly in cognitive maps. Findings suggest that the spatial identity of the campus design is related mainly to the gates structures, squares and stairs.

A FULLY INTERACTIVE VISUALIZATION METHOD FOR BUILDING CONDITION ASSESSMENT

Anna Banaszek [1], Sebastian Banaszek [2], Anna Cellmer [3], Vicenç Gibert [4], Carles Serrat [5]

[1] Institute of Geograpgy and Land Management, The Faculty of Geodesy, Geospatial and Civil Engineering, University of Warmia and Mazury, ul. Prawocheńskiego 15, 10-720 Olsztyn, Poland
[2] CEO of Training and research Center "DroneTechCamp", ul. Bajkowa 127, 00-696, Olsztyn, Poland
[3] Dept of Geoinformatics, The Faculty of Civil Engineering, Environmental Engineering and Geodesy, Koszalin University of Technology, ul. Śniadeckich 2,75-453 budynek E pokój 212-2 E, Koszalin, Poland
[4] Dept of Architectural Technology, LABEDI-EPSEB, Universitat Politècnica de Catalunya-BarcelonaTECH, Dr Marañón, 44-50, 08028-Barcelona, Spain
[5] Dept of Mathematics, IEMAE-EPSEB, Universitat Politècnica de Catalunya-BarcelonaTECH, Dr Marañón, 44-50, 08028-Barcelona, Spain

ABSTRACT

The aim of the paper is to introduce a tool for the accurate assessment of the technical condition of buildings. The proposed methodology is becoming an efficient strategy for the massive inspection of building stocks, in big residential areas. The authors have developed an utility based on high-performance images captured by Unmanned Aerial Vehicles (UAVs). The flights of the UAVs have been technically protocolized in order to get the proper high-quality information about the real condition of the building. After collecting the images, a 3D model is generated and orthophotos of building facades are created. The graphical information is connected with tables of attributes which allow the interactive geo-referenced management and assessment. Main advantages of this visualization technique will be presented by analyzing a particular case study. The selected example will allow the illustration of the methodology from the early beginning initial steps till the exploitation of the resource. Ongoing developments and technical details about the information system and the analysis platform connected with the visualization tool will be also reported and discussed.

Corresponding Author: Anna Cellmer

RELATIONSHIPS BETWEEN URBAN FORM AND AIR QUALITY AT DIFFERENT SPATIAL SCALES: A CASE STUDY FROM NOTHERN CHINA

Fan Li, Tao Zhou

School of Construction Management and Real Estate, Chongqing University, No.174. St. Shazheng.Shapingba, Chongqing, China

ABSTRACT

Examining the relationships between urban form and air quality at small spatial scales across multiples cities could simultaneously identify between- and within-city impacts. The current study used linear regression and geographically weighted regression models to identify the overall and local relationships between urban form and air quality at whole-city, 50 km and 10 km spatial scales in 50 prefecture-level cities in Northern China. Air quality data were obtained from 235 monitoring stations throughout 2015. Urban form was characterized by urban fragmentation, sparseness, continuity, and forest area ratio, as computed from satellite images. High urban continuity and low forest area ratios were related to poor air quality at all three spatial scales. Urban sparseness had a positive relationship with air quality at the city scale, negligible relationships at the 50 km- and 10 km-scales. The overall relationship between urban form and air quality varied little according to spatial scale, while local relationships varied widely, with the difference increasing with decreases in scale. The findings suggest that, in general, public policy should encourage scattered, polycentric, and highly forested urban forms; however, policies for small spatial units within a city should consider the specific conditions of the unit.

Corresponding Author: Tao Zhou

TRADITIONAL HOUSES IN MARINGÁ (BRASIL): ICT IN PLANNING RESEARCH

Camila Gonino [1], Ana Virtudes [2]

[1] Department of Architecture and Urban Planning, University of Maringá, Brazil
[2] C-MADE Centre of Materials and Building Technologies, University of Beira Interior, Covilhã, Portugal

ABSTRACT

In many cities, the examples of traditional architecture are being replaced by contemporary buildings, without strategies in order to preserving a specific period of the urban and housing histories. These legacies are witnesses of particular features in terms of local communities, planning strategies, societies, political environments, urban morphologies or architectural languages. In this sense this article presents the case study of the traditional wooden houses in the city of Maringá in Paraná (Brazil). There is a set of buildings which are still remaining among the existing urban fabric. However, every year some of them are destroyed in order to give room for new ways of designing the city, under to the planning strategies. Thus, there is an urgency of studying and mapping these buildings, in order to find strategies, capable to preserve and enhance them. The methodological approach is based on the use of ICT (information and communication technologies) as a tool to study the features of these traditional wooden buildings. The results show that some of the studied buildings are still in a good status in terms of conservation. The main challenges are to have planning instruments contents, analysing the city of Maringá as a whole, focused on the preservation of traditional buildings features. Related to the previously mentioned issue, there is still a long way a head, regarding the Brazilian planning system framework.

Corresponding Author: Ana Virtudes

E-CITY PLANNING: THE MASTER PLAN CHALLENGES AT LOCAL LEVEL

Olga Gonçalves [1], Ana Virtudes [2]

[1] Civil Engineering, University of Beira Interior, Covilhã, Portugal
[2] C-MADE Centre of Materials and Building Technologies, University of Beira Interior, Covilhã, Portugal

ABSTRACT

The use of new technologies such as the ICT (information and communication technologies) is already a reality in several domains of the scientific development. In this context, this papers aims to present an example of use of ICT in the spatial planning domain at the local level. It is focused on the e-City Planning, based on the example of the municipal master plan, which is the most iconic figure of the planning system framework in Portugal. The conclusions show that the use of e-platforms and e-City Planning instruments have several advantages. Among these advantages there is the sharing of knowledge in between local authorities and the citizens in general, who have direct access to the spatial planning contents information, at the distance of a click. With e-City Planning tools and platforms is possible to update the planning strategies automatically and therefore, according to the real territory needs, opportunities and features.

Corresponding Author: Ana Virtudes

CYCLOCABLE IN TRONDHEIM-NORWAY: SOFT MOBILITY IN MOUNTAIN CITIES

Isabel Matias [1], Ana Virtudes [2]

[1] Civil Engineering, University of Beira Interior, Covilhã, Portugal
[2] C-MADE Centre of Materials and Building Technologies, University of Beira Interior, Covilhã, Portugal

ABSTRACT

With the rising of soft mobility strategies among to the decision-makers regarding the city policies, the urban designers are developing new ways of improving the bicycles use solutions considering the urban space features. In the particular case of the mountain cities, in many places, the bicycle is still seen as a problematic way of transportation, requiring deep transformations of the existing urban fabric. In this sense, this paper presents the case study of the Norwegian city of Trondheim, which is very well-known by its hills. This city is an enormous success in terms of bicycle solutions, not only among the locals but also in between the visitors. The system that was created several years ago, is called Cyclocable and it is the first cycle lift for collective transportation which aims to help cyclists, who wish to move more easily, to overcome the sleepiest slopes of urban neighbourhoods. The methodological approach is based on the literature review, in order to identify the characteristics of Cyclocable system, which could be used in other mountain cities, with similar features in terms of urban morphology. The results show that with the Cyclocable the number of cyclists in Trondheim has been increasing with environmental, economic and social advantages.

Corresponding Author: Ana Virtudes

CHARACTERISTICS AND OPTIMIZATION OF THE CROWD INNOVATING SPACE SYSTEM IN OLD CITY BY COMPLEX NETWORK MEASUREMENT: TAKING JIANG'AN DISTRICT OF WUHAN AS AN EXAMPLE

Zhao Shouliang[1], Ran Yaoling[1], Ewelina Wozniak-Szpakiewicz[2], Chen Tingting[3]

[1] School of Architecture and Urban Planning, Huazhong University of Science and Technology
Add: 1037 Luoyu Road, Wuhan, Hubei, China
[2] Faculty of Architecture,Cracow University of Technology,ul. Warszawska 24; 31-155 Kraków, Poland
[3] School of Urban Design, Wuhan University, Donghu Nan Road 8, Wuhan,430072, P.R.C.

ABSTRACT

City is the place where creative economy taking place as well as the primary gathering place for talents. The functions of the city are the incubators of innovation. Generally speaking, the old city is the “concentration site of problems” and the “innovation trial field”. In the background of “Mass Entrepreneurship and Innovation”, the research on the crowd innovating space is increasing, mainly focusing on qualitative research such as space operation mode and architectural spatial form. However, there is few research focusing on systematic characteristic at the regional level. With the development of domestic innovation economy, the construction of crowd innovating space system in the old city will help to improve the construction of urban innovation ecosystem. Therefore, the paper analyses the types and characteristics of the network elements of the crowd innovating space by constructing the network topology of innovation network of crowd innovating space in the old city. Meanwhile, by complex network measurement method to carry on the quantitative research, the innovation network of crowd innovating spaces in old city has been analysed from four aspects: network node centrality, network relevance, network clustering and network community structure. Based on that, the paper summarizes characteristics of crowd innovating spaces in network from importance, relevance, stability, and functional structure. Finally, the paper proposes corresponding planning optimization strategies. From the perspective of spatial economic relations, improvement of the crowd innovating space system construction mode in the old city should be made, Furthermore, Enhance the explanatory power of urban space and planning theory. Keywords: Crowd Innovating Space, Innovation Network, Complex Network Measurement, Space System

Corresponding Author: Zhao Shouliang

GREEN-BLUE STRUCTURE IN MULTI-STOREY RESIDENTIAL AREA

Una Īle, Aija Ziemeļniece

Latvia University of Life Sciences and Technologies, Rigas iela 22, Jelgava, Latvia

ABSTRACT

Green areas play an important and diverse role in the multishaped development of the urban environment. The spatial structure and organization of the urban environment must provide three basic functions that form a unified spatial system: various recreational and sporting activities, improvement of sanitary hygiene situation and aesthetic improvement of the urban environment. Based on the matrix developed in the research process, there is analysed and fixed the functional zone planning, the visual quality of the technical solution, the occupancy of parking lots, the provision of accessibility, the boundaries of the visual outer space, the method of integrating greenery and water in recreation areas, as well as the interchanges with the adjoining areas, in order to ensure visual links between green-blue structure and outside residential neighbourhoods. Thereby, the aim of the research: to explore the green-blue structure and identification limits in the multi-apartment residential blocks of the 21st century, identifying the development potential in ensuring sustainable landscape.The research methodological and informative materials base consists of a modern analytical review about the outdoors of multi-apartment residential blocks, which was created in the 21st century. To achieve the objective of the research, scientific research articles, periodicals, books and normative acts, electronic resources analysis were used. Residents' and specialists' surveys were developed to find out the people's opinion about current situation of such places. The results of the survey process are summarized using a static data processing method. Based on the matrix developed in the research process and the use of an empirical (intuitive) method, the establishment of separate criteria in the multi-apartment residential blocks (in the districts of Riga, Marupe, Balozi, Jurmala and Ozolnieki) surveyed. Using the comparative analysis method, results have been obtained that characterize the diversity of the existing situation in multi-apartment residential blocks. Additionally the analysis of the Scandinavian experience for development of multi-apartment residential blocks was done based on author's surveyed areas in Denmark - Copenhagen and Roskilde, Norway - Oslo and Arendale, and Sweden - Stockholm and Malmö. A monographic or descriptive method based on the analysis of the theory, the findings obtained during the research process and the results of the research, was used for collecting and determining the results. Based on the analysed examples and the current situation, results have been obtained that determine the overall view of the green-blue structure in multi-apartment residential blocks, highlighting different identification limits and access to the use of outdoor living space, which equally marks the future development potential in providing a sustainable landscape. The findings of the research process and the results obtained provide a comprehensive insight into current trends of the outdoor residential space in 21st century.

Corresponding Author: Una Īle

ABANDONED AND GHOST SETTLEMENTS IN EGYPT

Yehya M. Serag

Faculty of Engineering and Technology, Future University in Egypt, FUE Campus, 90 road
New Cairo, Egypt

ABSTRACT

Abandoned settlements are phenomenon that existed and still exist in many parts of the world. Already existing settlements might face some challenges that can affect their own continuity and existence. They would start losing population because of migration, in what is known as shrinking cities until they become fully deserted. In some cases, deserting the settlement might take place suddenly because of a sudden disaster and in both cases these settlements change into ghost towns. In Egypt this phenomenon is also tangible, be that among the desert regions, in new cities or in once thriving locations. This paper sheds the light on this phenomenon, and tries to reach a proper categorization based on the causes leading to this phenomenon. The paper does not attempt to cover all categories of Ghost towns and abandoned places in Egypt, yet it tries to expose the phenomenon in Egypt.

LEGAL CONDITIONS AND THEORETICAL BASIS FOR THE ARRANGEMENT OF WATER-BASED AREAS IN POLISH CITIES

Mariusz Łysień

Institute of City and Regions Design, Faculty of Architecture, Cracow University of Technology, Warszawska Street 24, 31-155, Cracow, Poland

ABSTRACT

A series of diversified factors affect the arrangement of water-based areas in Poland. One of the most important elements are planning documents, such as the Act on Planning and Spatial Development, Water Law, or the Environmental Protection Law. These and other documents regulate the mutual relations between natural and cultural conditions as well as urbanized areas. At the same time, they affect the ability to conduct new investments in water areas – including those requiring the revitalization of post-industrial areas. The intense development in the last thirty years has meant that currently industrial facilities are in the city centre area. Authorities of many cities are trying to solve this problem, but it requires the application of not only interdisciplinary solutions, but also the establishment of large economic resources, without which it is impossible to restore the use of these areas. The adequate protection of the city against the effects of floods is an important issue related to the development of the water areas in the city. In this respect, there is a tendency to use expensive and ineffective methods of securing investment zones. The possibilities of water retention in flood control reservoirs are nearly five times smaller in Poland than in most other European countries. The scarce examples of polders show that this is one of the most effective methods of preventing damage caused by floods in urban areas. Such reservoirs are simultaneously valuable natural areas. In many intensively developing cities around the world, the generally accepted action is to strive to use the quays to create the signatures of cities. These places are designed to become an interesting space that people want to visit and which they want to use. Important city functions are located there, which are easily accessible due to public transport. However, it should be noted that in these spaces, their users have close contact with water. The current legal status and general public awareness (sometimes also of the city authorities) make it seem necessary to pay more attention to the comprehensive approach to the revitalization of vast water-based areas. It is important to integrate neighbouring functions and the way and quality of the arrangement of the whole area, and not just its fragment. The changes taking place in legal documents make the administrative path related to the transformation of water-based areas excessively complicated. However, it would be beneficial to specify the provisions of local spatial development plans and the general increase in coverage of plans of urban areas. The use of foreign standards seems to be valuable, where the revitalization of even vast areas is carried out in accordance with the precise assumptions. Such activities allow for creating interdisciplinary solutions, integrating numerous elements, which often leads to obtaining the synergy.

WATER ELEMENTS IN THE CREATION OF PUBLIC SPACES

Urszula Nowacka - Rejzner

Institute of City and Regions Planning, Faculty of Architecture, Cracow University of Technology, St. Warszawska 24, 31-155 Cracow, Poland

ABSTRACT

The need to create high-quality sustainable urban structures is widely emphasized. An important place among the elements shaping a sustainable urban space is occupied by natural elements, including water. The importance of water results from its multifaceted impact both on the physical conditions of the city and its beauty. The article draws attention to the role of water elements in shaping public spaces in the areas of European cities. The role of water in the creation of public spaces and the very diverse range of functions fulfilled by it was emphasized in a particular manner. Among the water elements found in urban spaces, the largest group consists of fountains and bells and whistles. Over the centuries, these water elements played a variety of functions: utility, cult, aesthetic and climatic, while being a significant element of the composition. Selected examples presented in the article concern both historical and contemporary use of water in shaping urban squares and green park and garden spaces. Analysing contemporary examples, particular attention was paid to the use of water elements for ecological remodelling, as well as reviving and increasing the attractiveness of revitalized areas in the urban tissue. This interest in water as a material with a wide variety of possibilities, which results from its physical properties, resulted in a variety of functional and spatial solutions. The research and studies conducted for many years by the author regarding the participation of natural elements, including in particular water and greenery, in the shaping of urban structures were the basis for the considerations. The public spaces with water elements analysed in the paper are places with high aesthetic values. They serve recreation, rest, education, promote social bonding, and are often places for organizing various cultural events or historic happenings. Water in these spaces is not only an element of the composition, but also a factor shaping a special microclimate. The potential of water for the creation of urban space is enormous and still not fully utilized, which is confirmed by subsequent realizations, encouraging with artistic and technical solutions, indicating the ever new possibilities of using water.

INVESTIGATING THE EFFECT OF URBAN COMPACTNESS ON ENERGY EFFICIENCY IN RECENT URBAN COMMUNITIES IN UAE

Khaled Galal Ahmed, S. M. Hossein Alipour

United Arab Emirates University, P.O. Box 13393, Al Ain, UAE

ABSTRACT

Studying the effect of urban compactness on energy consumption and thus realizing sustainable urban communities has been the locus of research for many Western researchers since the mid 1990s. Recently, this research interest attracted the attention in the MENA (Middle East & North Africa) region. In the last few years, the UAE government has adopted an agenda for energy efficiency in all sectors of development especially in the building and urban ones. As a result, a shift from the conventional sprawl urban form to a more compact morphology has been attempted in some recently developed neighbourhoods in the UAE but with actually no scientific evidence about the effect of these new, more compact, urban morphologies on energy efficiency in general, and cooling energy demand in specific. In a humble attempt to bridge this gap, this research adopted a comparative method for investigating the effect of urban morphology on energy efficiency through comparing the effect of the conventional sprawl vs. the effect of the recent more compact urban forms on cooling energy demand. The main utilized tool in this comparative investigation was the UMI (Urban Modelling Interface) simulation conducted for Al Dhaher conventionally designed neighbourhood in Al Ain city, representing the conventional sprawl urban form, and Al Ghreiba, a recently developed compact urban community, in Al Ain city as well. The results revealed that for Al Dhaher conventionally designed sprawl neighbourhood, the average cooling energy consumption reached about 103 kWh/m^2 for the whole buildings in the neighbourhood and 120 kWh/m^2 for houses. Meanwhile, in the recently developed 'compact' urban form of Al Ghreiba the average cooling energy was about 113 kWh/m^2 for all buildings and 121 kWh/m^2 for houses. Apparently, these figures exceed those of the conventional neighbourhood of Al Dhaher, while the opposite was expected. This explicitly indicates that the degree of compactness of the recent 'claimed-to-be' sustainable neighbourhoods has not been sufficient in lowering cooling energy consumption. Therefore, simply compacting the sprawl urban form to some degree seems not only insufficient in saving cooling energy but it might also result in higher energy consumption if other measures such as the building mass and the urban space/street grid form are not appropriately considered. More elaboration about these aspects is essential to ultimately depict a roadmap for the appropriate urban forms and morphologies that help realize sustainable urban communities in UAE and other MENA region countries.

Corresponding Author: Khaled Galal Ahmed

ANALYSIS OF THE SPATIAL STRUCTURE OF THE HOUSING ESTATES TRANSFORMATIONS'S POSSIBILITIES ON A SELECTED EXAMPLE

Szymon Opania

Silesian University of Technology, Faculty of Architecture, Department of Urban and Spatial Planning, ul. Akademicka 7, 44-100 Gliwice, Poland

ABSTRACT

The article is a summary of scientific and research work aimed at determining the possibility of transforming one of the selected so-called large-scale housing estates in Bielsko-Biała in Poland. One of the final work's effects was the concept of spatial development of a new housing estate in the area and in the neighborhood of the existing one. The research work was ordered by Cavatina & Partners company, which in its offer has a rare combination of leading experience in the design and construction of wide range of real estate. The company's goal is to create modern facilities and places of daily use for the dynamic needs of people, communities and companies. In its activities, it focuses on innovative thinking, the latest technology and sustainable development. Linking the problems related to the block of flats with the de facto development company revealed interesting results. The assumptions of the work assumed that despite the negative connotations and ideas about the blocks, related to their technical condition, poor architecture, spatial problems in the form of a small amount of greenery and the lack of sufficient parking spaces and diagnosed social pathologies many times, the selected housing is a relatively positive example of the stereotype. This was confirmed by the opinions of both inhabitants and statistical data. The formation's history of blocks of flats in Poland dates back to the 1950s. Currently, about 12 million people live in them, which is about 30% of the population of Poland. Hence, all problems related to this type of building are in fact becoming national problems. That is why discussions and questions arise: if the first of them were created more than 60 years ago, should they be demolished due to the technical condition and based on similar decisions? And maybe renewed and revitalized? If they constitute such a significant percentage of urban development and despite negative aesthetic impressions, should they be removed from the spatial structure of cities? The answers to this question often depend on the individual characteristics of the blocks with which their residents and users have to deal with. Even the most accurate answers do not often match individual cases. Such an example is the Karpackie housing estate in Bielsko-Biała, inhabited by about 10,000 people, where both positive and negative traits (such as spatial, technical and social problems) were diagnosed. Moreover, in a selected, specific case, on the one hand the estate is located within the boundaries of the landscape of the Silesian Beskids, while on the other hand, like many similar ones, it is negatively distinguished in the spatial structure of the city. Based on this case, the possibilities of transforming the estate from the 1970s, including all research results, were simulated. One of the main results was the obvious necessity of spreading over time, staging the planned transformation of the housing estate in accordance with nowadays requirements for modern housing estates.

Corresponding Author: Szymon Opania

SPATIAL TRANSFORMATION OF FACTORY ESTATES FOR THE ARMAMENTS INDUSTRY IN SOUTH-EASTERN POLAND

Anna Sikora

Faculty of Civil and Environmental Engineering and Architecture, Rzeszow University of Technology, Powstańców Warszawy 12, 35-959 Rzeszow, Poland

ABSTRACT

Production plants of the armaments industry are a specific type of enterprises that are often located away from existing estates, require the creation of housing infrastructure for employees and are subject to specific spatial transformations. This article is of a review nature: it describes examples of reconstruction of small towns and fragments of urban structures that were created in the interwar period and during socialist reconstruction after the Second World War. Selected settlement units are monofunctional, their downtown is built of multi-family housing buildings sometimes with services on the ground floor. The article also presents the case of structural changes of historical fragments of municipal units.

MINING OF GROUNDWATER IN CONTEMPORARY URBAN DEVELOPMENT ON THE EXAMPLE OF SELECTED GERMAN SPAS

Piotr Langer

Cracow University of Technology, Warszawska Str. 24, 31-155 Cracow, Poland

ABSTRACT

Mining activity is usually associated with heavy industry, degradation of space and areas with clearly industrial character. In fact, mining can be associated with other functions, such as health resorts, recreation and leisure. In the case of spas specializing in balneotherapy, healing underground waters - mineral and thermal, are extracted from local deposits using mining methods, in borehole mines. Mining activity is not the main direction of development of these places, but it remains absolutely essential for maintaining the spa function and offering services in the field of recreation, rest and tourism. The article focuses on the relationship between mining activity and the basic function of spas, spatial relations between urban development and the spa zone, the range of mineral and thermal water use (natural resources obtained from underground deposits using the borehole method), and above all – the way of exposing mining facilities in spa space and explaining the importance of these elements. The basis for consideration are the results of the original field research carried out by the author in 2018 at the Institute of Cities and Regions Design, Faculty of Architecture of the Cracow University of Technology. Research works were carried out in a dozen South-German statutory spas (Baden-Württemberg, Bavaria, Saxony). Four cities representing a much wider group of spa centers were selected for detailed analysis: Bad Buchau, Bad Saulgau, Bad Aibling and Bad Schandau. It was shown that the selected cities are directly related to the mining exploitation of groundwater, but at the same time they differ significantly in terms of the studied features. The conclusions from the studies may be useful in programming the development of spa towns operating on the basis of underground healing waters, as well as in the creation of concepts and projects on the urban and regional scale.

MARANO AND GRADO LAGOON: SILTING ISSUE OF THE LIGNANO INLET

Marco Petti, Silvia Bosa, Sara Pascolo, Erika Uliana

Università degli Studi di Udine, via del Cotonificio 114, 33100 Udine, Italy

ABSTRACT

The lagoons are characterised by a dynamic equilibrium, highly affected by the exchange of waters through the so called “lagoon inlets”, which are considered as breaches of the offshore bar that separates the lagoon from the sea. The proper functioning of the inlets is fundamental on one side because they are important vessel transport routes which are essential for the lagoon ports and for the economic activities involved with them, for example tourism, fishing and industry and for the efficiency of this water recirculation system on the other. The Marano and Grado Lagoon is a perfect example of this complex environment. This Lagoon is located in the north-east of Italy, in the northern part of the Adriatic Sea, and was once part of a system of Lagoons which also included the Venice Lagoon. The Marano and Grado Lagoon covers an area of 16000 hectares and is connected to the open sea by 6 tidal inlets, of which the Lignano inlet is one of the biggest and the most western. In particular, over the years, the shape of the Lignano inlet has undergone considerable changes, which caused a partial narrowing of its section. From these observations emerges the need for an in-depth morphodynamic study of the Lignano inlet. The study is the baseline for an integrated coastal zone planning that is necessary for the management and development of the area. The morphodynamic evolution of the inlet is the consequence of the alternate erosive and sediment deposit processes caused by the combined action of tides and wind waves generated by offshore winds that have a direct effect on the capacity of entrainment, transporting and deposition of the sediments. The complexity of the phenomenon will inevitably need a dedicated numerical modelling in order to take into account this mutual interaction. In order to propose an integrated coastal zone planning intended to mitigate the effects of the narrowing, it is necessary to first of all understand the causes which generated it. In the present paper, a medium to long-term study has been carried out to verify the causes of this narrowing. Moreover, some issues concerning the Lignano canal, used as a lagoon access across the Lignano inlet, have been studied. Every year, the Lignano canal is subject to dredging operations to guarantee a canal depth compatible with the draught of the vessels. These dredging operations impact heavily on the regional budget. Recently, a new trace for the canal has been proposed. In this study a numerical model has been applied to check which of the two traces was the best. The numerical modelling used considers the wind waves, the tidal currents and their mutual interaction. The numerical results will be shown and discussed, showing once again that an accurate morphodynamic modelling can significantly help in coastal design.

Corresponding Author: Silvia Bosa

SEA DEFENCES DESIGN IN THE VICINITY OF A RIVER MOUTH: CASE STUDY OF LIGNANO RIVIERA AND PINETA

Marco Petti, Sara Pascolo, Silvia Bosa, Erika Uliana, Matteo Faggiani

Università degli Studi di Udine, via del Cotonificio 114, 33100 Udine, Italy

ABSTRACT

The European Union has a coastline of 68000 km. More than half of the EU population lives within a 50-km radius of the coast and in 2001 14% of the EU population lived within 500 m of the coastal line. Hence, the protection of the coastline is very important for the development of European coastal regions and involves economic, environmental, engineering and social aspects. The shorelines are extremely dynamic systems in which natural processes, such as tide, wind waves and sedimentary riverine inputs act together with anthropogenic ones. The coastlines of most of Italy are in a precarious equilibrium and are highly subject to erosion. In particular, in this study the attention is focused on the Lignano Sabbiadoro beach located in the extreme north of the Adriatic Sea. This beach is between the Tagliamento river mouth and the lagoon inlet of Lignano and it is divided in 3 beaches from west to east: Lignano Riviera, Lignano Pineta and Lignano Sabbiadoro. In the last few years, many and repeated storm tides caused extensive damage to the Lignano Riviera and Pineta beach, resulting in the removal of large amounts of sand along the beach. The beach nourishment is necessary for coastal safety and to ensure the full use of the littoral during the summer season but it impacts heavily on the regional budget. From these observations emerges the need of an in-depth study that is the baseline for an integrated coastal zone planning, necessary for the management and development of the coastal zone. The planning and the management of the Lignano Riviera and Pineta coastal zone is a process involving several eminent professionals, such as architects, civil engineers, economists and hydraulic engineers. In this paper, the attention is mainly paid to the study of a number of groynes built along Lignano Riviera and Pineta beaches. In particular, the last groyne placed on the Lignano Riviera beach close to the Tagliamento river mouth is affected not only by the long-shore sediment transport but also by the riverine one, which can deeply affect also the balance of the whole Lignano beach. In this context, a correct design of the groyne requires a proper numerical modelling, which should be able to consider all these peculiar issues, typical of both maritime and fluvial hydraulics, and their mutual interaction. With this in mind, in this study a suitable numerical model is applied to check the effect of a change in the length of the groyne on the erosion and deposition processes, in order to choose the optimal length to guarantee as well as possible the equilibrium between the long-shore and riverine sediment transport. The results will be shown and discussed.

Corresponding Author: Silvia Bosa

LIQUID SPACES: UNDERSTANDING OF URBAN SPATIAL NETWORKS THROUGH THE HUMAN DATA

Oto Novacek [1], Milos Diezka [2]

[1] Slovak University of Technology, Slovakia
[2] Medzihradska 1367/4, 02601 Dolny Kubin, Slovakia

ABSTRACT

Today's cities are changing faster than ever before, mainly because they have ability to produce spaces for everyone, but only when they are produced by everyone (Jacobs 1961). This phenomenon was even multiplied with enhanced informatisation and digitalisation. It would be wrong to perceive Smart City only as plain product of technological innovations. New markets are rising and new types of behaviour are emerging hand in hand with technological innovations (Townsend 2014). Therefore technological innovations, mainly than enhanced communication and digitalisation change the habits of analogue civilisation towards more liquid spaces. Cities are forced to adapt to those changes in order to stay competitive. Therefore it seems that traditional planning reaches its limits and can't fully address challenges produced by such change, which makes it unsustainable approach on the long term perspective. Project aims to develop set of tools and approaches towards creation of more liveable and resilient cities of 21. century by combining modern technologies, and humanocentric approach. Focus should be put on the research of relationship between the technological innovations (namely digitalisation and enhanced communication) and societal changes that transforms into material (urbanised) environment (Castells 1996). Understanding of urban spatial structures via gathering and analysing a new type of information about the city – the data – plays a key role in the research. As such, focus will be put on the analysis of urban structures through the online and offline participatory platform (Emotional maps), real-time movement data (Telco data), and axial analysis of the city's structure (Space Syntax). Aim is to find focal points in each analysis of urban structure, and to understand the correlation between perception of the space, its geometry and real-time movement in the space. An analysis further aims to overlap its results with another possible data sets (e.g. analysis of functions, housing prices, quality of public spaces, etc.) in order to understand and predict preferences of the users. Overall aim is to produce such analytical outputs, which will be feasible for the prediction and subsequent simulation of the processes with the use of the advanced computing and machine learning. Such developed approach towards more flexible urban planning methods should guarantee more sustainable planning of 21. century's city, and that no one will be left behind (United Nations 2015) in proposed planning processes and subsequent right to the city.

Corresponding Author: Oto Novacek

POSITIONING A CHILDREN'S MUSEUM IN/AS A NEW AND OPEN MUSEUM

Hannah Daisy Foster

Museum of Ethnography, 1055 Budapest, Kossuth Lajos tér 12., Hungary

ABSTRACT

Within a massive state funded project – the Liget Budapest Project – the Museum of Ethnography is leaving its current home, a compelling palace, and moving to a new building at the city park, designed specially to the museum. This is a once in a lifetime option for the institution: a possibility to rethink its purpose, goal and mission; and to present its new self with help of the building, usage of space, new functions and exhibitions. One of these new self-expressing functions is going to be the children's museum – or more likely exhibition. In my talk – as the leader of the children's museum designing team – I would like to introduce how this newly designed interactive exhibition can use architecture, space, urban surrounding and social collaborations to make an open, easily accessible, common place in, and out of the museum. I would like to touch on the topics of the collaborative designing process with the architectures (Napur Architect) and other museum-outreach options that we were using as participative research (method- and topic-testing workshops). Beside these, my focus will be on discussing the special needs of children (understood as the age group under 18) in museums, concerning the space, the interior design, the way of interpretation and the museum-language. I will introduce how we are trying to solve these challenges with the combination of our ethnographic collection, architectural elements, educational/ psychological methods and some participative gestures. With my presentation I would like to point out what a complex system of thinking, planning and operating is needed to accomplish a really open an easily accessible museum – and also the idealistic manner in what we think about these ethical and social "minimums". A children's museum in a museum that is moving from one representative place of the capital to another; where ideologies, interests and routines of different disciplines and concerned parties confront each other; and where the main goal is to get in touch and serve a much wider group of possible visitors then before: is it really possible here to be open and accessible to all? Following all the concepts of openness, diversity, accessibility or sharing in the different disciplines of architecture, museology or ethnography – will it lead to a total chaos or an outstanding example of cooperation? The designing process of the Museum of Ethnography children's museum is still in operation, so I hope that presenting at WMCAUS will bring some useful and relevant comments from a different point of view as the museum's, some new directions, or old topics that should be revisited.

ACTUAL CONDITION OF EMPLOYEE NUMBER in JAPANESE LOCAL CITIES' CENTRAL AREAS

Miyu Yada, Takashi Nakamura

Tokyo City University, 1-28-1, Tamazutsumi, Setagaya-ku, Tokyo 158-0087 Japan

ABSTRACT

In Japan, the decline of the central urban area is one of the most serious urban problems. It's caused by decreased commercial function in the central urban area, associated with the urban sprawl with disorderly constructed large commercial complex in the suburbs and motorization. In this study, we investigate employee number trend in the central urban area and suburban area. This study targets 35 cities with population ranging from over 100,000 to less than 400,000 that do not fall in the three major metropolitan areas (Tokyo, Nagoya and Osaka). We confirm actual employee number in central urban area from 2009 to 2014, population from 2010 to 2015 and location of large-scale retail facility from 2011 to 2019. This study analyses the relationship between population and employee number , especially paying attention to "Wholesale and retail trade" , "Finance and insurance" , " Scientific research, professional and technical service ", " Accommodations eating and drinking service", " Education, learning support" and " Medical, health care and welfare", which account for a higher proportion in all industry types in central urban area and have distinctive trends. As a result the following points were demonstrated. A: the employee number in almost cities is on a decreasing trend. B: the employee number of" Medical, health care and welfare" in central district is clearly on an increasing trend in all cities. C: the employee number of" Scientific research, professional and technical service " and " Education, learning support" is more slowly decreasing trend than others. D: Large-Scale Retail facilities are on a trend toward suburbanization in Japanese local cities after law amendment at 2000.

Corresponding Author: Miyu Yada

GREEN INFRASTRUCTURE AS CITY DEVELOPMENT PLANNING TOOL

Natalija Ņitavska, Madara Markova

Latvia University of Life Sciences and Technologies, Landscape architecture and Planning department, Rigas street 22, LV-3001, Jelgava, Latvia

ABSTRACT

The role of greenery in the urban environment is priceless - both for maintaining ecological balance, and for enhancing visually aesthetic quality, as well as home to small habitats and the key to urban identity. The development of greenery structures in a city or part of a city is often chaotic and spontaneous - developing greenery only for certain objects and not linking it with one another. Planning of greenery in the urban environment is influenced by several regulatory documents, which mainly focus on the preservation of the existing greenery structure and the restrictions on the planning of the greenery. Unfortunately, the detailed guidelines for the planning of the greenery are not sufficiently reflected in the existing normative documents. The concept of greenery is one of the tools for urban planning that, together with other planning tools (infrastructure, spatial planning, architectural design, urban planning, economic urban development planning, etc.), forms a single framework for urban planning tools that helps develope urban environment smoothly and identify priorities. The concept of greenery is a municipal spatial development planning document which determines the overall structure of greenery and its division in different types of greenery according to the use of the area and functional zone. The document also includes the requirements set by the municipality for the improvement of each area, the design, installation and maintenance of greenery and recommendations for the selection of the plant assortment as well as the qualitative indicators of the greenery for each of the types. The development of greenery plans and concepts has become topical in recent years and more and more municipalities are interested in this planning tool, which helps to plan the distribution of finanses for maintaining the structure of greenery and developing new structure. In the last ten years, four greenery concepts for medium-sized cities have been developed in Latvia, three of which have been developed by our research group, approbating the method described in the article. The aim of the article is to strenghten the concept of greenery, as one of the tools of urban planning.

Corresponding Author: Natalija Ņitavska

THE ACTUAL CONDITION OF THE LANDSCAPE PLAN BASED ON THE LANDSCAPE ACT IN CENTRAL URBAN AREA OF LOCAL CITIES

Ruri Nakatsukasa, Takashi Nakamura

Tokyo City University (Setagaya Campus) 1-28-1 Tamazutsumi, Setagaya-ku, Tokyo158-8557, Japan

ABSTRACT

In 2004, the Landscape Act was enacted to develop favorable urban and rural landscapes. It is thought to deal with a problem of the central urban area revitalization through the application of the system by Landscape Act. In this study, we investigated the actual conditions of landscapes policy, such as the landscape plan and landscape ordinance based on the landscape act in central urban area of local cities. For the purpose, I first analyze questionnaire survey to the local governments of 51 cities with population ranging from over 100,000 to less than 400,000 that do not fall in the three major metropolitan areas (Tokyo, Nagoya and Osaka).As a result, we clarified that landscape plan of 30 cities sort and consider central urban areas. Those cities replied the landscape of the central city area was improving after the landscape plan was devised. Also, outdoor advertisements, vacant stores, vacant houses, high-rise condominiums and buildings, disharmony of the form design for neighboring landscapes, the deterioration and the view inhibition Currently, for those problems expect the deterioration, landscape planning is utilized. But, the measures for the deterioration of the problem are not based on the Landscape Act. I will introduce unique example about landscape improvement.

Corresponding Author: Ruri Nakatsukasa

DESIGN AND PLANNING PRINCIPLES OF THE HOMOGENIZATION OF CONTEMPORARY URBAN MEDIUM (RUSSIAN VS EUROPEAN CITIES)

Ekaterina Kochergina

Institute of Architecture and Civil Engineering, Volgograd State Technical University, Volgograd, Russian Federation

ABSTRACT

A juxtaposition of the urban medium in Russian and European cities can show multiple differences both in spatial organization and in content, affecting functionality, homogeneity, and comfort of city life. Perceived in individual human scale, such differences provoke specific feelings and emotional approaches, an unconscious combination of which characterizes urban medium as positive or negative for living, convenient and attracting, or unfriendly and even aggressive. Among the numerous contemporary planning and design trends actively used in creation of so-called “European urban medium”, several deserve special attention, when it comes to the context of Russian urban space and spatial perception. Even widely spread international design and overall cultural unification has reached actively renovating Russian cities, the gap in development between Russian and European urban medium is still sharp. However, in this case, native for Russian society cultural diversity, overlapping historical layers and particular attitude to the scale of outer space bring possibility for significantly different path of urban renovation, where authentic and unique principles can be developed. The research aims to study the quality of open space through comparative analysis of spatial organization and design principles. Several types of urban medium – closed and open yards in residential area, intermediate space between public buildings and street as a spatial corridor - are taken as objects for study. Implementation of different principles of fulfilment for intermediate, “in between” space considered through the prism of European and Russian architectural practice, urban regulations and social orientation. Theoretical classification of urban patterns is supported by analytic of recently made projects. Such categories as physical penetrability and visual transparency, rhythmical coordination of solid and void massing, visual integrity, openness and closeness of the environment, are considered in horizontal dimension of urban landscape and in vertical dimension of street corridors and facades. In conclusion, overall three-dimensional picture of the spatial perception is supported by the integration of socio-cultural components. Thus, critical overview allows to understand how multiple historical layers and controversial planning principles of several epochs might be articulated to create a homogenized urban medium in global and local context.

DEEPING IN THE GENETICS OF MEDIUM-SIZED CITIES. HERITAGE AS AN IDENTITARY FEATURE IN ANDALUSIA

Clara Mosquera-Pérez [1], Juan Rodríguez-Lora [2], Javier Navarro-dePablos [2], Teresa Pérez-Cano [2]

[1] University of Seville, History, Theory and Architectural Composition Department, Avenida Reina Mercedes, 2. 41012 Seville, Spain
[2] Urbanism and Territory Management Department, Avenida Reina Mercedes, 2. 41012 Seville, Spain

ABSTRACT

Interest in urban agglomerations, metropolitan areas, large cities and in general the spaces where the majority of the world's population is concentrated, has occupied the interest of urban research for decades. According to United Nations sources today the world population is 7.6 billion, will reach 8.6 billion in 2030 and will reach 9.8 billion people in 2050. In Spain, according to sources from the National Institute of Statistics the population reaches 46.57 million inhabitants, although its distribution is not uniform in the territory. Andalusia, with 8.37 million, is the first most populated Spanish autonomous community, followed by Catalonia (7.55) and the Community of Madrid (6.50) with almost one million fewer inhabitants, respectively. Following the same indicators, most of this population already live in large cities and in the upcoming years this figure will increase exponentially. This means that a large part of people will be concentrated in a small part of the territory and, on the other hand, that we begin to have large areas of the territory without inhabiting or with a very low population density. Examining aspects traditionally considered as secondary, involving a minority of the population, has been one of the disciplinary general constants in the last century and that not only affects architects or urban planners. To say medium-sized cities in Europe is to think about urban-territorial heritage, historic landscapes that continue shaping wide territories. In Andalusia (87600 km2), the effects of metropolization are still punctual (3,72% on 778 municipalities). Totalling 778 municipalities, up to 122 of them are listed for their Historical Centres. We find that, only a 3.72% of these municipalities exceeds a population of 50000 inhabitants. Heritage constitutes its 'genetic heritage'. Both considering international and national scales, its historic relevance is noted in Civitates Orbis Terrarum (with 25 Andalusian cities from 34 Spanish). Nowadays, its heritage value is represented by Historic Centres (the first two listed cities in Spain, 1929, were Andalusian), and World Heritage inscriptions. This outlines the necessity of decoding Heritage DNA, as an indissoluble variable prior to planning. The aim of this research is to characterize the European medium-siezed cities and their territory in heritage terms, defining what is the Andalusian territory. Different cultural and productive landscapes are the main actors of medium-sized Andalusian cities: the landscape of fishing, the art of the almadraba, the wine cellars, the olive trees plantations, urban networks of convents are only a sample. The dynamics experimented at this regional level could be extended to the rest of the European countries analyzed in the project.

This research will gather partial results of a R&D project "Patrimonial Urban Characterization and Cultural Tourism Model in Middle Cities. Potentialities and Challenges for its Internationalization: Inner Baetica", funded by the Ministry of Economy and Competitiveness of Spain.

Corresponding Author: Clara Mosquera

SERVICE LIFE, MAINTENANCE, INFORMATION SYSTEM_ RELATIONS AND FUTURE PROSPECTIVES

Maria Azzalin, Massimo Lauria

University Mediterranean of Reggio Calabria, Via Melissari, Italy

ABSTRACT

Today thanks to the commitment of research and voluntary standardization, an important national reference platform is available on terminology, criteria, methods and tools for maintenance and quality assurance over time. It is never a question, with reference to a concrete transfer of the international principles of the service life planning; but the conditions and times are evident also those achieved by the present research, which has made evident features of overlap and integration between the national and international regulatory provisions being compared. Data, bases useful for the management of basic data and of contained values Service of life of reference (RSL) from which to derive from time to time through possibly normative and common procedure, the values of Service Life (ESL) contextualized. For this reason, it is believed that the strong application connotation linked to the need to systematize knowledge on behavior over time, can be considered one of the most interesting elements of the research presented. The proposal has found many opportunities for development thanks to the new national legislative and technical-regulatory framework that, as we said, has been set up starting from the 1990s. Its peculiar characteristic of creating a very close relationship between the different regulatory levels means that the necessary moment of verification and evaluation of the congruity of the hypotheses formulated and of the results achieved is delegated to the actual moment of standardization, i.e. the possibility that these results are taken into consideration and verified during the revision of UNI 10951. The fundamental thesis is that both the evaluation of the service life and the maintenance planning require the availability of the same data; data to be collected and processed so that they become information that can be used for the stated purposes. This is the crux from which this research work began; in the awareness, partly supported and supported by the present work that upstream of any prediction process and therefore of control and programming, there is the phase of knowledge, of data collection that has its answer in the Information System. Based on the objectives set and the relationships between the aforementioned issues of service life and maintenance assessment, the results achieved both on the methodological level with reference to the applicability of procedures already defined in ISO are important; both on the operational level with respect to which the availability of data allows to optimize and guide future choices from the design phase; and finally, as important as possible, the research developments entrusted in part to the definition of the guidelines for future regulatory activities appear to be important. Not only. It is clear that the essential requirement of future research programs on these issues is the openness to active collaborations between all those who in various capacities have an active role in the construction sector, from different research groups, to the world of standardization and, not least , the world of production

Corresponding Author: Maria Azzalin

ARCHETYPE OF THE ALLEYS IN THE CITY - RETROSPECTIVE APPROACH

Rafał Blazy

Cracow University of Technology, Faculty of Architecture, Institute of City and Regional Planning A-5, ul. Warszawska 24, 31-155 Cracow, Poland

ABSTRACT

Alleys are some very important elements in the city. Their role is not only architectural, but also cultural and social. When we are designating characteristic points on a city map, they are very often a significant space in in the wider area, as well as a place that is generally known, recognizable and allowing to determine a location or a reference point. According to contemporary urban definitions, the alleys is a walking, cycling or driving route. The alley also includes the waterway route, planted on both sides with trees or shrubs with a specific composition, that is, keeping the rhythm of planting and landscaping connections. It is also possible to separate the opposite lanes of the road with a green belt. It is a representative element of the city. It is characterized by special natural, cultural, aesthetic and economic values. "Allée" (meaning "the road", later translated into "alley") comes from the French "aller" and still at Dezallier d'Argenville, an excellent French theoretician of the gardens of the eighteenth century, meant quite generally a path in the garden or park with accompanying vegetation. In the article, the author included an archetypal analysis of the alley function in the city in the light of historical and cultural changes that taking place in the contemporary times. The alleys create permanent - stable forms in the landscape. One of the oldest is the Chestnut alley in Croft Castle from the beginning of the 17th century, in Poland it has 250 years of lime tree in Margonin. Many alleys from the first half of the last century can still experience another hundred years. Unfortunately, they are cut under the pretext of increasing the number of car accidents. On the other hand, due to excessive car traffic and related environmental pollution, the alleys lose their recreational significance. The role of the alleys in the city is changing. Usually it was a system that always associated with fashion and prestige. The author in the conclusions showed that the main values of the alleys should be cultivated today, their most important feature from the archetypical point of view should be recreation and economic opportunities. The article shows that, to a lesser extent, today's alleys should have communication importance. Because car traffic is no longer synonymous with progress of civilization and technical achievements.

REVITALIZATION OF RIVERSIDE BOULEVARDS IN POLAND: CASE STUDY ON THE BACKGROUND OF EUROPEAN IMPLEMENTATION

Blazy Rafał

Cracow University of Technology, Faculty of Architecture, Institute of City and Regional Planning A-5, ul. Warszawska 24, 31-155 Cracow, Poland

ABSTRACT

River banks have recently experienced a real renaissance, this form of development of the city areas located directly in the vicinity of the river is often treated as a showcase of the city. More and more cities are opting for the revitalization of heavily degraded areas bordering the river. Rivers, which in past were an area "unfriendly" to man through close proximity to industrial areas and transport functions have become currently often an attraction on the scale of the whole city and even the region. The author presents examples of revitalized boulevards in Poland, for example: Vistula Boulevards in Warsaw, River banks in Bydgoszcz, Vistula Boulevards in Krakow, Biała river bank in Bialystok, Marshal Józef Piłsudski Boulevard in Włocławek, Filadelfijski Boulevard in Toruń and Józefa Zwierzyckiego Boulevard in Wrocław . The aim of the study was to compare selected tapes of revitalization of these areas in Poland with selected foreign examples. In the conclusions, the author showed the factors determining their current function and character depending on their historical significance, location and function, and specially the current location in the functional and spatial structure. To a large extent, the current function of these public spaces is determined by the size of the city and their location in relation to the centre. Distance from other open public spaces, especially green areas, is also significant. The most frequent activity in these spaces is the improvement of their pedestrian and bicycle accessibility through the construction of paths, ramps, slipways and footbridges. The second basic action is the change of the status of these areas and the attempt to include them in the park area system, giving the status of recreation and leisure places for residents and tourists. Foreign examples The Rio Madrid Avenue in Madrid, the Quai de Conti in Paris and the Rheinauhafen Boulevard in Cologne show a fairly diverse approach to this issue, while expanding the scope of possible actions.

HOMES OR HOSPITALS, AN URBAN PLANNING APPROACH: THE CASE OF AMMAN CITY, JORDAN

Firas Sharaf

Dept. of Architecture, School of Engineering, The University of Jordan, Amman, Jordan

ABSTRACT

Health facilities are vital services in cities and often shared between public and private sectors. Planning public health services considers factors, such as population density, distance and distribution of health services in cities. This paper investigates the planning of private hospitals in urban areas and explores an evaluation criteria concerning hospital impact on urban areas of the city, particularly, on residential and commercial uses, circulation and parking. Four private hospitals examined in this study in Amman city taking location, zoning ordinances, site characteristics (area, accessibility, parking, etc.), building regulations, expansion and architectural style as factors of evaluation. Investigation includes resulting urban situation and alternative improvement approaches to hospital planning. Existing private hospitals in residential zones and resulting land use change to medical and commercial use in hospital area and accompanied large car traffic volume and parking hazards were dominant findings in the case study hospitals. A containment approach is explored to reduce negative impact of hospital on its neighborhood in addition to urban design approach to maximize existing medical services and amenities. Planning future private hospitals need to consider availability of space for consequent commercial and medical facilities in hospital area, such as private clinics, labs, pharmacies, accommodation for patients and their companions in furnished flats and small hotels. Location of private hospital should be in accessible areas of the city, but avoiding residential zones to prevent generating an excessive and continuous change of buildings use from homes to medical commercial facilities. İn addition to pressuring street capacity and availability of adequate car parking for hospital area attendants.

LOCATION OF UNIVERSITY BUILDINGS IN THE SPACE OF MEDIUM EUROPEAN CITIES AND SZCZECIN

Marek Wołoszyn, Magdalena Zych

West Pomeranian University of Technology Szczecin, Department of Housing Architecture, ul. Żołnierska 50, 71 - 210 Szczecin, Poland

ABSTRACT

Higher education in many cities is the dominant function. Often universities are characteristic city elements with specific layout, climate and tradition. The purpose of the article is to identify and discuss how to locate academic buildings in a city space. The analyzed objects are European medium-sized cities with academic traditions, in which there are min. two universities. What are the types of locations of academic buildings and what does it mean? To observe the most frequently repeated urban patterns, European cities with a population of 300-500 thousand in which there are more than two university buildings were analyzed. Buildings with an academic function, belonging to both public and private schools, were taken into account. Five cities were selected for analysis: Szczecin (Poland), Mannheim (Germany), Dublin (Ireland), Edinburgh (Great Britain), Kaunas (Lithuania) and two campus universities located in Kiel (Germany) and Birmingham (United Britain). The analysis allowed to distinguish four layouts of academic buildings: dispersed, semi-open, compact and campus. The synergy of academic functions strengthens individuals in diverse community. Separated academic spaces in the city allow for greater integration of the academic community and strengthen the feeling of being the host of this space. This causes more initiative and inventiveness in student life. Academic teachers could easier create interdisciplinary teams, which is beneficial for the level of science. As K. Wejchert wrote in the book "Elements of urban composition": *The space surrounding man should be a specific work of art, because it can influence his mental state, giving him peace, joy, and provoking its comprehensive development*. The analyzes have proven the superiority of compact locations (and even campuses) over the dispersed one. Cities and universities where a distributed system is found must focus their efforts on changing this state.

Corresponding Author: Marek Wołoszyn

THE HIDDEN COSTS OF URBAN AND TERRITORIAL PLANNING

Luigi Mundula

Department of Civil, Environmental Engineering and Architecture (DICAAR), University of Cagliari, via Santa Croce, 67 – 09124 Cagliari, Italy

ABSTRACT

Approaching the urban and territorial planning process two main facts need to be considered. First, this activity, as a decision-making process oriented to define and introduce specific policies, is generally influenced by the actions of pressure groups. Second, urban and territorial planning, via the conditionings and limits imposed upon the ways in which land can be used, may affect many social dynamics in ways where there is not always a clear distinction between the costs and the benefits. This research field is favored, in particular, by a growing and fruitful discussion between lawyers, economists and planners on issues regarding the effects of laws, regulations and other types of regulatory provisions. This directly concerns urban and territorial planning, because its central focus are the rules governing the ownership and the uses of the land, i.e. of a factor of production that continues to be the cornerstone of economic development. The impact of such a form of regulation affects, in first place, the localization of human settlements and the related economic activities and then the price system of land and buildings, but more generally, as it can be easily understood, the overall wellbeing of the citizenry. The urban and territorial planning process has so both explicit and implicit (or hidden) costs. The contribution highlights these issues using the economic analysis tools and aim to consider in particular the hidden costs of the urban and territorial planning. More in detail three different typologies of hidden costs affecting the urban and territorial planning has been considered, namely: transaction, operational and assessment costs. The results of the analysis highlights how the planning process allow to protect public goods, such as environmental health and safety, as well as ensure competitive markets. But an excessive or misusing of the planning instrument is harmful, produces unnecessary costs for businesses, citizens and public institutions, fuels corruption, improves injustice, paralyzes economic activities and loads the action of government. Too many rules or confusing and contradictory rules are equivalent to no rules. The normative proliferation feeds the uncertainty and asymmetric information, increases the possibilities of interpretation encouraging elusory behaviors that constitute the first step towards the illegality. Improving the planning system is therefore an essential prerequisite to modernize the countries, but taking actions to correct, from time to time, individual dysfunctions caused by wrong, outdated, unnecessary invasive and rigid rules it's not enough. It is necessary to change the decision-making process, from hierarchical systems to a more complex system that involves participation, monitoring and evaluation and is able to help decision makers to better understand the outcomes of their choices (minimizing the cost for the public institution), to limit (if it is not possible to eliminate) the opportunistic behaviour and, if verified, to punish it immediately.

COMPARATIVE STUDY OF FORMAL PUBLIC TRANSPORT NETWORK AND INFORMAL PUBLIC TRANSPORT NETWORK OF NAGPUR, INDIA

Rajesh A Sawarkar, Akshay P Patil

Department of Architecture and Planning, Visvesvaraya National Institute of Technology, Nagpur, India

ABSTRACT

In developing countries along with formal public transport network (*FPTN*), informal public transport network (*IPTN*) also plays an integral role by achieving high public transport ridership. *IPTN* caters effectively to the user's expectations and appears to be highly integrated with urban fabric. *IPTN* either complement the existing FPTN or compete with the existing *FPTN*, even though due credit is not given to *IPTN* and considered as unlawful entities. Efficiency and robustness of transport network is based on topological structure of network. To summarize which network is more efficient and robust, the study tests the network parameters of formal Public Transport Network and Informal Public Transport Network of Nagpur (India). Topological measures of network structure have been tested based on elementary concepts of graph theory. We explore the network structure and their properties. The practical significance of the network parameters was then analyzed. In the *IPTN* the degree of small-worldliness is smaller, as compared to *FPTN*, indicative of *IPTN* being more robust as compared to *FPTN*. This study provides an approach to understand the efficiency of an Informal public transport network in combination with Formal public transport network. The article identifies the importance of Informal public transport network to improve the Complementarity with the formal public transport network. Integrating formal and informal transportation network into a hybrid network has the potential to induce the desired relationships amongst *FPTN* and *IPTN*, i.e. either competing or complimenting nature to improve the overall efficiency of *FPTN*.

Corresponding Author: Rajesh A Sawarkar

PLANNING FOR THE NORTH-EUROPEAN WATERFRONT CITIES

Piotr Lorens

Gdańsk University of Technology, Faculty of Architecture, ul. Narutowicza 11/12 80-233 Gdańsk, Poland

ABSTRACT

Redevelopment of urban waterfronts is one of the leading themes in contemporary planning practice. This issue is a subject of interest to many scholars and practitioners, associated with development of waterfront cities. In literature on this topic one can find a lot of information regarding leading examples of this process, discussion of issues and problems associated with this phenomenon as well as analysis of the results achieved. In addition, many specialists in this field managed to developed a sort of “guide of good practice” for cities and planners interested in undertaking an effort associated with reshaping the waterfront site. But one can easily spot that most of the cases discussed are based in climate zones allowing extensive public use of the waterfront sites for the most part of the year. In addition, most of the appraised cases are located in the relatively large cities, which allowed development of the diversified urban program and extensive networks of public spaces. Therefore, the phenomenon of waterfront redevelopment is frequently associated with extensive development of large scale urban structures, in the climate realities allowing extensive public usage of these. On the basis of the “success stories” of many cities undertaking the waterfront urban redevelopment process also municipalities located in “less privileged” from the climate point of view areas as well as small- and medium-sized cities tend to rethink their water related urban structures. This relates both to cities located in the hot and cold climate zones – which to large extent make the traditional type of waterfront redevelopment patterns unviable, both due to climate conditions and – being the result of those – different economic and cultural realities. In result, the design patterns based on the traditional “success stories” seem to be unsuitable for these locations and the designers and developers of waterfront sites located in such cities have to look for the alternative solutions. Same applies to small- and medium-sized cities, which not necessarily bear potential for implementation of the mixed-use, large-scale urban projects. In these cases also the problem of relations between “global” trends associated with development of mass tourism as well as with implementing the typical mixed-use patterns and specifics of local economy and cultural environment has to be taken into account. Within the proposed paper the specifics of small- and medium-sized waterfront cities, located outside the “climate comfort zone” will be elaborated. Within this group the special attention will be paid to the cities located in the northern Europe. Usually these are small and medium –sized municipalities, rarely aspiring to become the leading centers of urban development in their respective countries. At the same time their economy was traditionally based on fishing, small-scale maritime industries and local trade. In addition, in many cases these cities are not extremely attractive for mass tourism and are located aside from major transportation routes. Therefore, it seems necessary to rethink the “urban waterfront development pattern” within these sites, as the strategies based on copying the solutions known from larger cities cannot be effectively used.

CIVILIZING THE PUBLIC PARTICIPATION PRACTICE IN POST-TRANSITION COUNTRIES

Piotr Lorens,

Gdańsk University of Technology, Faculty of Architecture, ul. Narutowicza 11/12 80-233 Gdańsk, Poland

ABSTRACT

The phenomenon of public participation is not so new to both planning theory and practice. In fact, involving local community in the decision-making process regarding local urban development directions is widely discussed and a number of various forms of these are being introduced. Some of the innovative initiatives associated with this were also promoted by ISOCARP (as i.e. the WikiCity initiative of the City of Amsterdam – 2008). Moreover, developing various forms of public participation in this matter has become a standard planning practice in many countries and communities. It takes different roles and – depending on the level of development of the public discourse on development issues as well as on the specifics of local democratic control mechanisms – may be regarded as just an addition to the regular planning procedures or as some sort of substitute to them. In case of so-called post-transition countries (which include post-socialist states as well as countries facing just economic transformation) the demand for public participation is extensively and rapidly growing. It has to be noted that just a few years ago involving local community into the urban development decision-making process was regarded as a kind of novelty and rarely treated seriously. But along with development of the democratic societies, understanding by the people that their opinion matters as well as with growing mistrust to the local planning and municipal management elites completely changed the situation. Local communities started not only to verify the development and planning decisions but also to demand more participation in this process. In many cases this has led to the situation that no planning or development decision could be made without a public consent, which – in realities of diversified opinions and interests represented by different groups of stakeholders – had led towards stopping any development and not making any decisions at all. This means that development of the civil society – in realities of the lack of political and democratic culture – led to the paralysis of the decision-making process, which especially relates to the most disputable projects and plans. Of course, this issue has not been left unnoted by both central governments and by local municipalities. Also, various groups of local activists have understood that negation of any plans and decisions made (especially) by local governments is not a solution and can lead towards stagnation. Therefore, various programs and initiatives leading towards making public participation part of the “civilized” planning and development decisions-making process were introduced. One can mention here a number of different forms and initiatives of different magnitude, which are currently changing the decision-making procedures. Within the paper a special attention will be given to the Polish case, which is one of the most interesting due to diversity of forms of public participation introduced, an array of practices tried and tested, and – finally – due to making this a part of the formal urban regeneration planning process. Therefore, results discussed and presented shall allow discussion of the possible inclusion of the Polish experience in the planning practice of other countries and regions, with a special focus on countries in transition.

Session Title:

Public Space

WATER IN THE ARCHITECTURAL AND URBAN PLANNING ASSUMPTIONS OF CZĘSTOCHOWA

Malwina Tubielewicz-Michalczuk

The Technical University of Częstochowa, 69 Dąbrowskiego Street, 42-200 Częstochowa, Poland

ABSTRACT

Emerging trends in architecture and urban planning in the last decades concern the use of water as an important element creating both the image of the city, the environment and the landscape. The subject of the research is an analysis of ways of shaping contemporary public spaces on the example of water in the city and the nearest surroundings. The aim of the article is to show its impact on shaping urban development, natural and cultural environment. The subject of the publication is a systematically done research concerning architecture, architectural and landscape space of the area located above the Warta River flowing through Częstochowa as well as fountains and water reservoirs newly built in the city. The article discusses innovative solutions aimed at connecting the river and water objects of small architecture with innovative solutions of architectural designs of urban buildings created for people and friendly to the environment in which they reside. The author characterizes the process of creating sustainable urban environment. The dominant activities include: project sustainability consisting of planning the integrated space between the facility and the existing environment, combining topography and hydrology, the use of modern and ecological materials, the introduction of native plant species. There is also presented a discussion of the role of location, shape, natural values of areas with the various forms of water found in their area and their impact on the microclimate and aesthetics of the surroundings. It shows the main trends regarding the modernization, reconstruction and design of the modern public space, which include innovative ways of using water in designed spaces. It shows that sublime forms of fountains are designed serving their purpose accurately, enliven the surroundings, bring some dynamics, reflections, and they are a source of various sounds too. Suitable integration of water with urban construction or access of open space to the river create the environment of individual character and unique shape, harmoniously connected with the whole city. Creative and innovative design solutions with the use of water make the space friendly and attractive for people, and they have a positive impact on the sustainable environment. The paper includes situational and altitude plans of the analyzed area, photographs and bibliography.

HETEROTOPIC URBAN [A]DESTINATIONS

Igor Guatelli

Mackenzie University, R. da Consolação, 930, Prédio 9- Consolação, São Paulo - SP, Brazil

ABSTRACT

Different from the Utopias, normally treated as a unique projection of an ideal future, despite their multivalent potentiality of refusal, the heterotopies (other spaces) are always plural, multiple unique places in their existences; places at the margin of universal and universalizing logics. The term is connected to one of the discussions held by Foucault on the existence of unique spaces, which dispositions in the society transform them in deviant or diachronic spaces in relation to the cultures in which they are inserted. They are spaces administrated and managed according to quite specific laws. On the one hand, they are inverted images of the logic to which they belong or which they reflect; spatial differentiations resulting from the social realities and logics of which they are repressed and begin to illustrate in an inverted manner and. On the other hand, they take on the role and the chance to be spaces with a onto-teleologic dimension (existence and purpose) that may be disturbed by temporary situations capable of introducing other impermanent operating logics (events of heterochrony). Which were the logics that came as social and spatial becommings “with” these new pedestrian lines, these heterotopic places: the “parked” infrastructures Viaduc des Arts in Paris, the Spitellau Viaduct in Wien, the High Line Park in New York and the still “hesitant” transformation of Elevado João Goulart, in São Paulo, into a park ? Which infrastructural spectra are those which, when they return as antagonists of what they were or what they insist on being, deflagrate other sociabilities? What was expropriated from these infrastructures at the moment they returned and return, and are socially re-appropriated, according to another city-planning logic? What is in front of us and what is still to be seen as an urban and social phenomenon? This entity that returns is edited by visible and spectral forces, invisible, or by what is apparently beyond and beneath the thing, surrounding it, underlaying it but, even so and despite of it, already is or still is the thing itself. Under the aegis of the city for the people, the right to the city as a retake and return to and of the public space, the *flânerie* as urban strolling and wandering, the city of merchandising is consolidated by a technical engendering of a successful or unsuccessful [always democratic?] other place, product of a not revealed or unraveled tactical desire.

NETWORK BUILDINGS: DEFINITION AND ASSESSEMENT

Alexandra R. Vieira [1], Jorge T. Ribeiro [2]

[1] University of Lisbon, CIAUD, R. Sá Nogueira, 1349-063 Lisbon, Portugal
[2] University of Lisbon, Lisbon School of Architecture, CERENA, R. Sá Nogueira, 1349-063 Lisbon, Portugal

ABSTRACT

The International Congress of Modern Architecture (CIAM), through the Athens Charter of 1933, strongly advocated the creation of open urban spaces as an essential principle of urban planning, referring to open spaces such as the city's lungs. It is certainly for this reason that several authors choose the green spaces and urban parks of cities as the fundamental open public spaces to integrate in the design of new cities and in the rehabilitation of the oldest or parts of these. However, in the older cities, namely in their older core cities, or in compact cities the physical limitations, to a certain extent, make the existence and creation of this type of urban public space unfeasible. Above all, in these cases, the increase in the attractiveness of the public space should focus on the morphology of buildings, particularly on the ground floor, as it is also defended by several authors. In this context, this paper is dedicated to the definition of a new concept of building - network building (of generalized application to isolated buildings or set of buildings), whose conceptual characteristics have taken into account criteria of polyvalence, flexibility, adaptability, durability, sustainability, permeability and aggregation of functions. The role played by these buildings establishes connections and promotes pedestrian mobility, the interconnection of places of conviviality or daily use of the public space. These buildings also contribute to the diversity of activities of work, leisure, culture and housing, generating vitality of the environment and qualification of the urban areas where they are inserted. In addition to the definition of the new concept, an empirical assessment based on the adaptation of the correspondence analysis to the discriminant analysis is made to classify, in relative terms, 37 buildings of the city of Lisbon of the last 70 years.

Corresponding Author: Jorge T. Ribeiro

USERS' PRIORITIES AND THEIR INFLUENCE ON CITY SPATIAL IDENTITY

Melita Rozman Cafuta

University of Maribor, Faculty of Civil Engineering, Transportation Engineering and Architecture, Smetanova ulica 17, 2000 Maribor, Slovenia

ABSTRACT

The article explores holistic approach of understanding that the concept of the city is not only material reality, it is also a mental structure that results subjective perception. Users play an important role because it is essential to know how they sense the city. Their environmental perceptions reflect their spatial priorities. Spatial identity is reflection of what they see and feel. In such context human well-being is more important as architecture aesthetic, technological possibilities and environmental protection. A three domain scheme was created in order to determinate user profile. Users act in accordance with psychological priority, sociological priority and aesthetic-functional priority. It is assumed that environmental perception varies during different time sequences. An empirical research was conducted, based on analytical method of mental mapping. For the research location Maribor city, as the second largest Slovenian city, with an important central regional role, has been chosen. A sample of 200 respondents was taken. Within 20 minutes they were asked to draw a city map twice, once for the day - time city and once for the night - time city. Obtained graphical results reflect a subjective mental image that reflects spatial idea of individual thinking mode. Iillumination strongly influenced environmental perception and focused city awareness along the most commonly used routes that are different between day and night. When processing the results, 37 features, more or less frequently detected, were exposed like: streets, squares, open green areas, morphological features, architectural attractions of individual buildings, unique urban equipment, and more. 34 features were different evaluated by day and by night. It is possible to say, that modified spatial circumstances effect the perception and utilization of urban space. The research results show that spatial identity of the city depends on time. Proposed scientific approach is useful tool in decision making and urban planning process or lighting strategy preparation.

LANDSCAPE ARQUITECTURE AND SHAPES

Filipe Lacerda Neto

University of Beira Interior, Calçada Fonte do Lameiro, Edifício II Engenharia, 6200-001 Covilhã, Portugal

ABSTRACT

Nowadays, the word landscape is used to name very different realities and, frequently, very far from its original meaning, which is connected to the rural territory. The adjectives that are usually used with it help to define its meaning and to extend the conceptual framework in which the word landscape is integrated. Therefore, we can talk about interior landscapes, musical landscapes, artistic landscapes, poetical landscapes or human landscapes. Creating contextual architecture means incorporating into the project data, guidelines or relations imprinted in the territory or place of the intervention. This amounts to link the architectural work with the structures which define the area where it will be located. The new intervention becomes another layer of the process of transformation and it can be consistent or collide with what already exists, in terms of form. This document aims to fulfill the primary need of pointing with precision the conceptual framework in which what has been defined as Landscape Architecture and Shapes is integrated. It is a discipline that studies the analysis and assessment of the material, environmental and formal conditions of the landscape, but always oriented towards the production of open spaces through the project and the implementation of specific techniques. This article intends to offer a broad and systematic perspective of the different aspects involved in Landscape Architecture, with the support of relevant examples of the contemporary culture of the landscape.

DESIGN PROBLEMS OF TOURISM INFRASTRUCTURE FOR PEOPLE WITH DISABILITIES IN PROTECTED LANDSCAPE AREAS IN POLAND

Alicja Maciejko [1], Bogusław Wojtyszyn [1], Agnieszka Skrzypczak [2]

[1] University of Zielona Gora, Department of Architecture and Urban Planning, ul. Prof. Z. Szafrana 1, 65-516 Zielona Gora, Poland
[2] Gardens Agnieszka Skrzypczak, Polichno 136 E, 26-060 Chęciny, Poland

ABSTRACT

The article presents problems of designing tourism infrastructure for people with disabilities in protected landscape areas. These aspects will be discussed on the example of a project implemented in Gory Stolowe National Park in Poland. The proper architectural solutions of the protected mountainous areas are response to improves the quality of life of turists and also people with disabilities. For public space in urban areas and in architectural buildings, removing barriers and accessibility for people with disabilities are legally guaranteed in Poland. However, there are no legal regulations that provide space in the open landscape. According to the authors, the definition of public space does not refer to space of highly urbanized places, but to all places, in which people meet with each other. The places in the open landscape may be also called public space. To a certain extent (limitations may be caused by different terrain conditions each time), this space should be organized in such a way as to provide access for all users, while at the same time protecting the natural resources that are made available for tourist traffic. The degrees of difficulty and possibilities of access should be described in detail so as not to exclude any user. However, any investment in protected areas is connected many formal, legal, technical and aesthetic problems. Theoretically, these areas should be free from any forms of human development and interference in the natural environment and all activities should be subordinated to nature protection and take precedence over other activities related to making them available to the public. All nature and specific features of the landscape are subject to protection. In the public space the most important accessibility for all users, safety of use and public good. In the protected mountainous landscape, accessibility is limited, routes are adapted to tourist traffic in a narrow range, interference in natural landscape and nature systems is strictly controlled and monitored. In the situation of activities in the field of tourism and recreation, which even force to extraordinary physical effort, because the facilities are located in hard-to-reach places, where it is impossible to maintain the standards required for public space, it is reasonable to subject the tourist and recreational infrastructure to the requirements availability and ergonomics? Gory Stolowe National Park are looking for architectural solutions that would change the image of the place closed for disabled people and adapt park to the requirements of modernity in this field. There is no possibility to grant access to all the users, because of the landscape conditions (slopes) as well as difficult location conditions. Does it make it impossible for the disabled to use the space? In fact, there are many possibilities. The needs of the disabled should be fulfilled not only through adequate space projects, physically assistance help disabled people in overcoming barriers, professional, off-road wheelchairs with increased mobility, which can parks be equipped with , but also through the modern technological solutions (smart phones, applications, GPS, sounders) and also through the adequate assistive devices.

Corresponding Author: Alicja Maciejko

TOURISM INFRASTRUCTURE PROVIDING ACCESS TO AREAS OF PROTECTED LANDSCAPE AND NATURE IN POLAND: SELECTED EXAMPLES

Alicja Maciejko, Bogusław Wojtyszyn

University of Zielona Gora, Department of Architecture and Urban Planning, ul. Prof. Z. Szafrana 1, 65-516 Zielona Gora, Poland

ABSTRACT

The article presents design problems of tourist infrastructure in protected landscape and nature areas in Poland. They concern discrete regulation of the intensity and course of leisure and tourist traffic towards and within protected areas. Such regulation can only be carried out on the basis of the structure of accessibility of areas covered by protection and spatial development plans, shaped in accordance with environmental conditions. The quality of access to protected areas is also significantly influenced by the architecture of tourist infrastructure objects presented in the article. It concerns selected objects of small wooden architecture designed in areas with special landscape and natural requirements, which have been implemented in Poland in recent years. These objects are small elements, e.g. signposts, information and educational boards, benches, tables, waste bins, rest shelters, objects at entrances to protected areas (gates), ticket offices, as well as impressive engineering structures built in difficult terrain conditions, e.g. terraces, platforms and observation towers. Design in a protected and inaccessible landscape is connected with many formal, legal, technical and aesthetic problems. These are also stereotypes concerning architectural forms, attachment to the traditional style called "highlander" and the conviction of the impermanence of wood. The article analyse five important problems: (1) designing in protected landscape, (2) possible degradation of natural landscape elements, (3) designing in the existing cultural landscape of the Sudety area in the form of regional architecture with very strong and characteristic stylistic elements (4) designing contemporary architecture, taking into account strength requirements, durability in a difficult climate, functional and technical aspects and (5) designing for physically active and disabled people with different degrees of physical activity and the ability to adapt and access routes (which by nature are difficult to access) for people with different disabilities, under ergonomic and safety t conditions. The groups of users of this architecture include: people in wheelchairs, people walking with crutches, walking sticks of prostheses and other equipment, people with manual impairments, blind and partially sighted people as well as deaf and hard of hearing people. Due to the existing environmental conditions, not all projects of this kind of tourism infrastructure are willingly implemented in every place in protected areas. These issues will be presented on the basis of many years of research and design works concerning protected areas in Lower Silesia (arch. Bogusław Wojtyszyn) and original designs (arch. Alicja Maciejko and arch. Mirosław Strzelecki) realised on the tourist routes of the Gory Stolowe National Park.

Corresponding Author: Alicja Maciejko

CONTINUITY AND TRANSFORMATION OF OPEN SPACES IN LARGE HOUSING ESTATE DEVELOPED UNDER SOCIALISM IN PRAGUE, CZECH REPUBLIC

Yuno Tanaka

Tokyo Institute of Technology, W9-93, 2-12-1 Ookayama, Meguroku, Tokyo 152-8550, Japan

ABSTRACT

After WW II, large number of housing estates have been developed all over the world. Especially in the socialist countries at that time, prefab panel housings had been constructed quickly before the completion of neighbourhood facilities and open spaces. In Jižní Město, one of the largest housing estates in Prague, various open spaces and public facilities had been planned in 1960s but many of them had not realized as planned and remained without maintenance. However, it has been decades after the development and now the regeneration of these open spaces has been taken place. In this paper it is clarified that the regeneration way of the open spaces depending on their own backgrounds and present situations. First, I clarified the original concept and present situation of open spaces in Jižní Město by archive documents and field survey. Next, I clarified the present policy and idea of the regeneration by interview with the municipality. When new building is constructed in Czechoslovakia under socialism, it was enacted that the part of the construction fee had to be used for artworks. At the development of Jižní Město, concept of open spaces and arrangement of artworks were mentioned in a document of development plan. According to the document, every design should be designed not only for individual building or plot, but also the whole area of Jižní Město. Besides, the area inside of Jižní Město was divided into five parts and each of them had own theme. Various art works -mainly sculptures, some reliefs and fountains etc.- were planned under each area theme. In addition, a design competition of courtyard and street furniture was held. This design process means the original concept of open spaces in Jižní Město paid attention to the artistry of place. Present regeneration of open spaces in Jižní Město is designed in a shorter period of time and smaller scale than original plan because it can be cancelled in the course of planning if it takes long time. Furthermore, the successful realization of regeneration can raise awareness of neighbours about open space and make cooperative relationship easier on future regeneration. Each regeneration of open space considers existing objects, neighbours' needs and relationship with surrounding buildings and facilities. For example, a sculpture designed in socialist era remains until today and became part of the regenerated open space. On the other hand, more functional materials such as laundry drying tool or sandbox are planned to remove when they have not been used anymore. An existing desire path route remains as a paved path in new regeneration plan considering inhabitants' convenience. The functional materials in open spaces can be changed flexibly by regeneration depending on the inhabitants' needs and it can make open spaces more comfortable and convenient. However, at the same time, some artworks created under socialism are preserved and trees planted decades ago are now grown and provides rich green areas. These kinds of continuity indicate the history of the place through transformation.

Corresponding Author: Yuno Tanaka

TRANSPORT ASPECTS OF SHAPING THE PUBLIC SPACES OF PUBLIC SPACES OF URBAN SQUARES IN WARSAW

Andrzej Zalewski

University of Science and Technology in Bydgoszcz, Faculty of Civil and Environmental Engineering and Architecture, Prof. S. Kaliskiego Avenue 7, 85-796 Bydgoszcz, Poland

ABSTRACT

The paper presents the issue of transport aspects of shaping the public spaces of urban squares in Warsaw. In terms of infrastructure solutions and transport service, 30 Warsaw squares situated in various parts of the city were analyzed: the size of the square measured by the surface of the square, road and street layout of the square. The results of the analyzes carried out indicate that the squares analyzed are a very important element of the functional and spatial structure of the city of Warsaw. The test squares are characterized by a very large diversity: in terms of surface area, street layout solutions shaping the structure of the square, the functions and categories of administrative streets passing through the square, traffic load and the form of public transportation and bicycle transport service. As a result of the analysis of the spatial layout and the function of streets serving squares, 5 types of squares were distinguished in terms of transport: pedestrian square, autonomous square, urban square with local traffic, urban transit square of 1st and 2nd category. Pedestrian zones and green zones with dominant traffic are an important element of shaping the space of squares and significantly affect the function of a given square. The analyzes show that, especially in the area of the center, there are relatively few parking spaces located in Warsaw's squares, and this number is decreasing. This is the result of the actions of city authorities promoting sustainable development policy, including trips to the center and downtown by public transport and bicycles.

WATER IN KRAKOWS GARDENS, PARKS AND AREAS OF GREENERY

Agata Zachariasz, Karolina Porada

Cracow University of Technology, Faculty of Architecture, Institute of Landscape Architecture
Landscape Planning and Composition Department, address: Warszawska 24, 31-155 Kraków, Poland

ABSTRACT

In park and garden design, one of the more valued assets of the natural environment is water. Perceived as the source of life, it has always constituted an essential element of garden compositions, one that is both impressive and symbolic. In subsequent historical periods, designers expanded the possibilities of using water in garden layouts and since the nineteenth century waterfront areas have been an important element of shaping systems of urban parks. The article features a characterisation of the participation of water and waterfront areas in Krakow's gardens and areas of public greenery. The matter of both waterway systems that order the structure of the city, anthropogenic or natural pools, as well as details decorating park spaces were discussed. One of the most essential elements that have crystallised Krakow's urban layout are so-called river parks. The presence of rivers in the city significantly improves its visual attractiveness. Natural points, sequences of views and exposed places are highly distinct, in addition to an attractive waterfront landscape with outstanding landmarks. This is confirmed by historical panoramas and contemporary conceptual proposals of walking areas and boulevards. River parks, which are linear, show highly diverse landscapes, the separate tradition of places, their own identities, including natural identities—not limited to the Vistula River valley—as the Vistula is the main river. Natural and artificial bodies of water and their accompanying recreational areas, e.g. Zakrzówek, Bagry or Przylasek Rusiecki, have a significant share in shaping Krakow's areas of greenery. Water is also present in Krakow's gardens and parks. Its visual qualities, the charm of shimmering light, reflections and the dynamism of, among other things, water jets on a smooth water surface, as well as its sound have all found their use. In gardens or manorial or palatial parks it often constituted an essential compositional element, e.g. in the garden of Łobzów, the parks of Dębniki or Prokocim. It did not survive in any of them. Later on it also became an important part of the programme of public parks, with pools or ponds located, among other places, in Planty Park and Park Jordana. To this day it brings joy and refreshment to its users in the form of representative fountains and water jets. In the article it was presented just how diverse functions does water play in the composing of Krakow's areas of greenery—from the detail to the planning of its urban structure. The fact that, particularly recently, a frontal turn has been made towards the Vistula, as there were voices that the city had its back turned to it. At present, public areas that are open towards the water are being designed. Designs of waterfront areas that have recently been completed in Krakow and which constitute a result of competitions, were shown as well. These include the parks in Zakrzówek or near Płaszów lake. This proves that water still remains an inexhaustible source of inspiration and its accessibility in areas of public greenery attracts large amounts of users.

Corresponding Author: Karolina Porada

Session Title:

Urban Design

PROTECTION OF NATURAL AND CULTURAL ENVIRONMENT IN PATARA SPECIAL ENVIRONMENTAL PROTECTION AREA

Mehmet Tunçer

Cankaya University, Faculty of Architecture, City and Regional Planning Department, Ankara, Turkey

ABSTRACT

PATARA is the capital of ancient Lycia and is located in the Patara Special Environmental Protection Area (SEPA) with 193 km^2 face measurement, where the natural and cultural values to be protected are concentrated. With its ancient past and important location, Patara was first known as 'Pttara', so named by the indigenous Lycians, who called themselves the 'Trmmili'. This meant 'city' in the Urartean language. The Hittites called the city "Patar". Tudhalia IV, the Great King of the Hittites said "I offered gifts and sacrifices in front of the Mount Patar, erected steles and built holy places". A part of the ancient city of Patara (Necropolis area), Gelemis Village is located within the boundaries of the settlement. Patara I. Degree, Gelemiş Village settlement III. Degree Archaeological Site has been determined as. In terms of biodiversity, Patara SEPA, which is located in the Mediterranean phyto-geographic region, contains an important wealth in terms of plant and animal cover and ecosystem diversity. Within the limited framework of this statement, the studies and problems related to the protection of natural and cultural values within the Patara Ancient City and its vicinity (Gelemis Village) within the Patara SEPA will be conveyed and suggestions will be developed. Patara is still one of the most well-preserved antique cities of Anatolia. Archaeologists dream to see Patara in The World Heritage List. This would be the final preservation shield for the antique stones, green leaves, footprints of Caretta caretta and for the blue Mediterranean with its shining sands. It is also the dream of many people who know and love Patara, that its unique past and beautiful landscape should be preserved for future generations. A rival to Ephesus, it fully deserves inclusion in the World Heritage Site programme. Nowadays; the villas, which started to be built around the ancient city of Patara in Kas, Antalya and caused great reactions, entered the agenda of UNESCO. Upon application of MEDASSET, the villas in Patara, which were allowed to be built under the protection development plan, also mobilized the UNESCO World Heritage Convention (ICOMOS). In 2009, Turkey Patara's 'world heritage' have applied to be on the list, but despite this villa built in the region had been subject to criticism.

EVALUATION AND PROPOSALS FOR METHODS OF THE PLANNING AND DESIGN PHASES FOR A GOVERNMENTAL PROJECT IN TURKEY: A CASE OF OUR GAZIANTEP CITY PROJECT

Mehmet Tunçer [1], Oguz Yilmaz [2]

[1] Cankaya University, Faculty of Architecture, City and Regional Planning Department, Ankara, Turkey
[2] Ankara University, Faculty of Agriculture, Department of Landscape Architecture, Ankara, Turkey

ABSTRACT

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

Corresponding Author: Mehmet Tunçer

LANDSCAPE ELEMENTS CHANGES IN CONSERVATION APPLICATIONS AROUND ANKARA ULUS HISTORICAL CENTER

Oznur Aytekin

Cankaya University, Faculty of Architecture, City and Regional Planning Department, Ankara, Turkey

ABSTRACT

Hacı Bayram-Veli Mosque and the Temple of Augustus, which are located in Ulus Historical City Center, have been symbol for Ankara for centuries and have reached the present day with their historical residence texture in the region which has been a religious center for thousands of years. Following the declaration of Ankara as the Capital City, the city's main decision was made on the development of the city towards the plain (Yenişehir section) and Çankaya, not on the Old City. An international design competition was opened in 1928 and a design was chosen that supported this decision. Hermann Jansen signed the decisions that shaped Ankara until 1939. The national competition, which was organized for the protection of the Ankara Ulus Historical Center and characterized as an landscaping elements project at that time, is one of the rare projects that were able to be implemented at the national level. Ankara Castle Protection Development Project (1979-1980), which first started with the Ankara Castle Protection Development Project (1979-1980), and then under the protection of the Historical Development of the City Protection-Development-Planning Studies (1983) and Altindag Municipality in 1985 until the formation of the Planning Department in the period between the Ministry of Culture and Ankara The City Directorate has carried out the necessary technical studies. The Hacıbayram Preservation Development Plan (1984) is a region where the city has spent a great deal of effort and money to organize and repair the National History Center Contest (1986) and the Hacıbayram Square Regulation Project since the 1990s. The aim of this article is to give the Landscape Designs and environmental arrangements of this important area Ulus Historical Commercial Preservation area. And to draw attention to archaeological remains that still exist in human settlements as a part of modern life. The methodology used depends on a survey of the literature, personal observations documented during the last years and various studies. Construction works were started in 2009 within the boundaries of the Temple of Augustus and the Urban Conservation Area adjacent to the Hacı Bayram Mosque by the Ankara Metropolitan Municipality. The construction of the pool was started instead of the walls of the Augustus Temple, and the walls where the walls were finished were excavated and the landscaping was started. In recent years, the Hacıbayram Mosque and its surroundings have almost been rebuilt. However, the practices have not only destroyed the Phrygian Tumulus, the 1st Degree Archaeological Site, but also damaged the Temple of Augustus and its environs. Ulus Environment has been rehabilitated as a healthy and livable environment with the street regulations and infrastructure works done in the environment. One other aim is to give detailes about landscape architecture, such as “Ornament Pool” erect, which have been completely passed through legal processes, have been constructed as “Water Pool“, which will harm the historical and archaeological environment and the Temple of Augustus. However, this pool damages the Temple of Augustus near it. The paper will give the plans, projects and duration of the Hacibayram Mosque square was enlarged and planted in the scope of the project, the area where the funeral prayer was performed was renewed and decorated with historical portico. Reinforced concrete structure and brick covering were rebuilt and rebuilt as a result of the failure to use the mosque's ”original architecture”. While the Hacıbayram-Veli Mosque was being expanded and the women's treasures were made under the ground, the Phrygian Tumulus, the 1st Degree Archaeological Site, was destroyed. Also the some of the valuable remains of the “Antique Wall of Ankara” was destroyed.

URBAN INSERTION PROJECTS FOR THE UNIVERSITY OF LOUISIANA AT LAFAYETTE

Thomas Sammons

P.O Box 42811, Lafayette, Louisiana 70504, United States

ABSTRACT

The Community Design Work Shop (CDW) is an Institute within the School of Architecture and Design at the University of Louisiana at Lafayette. The CDW has been involved with community urban design projects in architecture and planning for over twenty years. During this time, the CDW has been involved with small town projects that promoted the revival of their downtown areas and neighborhoods along with large infrastructure designs for interstate highways and major arterials for Municipalities and the State of Louisiana Department of Transportation and Development. The CDW was engaged in restoration projects for small towns following Hurricanes Katrina and Rita devastation in 2005. Additionally, the CDW has completed multiple projects for the University of Louisiana at Lafayette where the CDW team proposed the design, developed the construction documents and was involved with supervising the building construction. The purpose of the CDW is to function as an outreach Institute to the community for urban design and provide graduate architecture students an opportunity to gain practical experience with real world design problems. The paper will focus on the process of engaging the university's administration and students in charrettes and public meetings. Working as a team, the CDW produces the design, develops the construction documents and consults with local architects and engineers. The paper discussion will highlight three of the CDW's projects: The University Bike Path – which links the University Research Park to the main campus completed in 2014; the redesign of the main campus Quadrangle completed in 2017; and the University International/Cultural Space, currently in progress. These three projects demonstrate how the public can be engaged in a design process, how student learning benefits both the student the public, the development of the design, and shows the construction process to completion.

SHOPPING CENTRE VS. RAILWAY STATION. SELECTED EXAMPLES IN POLAND

Łabuz Rita

Cracow University of Technology, Faculty of Architecture, Institute of City and Regional Planning,
ul. Warszawska 24, 31-155 Cracow, Poland

ABSTRACT

A modern shopping centre is often built as a multi-functional facility. It constitutes a place that generates customer traffic, and consequently a demand for a relatively big number of parking spaces. A characteristic group of shopping centres are facilities erected in the vicinity of transport hubs, combining different means of transport. This study focuses on shopping centres located near railway stations. The railway station and the shopping centre are examples of buildings which fulfil different functions, and yet Poland has seen more and more projects combining these two types of facilities. This paper attempts to determine the influence of the shopping centre integrated with the railway station onto the functions and significance of the railway station building. It also touches upon the aspect of accessibility of individual structures, particularly to pedestrians. Two shopping centres are considered herein within the scheme of comparative analysis: “Galeria Krakowska” in Cracow and “Avenida” in Poznan. Both facilities came into being as part of the construction of new transport centres located near the main passenger railway stations in both cities. These areas are located in inner cities or nearby, which makes them potential representational venues. In the result of the study a tendency to design shopping centres directly combined with a railway station, e.g. via passages with service outlets, has been observed. It seems that the railway station ceases to be a fully independent structure. In Cracow, it is located underneath the railway platforms, constituting a connector between the shopping centre and the coach station. In Poznan, the railway station is located above some of the railway stations and is linked with the “Avenida” shopping centre via a shopping passage. It has been observed that in both cases it is difficult to separate, both spatially and visually, the new railway station building from the building of the shopping centre, which seems to make the shopping centre take over the function of the edifice of the railway station, welcoming and bidding farewell to passengers. The building of the shopping centre in a way becomes the railway station building. The function of the transport hub, combining different means of transport, does not always entail comfortable pedestrian accessibility. For example, in Poznan some of the railway platforms are not accessible directly from the buildings of the railway station or the shopping centre. Furthermore, this paper points to the impact of such investments on the intended use of former railway station buildings. It has been observed that adaptation of all railway station buildings to new functions in the examples referred to above took place several years after they had been closed down. The Author emphasises the need to determine the future use of old and often historic railway station buildings already at the stage of investment planning.

Corresponding Author: Rita Łabuz

LAND USE ATTRIBUTES TO IMPROVE PUBLIC TRANSPORT: THE CASE OF AL AIN, UAE

Sahera Bleibleh, Abdel Rhman El Fawair, Meera Al Dhaheri, Fatima AlZaabi, Hamda Almehairi

College of Engineering, Architectural Engineering Department. United Arab Emirates University
P.O. Box 15551, Al Ain, UAE

ABSTRACT

Building on the correlation between land use attributes, mainly public space, and public transport development in UAE, this research attempts to study the type of land use that triggers people to use public transport in Al Ain, UAE. In a place where commuting mainly car oriented, downtown al Ain has the potential to act as a hub of transit oriented development. It has many businesses, amenities and mix use. In the context UAE in general and Al Ain in particular, this research aims to answer the certain questions regarding: the expectations of adjacent spaces and land use to activate the use of public transport. This research intends to observe people patterns of public transport commuting in a 10 minutes walking distance from Al Ain city centre to collect data in terms of number of users in correlation to bus timing, land use attraction and street furniture. The attributes of each bus stop should support defining the type of land use in relation to public space type. Research data is collected by filed observations and by using Garmin XE cameras. In so doing, the collected data on the land use attributes of each bus stop shed the light on which of them works as a node based on the affiliated land use. By analysing the several attributes of each bus stop, the research attempts to highlight the emergent of informal gathering spaces to propose element of urban design to enhance access public transport. The research findings are expected to serve the analysis to enhance design strategies to rethink, contextualize and encourage using public transport.

Corresponding Author: Sahera Bleibleh

AESTHETIC DELIRIOUS URBANISM – REM KOOLHAAS

Filipe Lacerda Neto

University of Beira Interior, Calçada Fonte do Lameiro, Edifício II Engenharia, 6200-001 Covilhã, Portugal

ABSTRACT

According to Rem Koolhaas, the 70´s had a great impact in the western economic life. It was the beginning of two twin systems: financial and political, the liberalism and the globalisation. During this decade, New York is the stage of the decaying show of organised crime, drugs and social and financial crisis. In 1977, in an attempt to save the city, the campaign “I ♥ NY” is launched. It emphasises the possibilities of New York´s urban and frenetic life. The city proclaims itself as the centre of the world, at least of the western world. As a consequence, driven by a blind patriotism, or even delirious, Manhattan´s architects took possession of the most obvious characteristics of the city´s architecture of the period before the Second World War. A new old city develops. According to Rem Koolhaas, it is an architecture made of money “shots”. In 1978, Kollhaas publishes his retroactive manifesto “Delirious New York”, where, in due course, he draws attention to the constant relation between the city and the new all over the centuries. In this manifesto, Koolhaas reveals his fascination with the modernity and urbanity. His work depicts Manhattan´s evolution since its “Prehistory” – before the European´s occupation – as an experience of modernity. An island that is a pioneer in the problems that affect the main capitals of the world today, but also a pioneer in the attempts of solving, or at least maintaining, the chaos that it contains. The aim of this written essay is to analyse and clarify how the fascination with the new, the technology, and the way this relates to what is banal – urban delirium – represent aesthetic criteria in Koolhaas´s work.

GARDEN IN THE CITY BY IRENA BAJERSKA

Kinga Zinowiec-Cieplik

Faculty of Architecture, Warsaw University of Technology, Koszykowa 55 / 00-659 Warsaw Poland

ABSTRACT

The Library roof garden of the University of Warsaw designed by Irena Bajerska - Polish landscape architect (created as part of a competition project by Marek Budzyński and Zbigniew Badowski team) was selected for the MoMoWo exhibition - 100 WORKS IN 100 YEARS - EUROPEAN WOMEN IN ARCHITECTURE & DESIGN (1918-2018). It is one of the most interesting completed projects in Warsaw in the last 20 years. The garden inscribed in the cityscape, becoming his landmark and strongly defined the place. The implementation of the winning project with the roof garden gave rise to changes and development of the neglected and forgotten district of Warsaw - Powiśle. The green composition consisting of two parts (upper - 2.000m2 and lower - 15.000 m2) is the culmination of Irena Bajerska's creative works, where we can observe the features of her designs from the luxuriantly used climbing plants to captivating colorful combinations fields of of shrubs and perennials. Its success results on the composition's originality and the alternative perspective of the city's panoramas from the roof garden.

REFLECTIONS ON THE CREATION OF PUBLIC (NON-SPACE) SPACE: PARK OF GOLDRA

Cláudia Beato, Luis Moreira Pinto

CITAD Research Center, Lusiada University of Lisbon, and UBI University/Covilhã, R. da Junqueira 188-198, 1349-001 Lisbon, Portugal

ABSTRACT

This article focuses on one of the study cases that are the object of a funded research project in progress, Goldra Park in Covilhã, intends to contribute to the debate about the intervention of the architect in the public space in Portugal and what is taught in the national schools of architecture. In fact, the project analysed represents a concern expressed in recent years over the design of the public space by Portuguese architects, especially under conditions of great financing, as in this case, under the POLIS Program, co-financed by the European Union. Built in a central part of the city, emblematic for its importance for the understanding of the city and its evolution as well as the morphological configuration, this space is underutilized and in manifest conditions of degradation and abandonment, in less than fifteen years. If you have in mind that this park is adjacent to the main campus of the University of Beira Interior, with more than 7000 students, even more strange the conditions under which it is today. This research intends to show the direct correlation between the project options and their current state, understanding the need to rethink the urban intervention respecting the traditional principles of a good urban design, namely material and temporal sustainability, beauty and utility, in the light of the complexity of today's society. For this, it is intended the need to reflect on the need to understand the role of the architect, on the methodology to be used in the approach to these spaces and on what to improve in the learning of the profession. By analysing documents, and reflecting deeply, interviewing the users and non-users of this space, and some of the main actors in the "construction" as well as some of the docents of the architecture course in this city, it seems possible to conclude, among other things, that there should only be a greater sensitivity in the understanding of the city, as the methodology used in the urban design of the city must be appropriate to the place in question, so that the solution found is distinct and easily understood by the citizens. Here, it is apparent that there is a need for a better education of the autarchic decisions in the areas of urbanism, planning, since in Portuguese society they not only have the capacity of veto, "on technical decisions in these areas, as they are, who mostly choose who and what to do in the public space.

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Corresponding Author: Cláudia Beato

AIMS AND METHODS OF TRAFFIC CALMING IN SHAPING OF URBAN PUBLIC SPACES

Andrzej Zalewski, Joanna Fiszer-Sozańska

University of Science and Technology in Bydgoszcz, Faculty of Civil and Environmental Engineering and Architecture, Prof. S. Kaliskiego Avenue 7, 85-796 Bydgoszcz, Poland

ABSTRACT

Traffic calming is a solution that has been used for shaping urban public spaces for over half a century. This is a solution that applies to the majority of urbanized areas, in which the aim is to reduce transport nuisances, improve the aesthetics and landscape of public space and reduce the risk of traffic safety. The paper presents an overview of the objectives and methods of traffic calming affecting the shaping of public spaces in cities and examples of their application in various spatial conditions of implemented solutions in European cities. The results of analyses show that the undertaken activities should be comprehensive, because then you can achieve the desired goals and additionally create a synergy effect that would not be possible if the measures were applied individually and in an inconsistent manner. The shaping and rebuilding of roads and streets in the aspect of traffic calming have a significant impact on achieving the desired effects in the area of urban public spaces. This is achieved by limiting the intensity and speed of road traffic and access to the area, preventing the passage through the area, including discouraging drivers for transit journeys, speed limit by legal means (road signs), affecting the spatial shape of the route and using the surface features of the surface. The simultaneous management of parking and the implementation of coupled activities related to parking policy, capacity constraints and traffic organization have a very significant impact. The implementation of restrictions for car traffic should be replaced with the development of infrastructure for public transport, bicycle and pedestrian traffic. The success of the above-mentioned activities is expected to gain acceptance of the local community, which will be the user of the implemented solutions. This can be achieved by simultaneous carrying out information and education activities aimed at convincing users as to the purposefulness of implementing planned traffic calming solutions.

Corresponding Author: Andrzej Zalewski

THE CITY SHAPED THROUGH THE RAILWAY LINE: ALBERGARIA-A-VELHA, PORTUGAL (1908-2018)

Bruno Sousa [1], Rita Ochoa [2], Mafalda Sampayo [3]

[1] University of Beira Interior, Covilhã, Portugal
[2] CIAUD-UL/UBI, University of Beira Interior, Covilhã, Portugal
[3] CIES-IUL, University Institute of Lisbon, Portugal

ABSTRACT

The construction of the railway lines in the cities has led to relevant territorial transformations and instigated the first urban planning operations all over the world. In Portugal, the deployment of the railway line — even though late in the second half of the 19th century — had a crucial role in the transformation of the territory. This article analyses the relationships between the implementation of the railways and the urban development. This is clarified with the case study of the city of Albergaria-a-Velha, in Portugal, which takes part of a largest railway system named “Vale do Vouga” line. The article is organized into three main moments. First, the implementation of the railways in the cities, in general, is addressed. Then, in a second moment, the implementation of the railways in Portugal is studied. Finally, the article focuses on the case of Albergaria-a-Velha and the way the railways relate to urban development in this territory. It was found that, initially, the deployment of the train line in Albergaria-a-Velha was not too invasive in the territory, occupying predominantly agricultural lands. Also, it is noticed that Albergaria-a-Velha suffered its greatest urban growth during the early 70s of the 20th century. This came about abruptly and unregulated, similarly to what occurred in several other cities during this period. In the current urban structure, the railway line is an element that clearly divides the city. But still, over time, the railway line was responsible for moments in which the city was redesigned and adapted to it, through new buildings and streets. In fact, the railway line had an important role in the regulation of the urban fabric, shaping and defining the urban growth in Albergaria-a-Velha. We conclude that the railway line produces two opposite effects in the urban design of Albergaria-a-Velha. It regulates the space, but acts simultaneously as a barrier. Not only it conditions the roads that it crosses, but also conditions the limits on the development of urban form, while not preventing urban growth.

Corresponding Author: Mafalda Sampayo

THE CITY THOUGHT AND THE CITY BUILT: DESIGN APPROACHES TO TERREIRO DO PAÇO

Mafalda Sampayo[1], Rita Ochoa[2]

[1] CIES-IUL, University Institute of Lisbon, Portugal
[2] CIAUD-UL/UBI, University of Beira Interior, Covilhã, Portugal

ABSTRACT

This paper analyses the urban design processes of the square “Praça do Comércio”, in Lisbon. It comprises two distinct moments in its history. The first moment is about the period in the aftermath of the 1755 earthquake. The second analysis moment is about the late XX, early XXI centuries. It confronts a methodological analysis of the iconography and cartography of that periods, with current local observations and their spatial visual assessment. The paper has three parts. First, it presents the six proposals submitted for “Praça do Comércio” in the second half of the XVIII century. Another set of four period maps are also show as these maps include also the medieval city designs. This reveals the continuity of the different projects’ ideas for the “Praça do Comércio”. The second part deals with the placement of the D. José I equestrian statue. This section discusses the placement of the statue as part of an overall plan where the “Praça do Comércio” acts as stage for the D. José I statue. The ideology of public praise towards the reigning king is evident in this tie-in between square and statue. At last, the square's different functions and uses during the late XX and early XXI centuries are presented. For that, two recent projects are analysed. The first developed between 1992 and 2000 and the second from 2010. The analysis of the square designs reveals the existence of a strong connection with the past. The projects recover the medieval square design, both the opening towards the Tagus river and its design, regardless of the different proposals advances and retreats in relation to its form, notable buildings, and dimensions. Public art acts in an unabridged whole with the urban design. This is near the notion of urban composition, in that the monument transcends the idea of sculptural object and becomes the entire urban set. This understanding is contrary to the notion of public art as a decorative element apposed on pre-existing spaces. Urban composition is also contrary to the idea of public space as an outdoor gallery where art pieces are independent units without any coherent dialog with the public space. The 1992 and 2010 plans, although formally and materially different, present concomitant ideas. Both present ideas for the occupation of the lateral arcades of the square as touristic and living areas. The current project (2010 drawing), much criticized by architects in the media, abandoned ideas of the previous plan (1992). These included a road tunnel and an underground car park. The 2010 project includes some movement architectural barriers. It also presents a new design for the pavement based on a diagonal grid that lead to a novel reading of the square. These projects, proposed in the XVIII–XXI centuries, show how to interpret the memories, the symbolisms and the uses of the “Praça do Comércio”. The recent projects are dissonant about the image of the square, but nonetheless all projects respect the attributes of its genesis.

Corresponding Author: Mafalda Sampayo

Session Title:

Theories & Methods

FIRE PERFORMANCE OF THE THERMO ISOLANT FACADE SYSTEMS OF THE BUILDINGS

Adrian Simion [1], Claudiu Sorin Dragomir [2], Daniela Dobre [3], Ion ANGHEL [4]

[1] National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

[2] University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania; National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

[3] Technical University of Civil Engineering Bucharest, 122-124 Lacul Tei Avenue, District 2, Bucharest, Romania; National Institute of Research and Development URBAN-INCERC, 266 Pantelimon Street, District 2, Bucharest, Romania

[4] Police Academy "Alexandru Ioan Cuza", Fire Officers Faculty, 3 Morarilor Street, District 2, Bucharest, Romania

ABSTRACT

The large-scale use of the external cladding systems with polystyrene thermal insulation, for rehabilitation of existing and new buildings, requires the experimental determination of the fire performance of these thermal insulating systems, both as a whole and from the point view of the materials from which they are constituted. This study aims to present the evaluation of the fire performance of some polystyrene thermosystems and of the elements that make up these systems. Experimental tests are carried out related on the fire behavior of polystyrene thermal insulation systems used in building renovation, in order to determine the mechanisms of initiation and propagation of flames on the surface of combustible facades under natural ventilation conditions, the behavior of thermosystems in different fires scenarios and determining the fire performance of the constituent elements of these thermosystems. As a result of the performed tests, it was found that the overall performance of the thermal system against the fire action during the testing was mainly influenced by the value of the thermal load density parameter and by the way the thermosystem is built and put into operation. The contribution of the components of the thermal system to the ignition, burning, development and propagation of flames and smoke differed on a case-by-case basis, depending on the materials used to cover the polystyrene and the time elapsed since they were put into operation. In the direct fire area of the fire test, temperatures above 1000 ° C have been recorded that have led, in some cases, to complete damage to the thermosystem. It is intended to establish a concordance between the parameters resulting from the tests on the facades of buildings and those measured during the fire reaction tests of the elements from which the facades were made. This highlights the need to introduce the requirement of performing fire performance tests for building façade systems, following a harmonized testing methodology across the European Union. The behavior of the external cladding systems of dwelling buildings, at the action of fire, is dependent on the fire exposure scenario, the contribution to fire of the elements and materials from the thermosystem composition, the putting into operation of the thermosystem materials to the support layer, and not least, the use of barriers made of non-combustible materials for the thermal insulating facades.

Corresponding Author: Claudiu Sorin Dragomir

DETERMINATION OF SLR STATIONS COORDINATES USING DIFFERENT VALUES OF THE LOVE AND SHIDA NUMBERS: h_2, l_2

Marcin Jagoda [1], Romuald Obuchovski [2], Czesław Suchocki [1], Jacek Katzer [1]

[1] Koszalin University of Technology, Faculty of Civil Engineering Environmental and Geodetic Sciences, Śniadeckich 2, 75-453 Koszalin, Poland
[2] Vilnius Gediminas Technical University, Department of Geodesy and Cadastre, Saulėtekio 11, LT-10233, Vilnius, Lithuania

ABSTRACT

Determination of the SLR stations coordinates from the laser ranging is one of the main objectives of the satellite geodesy. The primary aim of this study was to assess the impact of use of a different values of the Love and Shida numbers: h_2 and l_2 for determination of the coordinates of selected SLR stations. Results are presented of coordinates determination for six SLR stations: Mt Stromlo (no. 7825, Australia), Matera (no. 7941, Italy), Grasse (no. 7845, France), McDonald (no. 7080, USA), Arequipa (no. 7403, Peru), Beijing (no. 7249, China) in the ITRF2014 reference frame derived from the analysis of Satellite Laser Ranging data. SLR data for the two satellites LAGEOS-1 and LAGEOS-2 observed during 10 years from January 1, 2008 until January 1, 2018 were analysed using two variants. In the first one, the SLR stations coordinates were calculated with the use of the nominal values (recommended in the IERS standards) of the Love and Shida numbers: h_2 = 0.6078 and l_2 = 0.0847. In the second, the SLR stations coordinates were estimated with the use of values of the Love and Shida numbers calculated in the authors' previous paper: h_2 = 0.6140 and l_2 = 0.0876. The influence of use of different values of the Love/Shida numbers on determination of SLR stations coordinates was investigated. The maximum differences (X,Y,Z(variant 1) - X,Y,Z(variant 2)) order 5 mm, were achieved for Z component for Mt Stromlo (no. 7825) and order 4 mm for Y component for Mt Stromlo (no. 7825) and Arequipa (no. 7403) and order 3 mm for X component for Beijing (no. 7249) stations.

Corresponding Author: Marcin Jagoda

STUDIES ON RECONSTRUCTION OF THE HOLY CROSS WOODEN CHURCH IN WODZISŁAW ŚLĄSKI

Jerzy Pocisk-Dobrowolski

Department of Urban and Spatial Planning , Faculty of Architecture, Silesian University of Technology, Akademicka Str. 7, 44-100 Gliwice, Poland

ABSTRACT

Wooden churches used to commonly appear in Silesia through the past centuries. Their location was the result of local people's needs and the accessibility of materials necessary to construct them. The form and nature of those churches were the fruit of intermingling influences of various national cultures of the inhabitants of those areas, craftsmanship experience of various structure builders and depended on the extent of wealth of the cities, towns and villages they were erected in. Wodzisław Śląski was among the places with wooden sacred objects, in the 19th century it was a small town with population consisting mainly of Poles, Germans and Jews. The Holy Cross wooden church was a hospital object. The church itself was situated on top of a low hill with a brook flowing in its direct vicinity. In the periods of heavy rainfalls the rapid stream used to wash out the hill thus affecting the church foundations, directly contributing to deterioration of the structure's technical condition. The critically bad condition of the church structure was the main reason for the decision to pull it down after 1826. Throughout the recent years the growth of local patriotism induced the interest in the town's history and its historical panorama. Relatively few pieces of information on the church and no drawings thereof have been preserved. The archeological and architectural research revealed a lot of interesting facts related to the church and concerning its structure and its supposed non-typical form. A realistic method to satisfy the curiosity what the church looked like in the period of its splendor was the construction of its model based on the research and studies carried out, the very construction of the miniature model in progress being a test site verifying some suppositions about the church's appearance. The model built was added to the exhibits of the Wodzisław Śląski Museum, becoming a contribution to the discussion on methods of dissemination of the information on the historical view of the town and including the research results in the papers concerning the future form and panorama of modern Wodzisław Śląski.

FROM SOCIALIST REASLIM TO MODERNISM: JÓZEF ZBIGNIEW POLAK - A FORGOTTEN CHAMPION ON POLAND'S ARCHITECTURAL POST-WAR MAP

Rafał Mazur

Warsaw University of Technology, Poland

ABSTRACT

The article concerns work by architect Józef Zbigniew Polak, who was the first Pole to win an international architectural competition in the Polish post-war era. As a lecturer, and graduate of the Faculty of Architecture at the Warsaw University of Technology, he continued the design school of prof. Bohdan Pniewski. Polak's architectural creativity can be divided into several phases, which are in turn closely connected to various developmental periods of architecture in post-war Poland. His designs and architectural realizations are often overlooked by researchers, which is among others the result of his later long-term activity in other countries.

PROFESSOR SŁAWOMIR GZELL – THE REPRESENTATIVE OF THE WARSAW SCHOOL OF ARCHITECTURE

Katarzyna Pluta

Warsaw University of Technology, Faculty of Architecture, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

Professor Sławomir Gzell is an outstanding architect and town planner as well as a scholar who contributed to the development of urban planning in research and practice, in the education of the present and future generation of architects at the Faculty of Architecture, Warsaw University of Technology. The activities and achievements of Professor Gzell concern the issues of shaping the order of Polish space, what he expressed above all in the works concerning the influence of the transformation of the system and globalization processes on the identity of Polish cities. The professor's achievements in designing the space of metropolitan centers, revalorization of small towns and innovative solutions in the field of urban composition of residential districts, as well as numerous scientific publications, merits in modernizing the didactic process and education of young scientists, deserve special emphasis and distinction. Sławomir Gzell is a continuator of the Polish school of town planners- theoreticians, visionaries and practitioners, whose representatives in Warsaw were Tadeusz Tołwiński, Jan Olaf Chmielewski, and Kazimierz Wejchert. Sławomir Gzell, in parallel with professional practice, conducts active scientific activity regarding the study of urban phenomena and architectural tendencies occurring in cities of various sizes and with different functional and spatial characteristics. The subject of the research are small cities, dispersed cities, as well as big metropolises. The research undertaken mainly concerns the processes of urban development, modernization, identity and the participation of local communities in shaping the image of the city. Sławomir Gzell's many competition entries are urban projects concerning many Polish cities, their districts, centers and the external zone. He paid special attention to two cities: Warsaw and Poznań. Sławomir Gzell actively participates in many national and international congresses and urban conferences. International cooperation strengthens the position of the professor in the world and at the same time creates incentives to undertake the most current research topics. The main objective of research work presented in the paper is exploring main scientific ideas and urban design solutions in activities of Professor Sławomir Gzell, on the example of his scientific works and urban design and planning projects. Principal results and major conclusions: Space is a unitary good, it is one and only, what means that once destroyed, it is lost. As such, it is one of those goods that the sustainable development theory says that they should be used in such a way that they are not thoughtlessly destroyed today, thus giving a chance of using them by future generations. So if space is shaped in a creative architectural and urban process, the better the fruit of this process, the better the space will be. In his activity, Professor Sławomir Gzell maintains a balance between the theoretical-analytical side of the work and their application side in spatial planning, urban planning and architectural design.

Corresponding Author: Katarzyna Pluta

TEACHING DRAWING, PAINTING AND SCULPTURE AT THE FACULTY OF ARCHITECTURE OF THE WARSAW UNIVERSITY OF TECHNOLOGY, CLASSICS AND MODERNITY

Mirosław Orzechowski

Faculty of Architecture, Warsaw University of Technology, Poland

ABSTRACT

Teaching art disciplines at higher schools of architecture goes back to the nineteenth-century Academy of Art schools. This also applies to the Faculty of Architecture at the Warsaw University of Technology. The fact of establishing a research and teaching team teaching arts disciplines at WAPW simultaneously with the University's establishment is important for the identity of the Warsaw School of Architecture. Teaching drawing and artistic disciplines underwent gradual changes from 1915 to the present. At that time, the school acquired a specific character, it became recognizable thanks to the elaboration of its own unique style of architectural drawing and views expressed by its representatives regarding drawing and teaching of architecture. From the very beginning, the school referred to the classics and for many years preserved traditional didactic methods. Moved to the present day, artistic academicism has undergone a thorough transformation in recent years thanks to a change in the approach to didactics and redefining of the understanding of the most important feature of the drawing. Change of understanding of the meaning of drawing in the education process from primary school to academic level requires teachers and students to change the perception of the essence of a drawing activity. This is not an easy process because the common understanding of drawing reduces it to the area of aesthetics. Meanwhile, a freehand drawing made by nature fulfills a fundamental role in the process of developing and shaping an independent creative personality. It is probably the most important skill alongside reading and writing. Acquainting and promoting the meaning of a freehand drawing is a task and a challenge for the current School of Drawing at WAPW. An indication of the essence of a drawing activity as a method that harnesses the processes of reasoning and information processing of an independent drawing record seems to be an innovative look at the drawing and its role in creating culture and civilization. We are therefore facing the task of defining drawing anew and rebuilding of proper artistic education based on a freehand drawing from nature.

Session Title:

Regional Planning

CONSTRUCTION PRODUCTION AS A KEY INDICATOR OF TERRITORIAL DEVELOPMENT

Lucie Vankova, Gabriela Kocourkova, Zdenek Krejza

Brno University of Technology, Faculty of Civil Engineering, Veveri 331/95, 602 00 Brno, Czech Republic

ABSTRACT

Balanced territorial development is essential for the long-term sustainable competitiveness of the region. There is an effort to take advantage of the strengths of the region and to fully develop their potential. Competitiveness of the region is dependent on the economic level and, on the contrary, the economic level of the region is based on its competitiveness. There are significant differences between the regions of the Czech Republic. Among the developed and backward regions, the disparities continue to widen. To capture these differences, there are some indicators that are monitored in a certain quality and time horizon. These indicators may be indicators of the national economy, but also indicators for capturing differences in the construction industry. The industry is a significant sector in the Czech economy, represent nearly 35% of the Czech economy and employing more than 40% of economically active inhabitants. One of the pillars of the Czech industry is construction industry. The article addresses the issue of territorial development in relation to construction production. The aim of the article is to identify regions with the potential for future development of construction work by analysing individual regions of the Czech Republic. The regions were compared to each other for the period 1998-2016, in terms of indicators of national economy and construction industry. Some dependency can be seen, when comparing these indicators. Growth in construction output is mostly driven by GDP growth. In some regions, construction output has a larger share of GDP changes than in other regions. The dynamics of GDP in individual regions was different. Differences in rate caused some regions to achieve a better result than the national average. In other regions, the rate was slower and their development slowed down for nationwide results. The impact on the size of these indicators is the size and location of regions within the Czech Republic. Research results show that all regions have the potential for future development. In some cases, this development will take place more slowly and at a lower level than others.

Corresponding Author: Lucie Vankova

Session Title:

Sustainable Urban Development

ECOLOGICAL URBAN AGRICULTURE FROM THE POINT OF VIEW BASIC ELEMENTS OF SUSTAINABILITY

Terézia Pošiváková [1], Jozef Švajlenka [2], Rudolf Hromada [1], Peter Korim [1]

[1] University of Veterinary Medicine and Pharmacy in Košice, Department of the Environment, Veterinary Legislation and Economy, Komenského 73, 041 81 Košice, Slovak Republic
[2] Technical University of Košice, Faculty of Civil Engineering, Department of Construction Technology and Management, Vysokoškolská 4, 042 00 Košice, Slovak Republic

ABSTRACT

Population grows fastest in the world's urban and metropolitan cities, the number of inhabitants in so-called metropolitan cities and in urban and suburban zones are expanding into the surrounding natural landscape. Consequence of these changes is the gradual displacement of natural greenery and nature from cities and newly created residential satellites designed to build residential and public amenities. In recent years, is more commonly used sustainable development phenomenon which has become as a responding trend to of cities and municipalities and the implementation of so-called urban gardens intended for growing crops within the communities of the population. In view of mentioned facts, the presented article focuses on ecologica l urban agriculture in terms of the main components of sustainability as an element contributing to the sustainable development of cities and suburban zones.

Corresponding Author: Terézia Pošiváková

MODELLING OF THE IMPACT OF THE RETENTION RESERVOIR ON THE FLOOD PROTECTION OF THE CITY - A CASE STUDY FOR THE CITY OF KALISZ (CENTRAL POLAND)

Ireneusz Laks

Poznan University of Life Sciences, Piatkowska 94E, 60-649 Poznan, Poland

ABSTRACT

Floods are natural phenomena related to the circulation of water in nature and they cannot be avoided. Despite the methods of predicting the floods, technological development and civilization progress, the flood risk is still growing. The relevant hydrotechnical development, rational spatial development and optimal water management have a significant impact on reducing the consequences of flooding. Especially retention reservoirs are important for raising flood safety and living conditions of urban residents who are at risk of flooding. They often perform complex functions starting from flood protection, through meeting economic, energy, and nautical needs, ending with natural and recreational goals. Retention reservoirs do not completely eliminate the flood hazard, but by reducing the maximum flow rate the flood protection system is significantly strengthened. The construction of a retention reservoir is a serious engineering, economic and eco-scale challenge. It must be preceded by many studies and analyses necessary to optimally carry out the entire construction process and subsequent operation. At present, a number of engineering and environmental analyses are supported by the use of forecasting and computational tools based on the mathematical description of a given physical phenomenon. With their use it is possible to determine, at the design level, the impact of a technical object on various elements of the natural or the human environment. One of the methods used to determine the influence of retention reservoirs on the transformation of flood flows are numerical models, more or less complex depending on the data available to carry out objective analyses. The paper presents analyses of influence planned retention reservoir located on Prosna river on flood protection system of city of Kalisz (Poland). The flood protection is insufficient in Kalisz and the weakness of the system was demonstrated, among others, by a flood in May, 2010. Analyses were based on data received from unsteady flow numerical modelling system and optimisation methods to support the management process of retention reservoir resources for extreme periods. The formulated task of dynamic optimisation due to its non-linearity was simplified to a static task by discretization of an independent variable.

AN ASSESSMENT OF CHANGES IN ECOLOGICAL STABILITY AND LANDSCAPE MANAGEMENT PRACTICES OVER THE LAST CENTURIES: A CASE STUDY FROM VRBOVCE, SLOVAKIA

Roman Vyleta, Peter Valent, Zuzana Németová

Department of Land and Water Resources Management, Faculty of Civil Engineering, Slovak University of Technology, Radlinského 11, 810 05 Bratislava, Slovakia

ABSTRACT

The landscape is an open system influenced by natural and anthropogenic factors that in a long-run fundamentally affect its state and development. A comprehensive understanding and assessment of the anthropogenic impacts on the environment is a key prerequisite to maintain its good ecological state. However, as the impacts of anthropogenic activities on the environment are omnipresent, necessary measures for their mitigation should be addressed to improve the landscape ecological stability. In Slovakia, agricultural activities on large blocks of land are considered as one of the main anthropogenic factors negatively influencing the landscape ecological stability, which however could be eliminated by effective landscape management activities. This study assesses the ecological stability of the cadastral area of the village of Vrbovce in both historical and current contexts and suggests several “green” measures aiming at improving its ecological stability. The information about the land types and structures were obtained by manual vectorization of historical and current topographical maps. Based on this information analysis of land utilization and its development was carried out for a period of more than 250 years. For each historical period, a coefficient of ecological stability was evaluated to assign a degree of ecological stability for each period. Moreover, an analysis of positive and negative landscape-ecological impacts was also performed to identify the problematic areas within the cadastral area that need to be addressed by mitigation measures. Based on these analyses several mitigation measures were suggested to improve the ecological stability of the area. Most of them were related to the agricultural land, which makes up a significant part of the area and represents its less ecologically stable part. The proposed measures respect the original rural character of the area and its specific scenery which is a result of centuries of man-land interaction. The measures are mostly focused on transforming some of the less ecologically stable areas into natural grasslands which would be used for ecological cattle and sheep breeding as these activities were historically the primary source of living in this area.

Corresponding Author: Zuzana Németová

RIVER RESTORATION AS AN ELEMENT IN SUSTAINABLE URBAN DEVELOPMENT

Andrej Škrinár [1], Martin Mišík [2], Matúš Janota [3]

[1] Slovak University of Technology, Faculty of Civil Engineering, Radlinského 11, 810 05 Bratislava, Slovakia
[2] DHI Slovakia, s r.o., Hattalova 12, 831 03 Bratislava, Slovakia
[3] Architect Matúš Janota, Hlavatého 2, 811 03 Bratislava, Slovakia

ABSTRACT

In Bratislava (Slovakia), alongside the Danube River, there is a continuous green area of diverse character with enormous potential for quality of life in the city. A group of experts, enthusiasts and specialists for the Danube, architects and urban planners, natural scientists, water managers and conservationists formulated a vision of Bratislava's Danube Park (BDP). The vision is to create and protect a unique and extensive territory along the river with aesthetic natural and natural-close riverbanks in places of suitable morphological and hydraulic conditions along with connection of several branches back to the main Danube channel. Many spots of urban greenery are directly connected to this area, which could thus become its backbone, providing the recreation and relax not only on the right bank of the Danube. The river in all its forms is the most important landscape element unifying this vast and varied territory. Beside the well-designed urbanized embankments, the character of the Danube River along with its hydromorphological and hydraulic parameters make it possible for Bratislava to have extensive riverbanks and inundation areas of natural character suitable for recreation, stay and movement of people near the river. The access of people in the area will be possible by walking and hiking trails, cycling routes as well as water routes in the river itself along with branches for recreational water sports. The BDP vision is wide and includes a wealth of data, documentation and studies necessary to carry out the vision. The process of implementation will be gradual. The first step will be to declare the city's and public's interest of vision-performing with the help of conceptual materials and studies. An important step will be to coordinate the city with the relevant state institutions, in particular with the river manager, with the other actors in the area along with the public, so that the vision of the final outcome is widely accepted and supported.

Corresponding Author: Andrej Škrinár

TYPE POST-MINING LAND USE FOR THE FUNCTION OF GEOTOURISM AND SPA

Anna Sikora, Paweł Deroń

Faculty of Civil and Environmental Engineering and Architecture, Rzeszow University of Technology, Powstańców Warszawy 12, 35-959 Rzeszow, Poland

ABSTRACT

The issue of land reclamation and post-mining land use appears to be extremely topical. In addition to traditional methods of excavation revitalization, such as directions: forest, water and communal, there is a very attractive solution which is an adaptation of these areas for geotouristic- or other functions designed to accommodate people, for example spa function. In addition to aesthetic assets, quarries have specific features predestining them to the location of the spa complexes. The article presents an example of the methods for selecting optimal locations and urban and architectural solutions for the needs of users of geotouristic and spa facilities.

Corresponding Author: Anna Sikora

OPTIMISATION OF DISTRICT HEATING SYSTEMS USING HEURISTIC METHODS: A REVIEW

Ioan Sarbu, Matei Mirza, Emanuel Crasmareanu

Department of Civil Engineering and Building Services, Polytechnic University of Timisoara, Piata Victoriei, no. 2A, 300006 Timisoara, Romania

ABSTRACT

The ever-increasing demand for heating in different sectors, along with more preventative regulations of greenhouse gas emissions, has forced different countries to seek new alternatives to heat buildings such as district heating system (DHS). A DHS is a technical solution to supply heat at the urban scale, best suited to areas with tall buildings and high population density, in relatively cold climates. District heating (DH) concerns the centralised production of thermal and possibly electrical energy and its distribution to a network of users. Traditional DHSs are generally used for residential space heating and domestic hot water, which are accounting for the largest share of energy consumption in buildings. Other advantages of DHS are known as the improvement of resource and energy management and also reduction in the user-side costs, including operation, maintenance, and safety expenses. Moreover, flexibility and safety in selection of the energy source such as biomass, solar, and geothermal energy instead of fossil fuels, which dominates the current heat market, is another attractive option of the DHSs. The capital investment for the DH network, which usually constitutes most of the capital cost for the overall system, often ranges from 50% to 70% of the total cost for DHS. Attempts should be made to reduce the cost and energy consumption of the distribution network through optimisation in design and operation. During the past decades, a large variety of non-linear and heuristic optimisation methods have been applied for the design and operational optimisation of the heating networks. This review article provides a briefly survey on the optimisation of DHSs using heuristic methods focused on the heat distribution network. The main purpose is to facilitate the rapid knowledge of the field, insight in the overwhelming amount of publications available and implementation of the future research directions. For this purpose the major components of a DHS, as well as the main heuristic optimisation methods are briefly described. Additionally, a single- and multi-objective optimisation problem is generally formulated, and the main optimisation criteria for the design and operation of the distribution network are synthesised. The state-of-the-art in DHS optimisation has been also reviewed and categorised based on the type of approached problem and the type of used objective function. Finally, some recommendations on future developments were included.

Corresponding Author: Ioan Sarbu

CREATING A SMART CITY – SUPPORTING MANAGEMENT OF REGIONAL PROJECT INITIATIVES

Anna Brudnicka, Adam Rybka

Rzeszow University of Technology, Faculty of Civil and Environmental Engineering and Architecture Al. Powstańców Warszawy 12, 35-959 Rzeszow, Poland

ABSTRACT

Smart cities are developing fast and introducing new practices and services that have a strong impact on policy making and planning, while also interacting with urban facilities. It is now needed to understand the smart city's contribution in the overall urban planning and vice versa, to recognize urban planning offers in the context of an intelligent city. The article is an attempt to preliminary analysis of the forms of innovation in small urban models for sustainable development, which can be used in a smart city. The structure of the review has been developed on the basis of conceptual framework of off-grid complex that unite selected regional specialties, the strategy of sustainable development and the process of connections, which has been chosen as a method of identifying paths of research in defined area. The result show that innovative projects for sustainable development strategy can be implemented using selected elements of data cloud computing, which would allow in the future strategy building in the cities based on selected categories of technologies and taking coherent actions in the area of innovative projects. The concept combines a variety of innovative technologies, where the outputs of one system are inputs of another. Further research is also required to develop appropriate measurement criteria for determining the effectiveness of strategies. The concept defined its main components, and outlines future directions to improve it.

Corresponding Author: Anna Brudnicka

FUNCTIONAL AND SPATIAL ASPECTS OF THE RIVERSIDE AREAS DEVELOPMENT IN CITIES OF THE SILESIAN VOIVODESHIP

Alina Pancewicz

Department of Urban and Spatial Planning, Faculty of Architecture, Silesian University of Technology in Gliwice, Poland

ABSTRACT

The subject of the article are rivers in urbanized areas with a particular role of introducing functional and spatial changes in areas adjacent to rivers. The research concerns the contemporary ways of transforming and introducing new development in the urban riverside areas of the Silesian Voivodeship. The experiences of recent years have shown the diversity of creative activities leading to the shaping of the new image and landscape identity of the cities. This diversity results from the changing economic, political, social, cultural or natural conditions. The new directions of development of areas located along the rivers also play a significant role. Research presents selected activities undertaken on a local and regional scale. They reflect ways to search roads towards sustainable cities. Improving the quality of riverside public spaces is associated with the desire to improve the living conditions of urban communities. This process depends on the financial, legal and organizational possibilities as well as the willingness of the municipal authorities. Some of the undertaken activities are a reflection of the aspirations of local communities for whom a well and safely developed riverside space becomes a place of the nearest recreation and leisure. The article objective is to show the possibilities and limitations of the riverside areas development and the use of river potentials in the cities of the Silesian Voivodeship. It is also an attempt to answer the questions whether these activities are sufficient to create riverside public spaces, if they meet the needs of residents, to complete the functional and spatial urban structure, and whether the effect of these activities is visible in the cities landscape of the Silesian Voivodeship.

INSPIRED BY NATURE: THE SUN AND SHADOW PAVILION. SOCIAL INTEGRATION AND ENERGY SAVING IN THE URBAN ENVIRONMENT

Krystyna Januszkiewicz[1], Meryem Alagoz[2]

[1] Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology in Szczecin, Poland

[2] Faculty of Civil Engineering and Architecture, Necmettin Erbakan University, Turkey

ABSTRACT

The paper deals with the socially inclusive and energy saving architectural forms in the urban space. These forms are treated as an ecological event (eco-event) per analogies to Bernard Tschumi's theory of „event cities". In this theory, the essence of space is to animate the movement and actions, which strengthens the social and ecological or political dimension of architecture. In this way the architecture form is a discourse about the spaces and events that take place in it. The aim of the research is to present the possibility of using architectural forms as eco-events in the process of improving the space quality and the microclimate prevailing in it. The first part describes the condition of public space in cities in the face of climate change. According to the research results, ecologically sensitive form such as a pavilion may play an important role in this context. Problems of energy saving and rainwater shortage, air pollution and temperature rise are taken in many pavilions in a practical way. Temporary pavilions become in this sense a field of scientific experiments, indicating the possibilities of using new proecological solutions in the city. The second part presents, among others, results of the research program undertaken at West Pomeranian University of Technology in Szczecin by authors. The program is focused on adaptive built environments and envision new solutions based on advanced digital technology. Presented research is going to find out ways to create the design of Nature inspiration architectural form (the eco-event) for public use. The results of this research is a proposal of solar active pavilion as a discourse about the urban spaces and energy efficient design principles and process is explained according to point of view Solar Passive Design. This study and design highlight the problem the modulation of microenvironmental conditions within an emergent macro-environmental system.

Corresponding Author: Krystyna Januszkiewicz

TOWARDS CLEAN AIR IN TURKISH CITIES: EVENTS IN THE URBAN SPACE

Krystyna Januszkiewicz[1], Pelin Saricioglu[2]

[1] Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology in Szczecin, Poland

[2] Department of Architecture, Gazi University, Ankara, Turkey

ABSTRACT

The present paper is focused on a new possibility to resolve the problem of air purification in highly-urbanized areas through architectural and urban design. The starting point for the research is Bernard Tschumi idea of „event cities". According to this idea, every city must have an attractive public space where architectural forms are a discourse about the spaces and events that take place in it. An experimental air-purifier could be one of urban event that will activate people and demenstrate a possible solution to fighting air pollution. The aim of the research is to develop an architectural forms as air-purifiers especially dedicated to turkish cities, forms which will be integrate local tradition and high technology solutions. The forms are treated as events in the city to demonstrate the process of cleaning the air with use TiO_{2}.. The first part of the research includes studying local tradition in search of forms that will be understandable for the inhabitants and associated with Turkey. The second part of the research depicts possible usage of Titanium dioxide (TiO_2) technology - nanoparticles of TiO_2, as a building materials component. These components are the latest findings in the field of nanomaterials development, and their effectiveness due to the usage of the photocatalysis, which depends on eliminating various atmospheric pollutants and especially cleaning the atmosphere from nitrogen oxides. The result of this research is the design of energy efficient biomimetic architectural forms that can be a component of public space in every city in Turkey. In conclusion, the paper emphasizes the usage of titanium technology and local tradition, open a new way in architecture and structure designing in the urban public space. This is indispensable to improve citizens' health and to clear the atmosphere from nitrogen oxides or the volatile organic compounds and serves also as the basis to newly-built communitiesas.

Corresponding Author: Krystyna Januszkiewicz

HYBRID SYSTEM THAT INTEGRATES THE LOST ENERGY RECOVERY ON THE WATER-WATER HEAT PUMP EXHAUST CIRCUIT

Dănuț Tokar [1], Cătălin Stroiță [2], Adriana Tokar[1] Alexandra Rusen [1]

[1] Department of Civil Engineering and Building Services, Polytechnic University of Timisoara, Piata Victoriei, no. 2A, 300006 Timisoara, Romania

[2] Department of Mechanical Machines, Equipment and Transportation, Polytechnic University of Timisoara, Piata Victoriei, no. 2A, 300006 Timisoara, Romania

ABSTRACT

Exceeding intermitence and the stochastic character associated with most renewable energy sources in order to maintain the balance between generation and consumption require the most efficient energy storage methods. This balance is important to maintain the quality of the power supply by adjusting the frequency and voltage of the grid. Storage is the capture of the energy produced at a given time for later use. It is known that electricity can not be stored directly unless it is stored in condenser batteries or in superconducting coils. Other methods of electricity storage presuppose the conversion of these into other forms of energy: mechanical storage, electrochemical storage. The optimization of RES operation and, implicitly, of the energy system implies the choice of a suitable conversion / storage system that must take into account a number of factors, such as: capacity and minimum storage time, loading and unloading conditions, minimum number of cycles download loading, power supply required by the storage system, system lifetime. It is not to be neglected the space required for the installation of the storage systems and their impact on the environment during their exploitation as well as during the post-use and recycling period. There are RES that contain natural storage systems (hydro-electric power plants and biomass and biogas generators). The article proposes an analysis of how to store electricity by approach a Pelton water-water-turbine hybrid system. The heat pump consumes electrical energy for action, producing a thermal effect. By integrating a system with Pelton water storage tank and turbine on the heat pump outlet circuit, the lost hydraulic energy can be recovered. The experimental hybrid system was made to develop HRES optimization models. Hybrid systems may exceed the limits of individual generators in terms of efficiency, economy, reliability and flexibility. An energy storage system can alleviate the problems associated with uncertainties and fluctuations from renewable sources. The large number of random variables and parameters in a hybrid energy system requires optimization to increase the efficiency of hybrid system components to achieve economic and technical benefits.

Corresponding author: Dănuț Tokar

REDUCING WATER LOSSES FOR SUSTAINABLE URBAN DEVELOPMENT

Simona Popa-Albu, Mihaela Pișleagă, Adrian Țenchea

Department of Civil Engineering and Building Services, Polytechnic University of Timisoara, Piata Victoriei, no. 2A, 300006 Timisoara, Romania

ABSTRACT

From the point of view of water supply systems, and in particular of distribution networks, the environmental, social and economic criteria have had a significant role in the selection of urban water development decisions. In this respect, the article addresses the issue of reducing water losses in drinking water supply systems. Thus, there are presented the methods and technologies used and studied, currently, for the detection of damages on the pipes of the distribution networks. Continuous monitoring of the pipeline network has become an integral part of drinking water supply systems. Remote data transmission and the use of professional software allows for accurate loss detection in places where the probability of loss is maximum. The relocation method has the benefit of economies of time and money. In most developed countries, the percentage of water loss is significant. The article makes a theoretical analysis on the application of non-revenue water loss solutions (NRW) in Timisoara, Romania. At various points in the drinking water distribution network, measuring points are installed to measure the pressure, residual chlorine concentration, flow rate and flow direction. Measurement panels installed in underground fireplaces and sensors mounted directly on pipes transmit the measured data from sensors directly to the dispatcher via the GPRS data service. In addition to this information, the measurement point also generates alarms in the event of a home flood, unauthorized access, or lack of power from the grid. The results of the analysis highlight the fact that the loss reduction is quantified in water savings with positive effects on the reduction of pressure on the existing networks.

Corresponding Author: Mihaela Pișleagă

A PLACE OF SUSTAINABLE DEVELOPMENT IN CONTEMPORARY URBAN CONCEPTS

Katarzyna Mazur-Belzyt

Silesian University of Technology, Faculty of Architecture, Akademicka 2A Street, 44-100 Gliwice, Poland

ABSTRACT

The concept of sustainable development for years promoted around the world by taking action to implement it on a global scale. Hence, as a development paradigm, it appears in many strategic documents at every planning level. The main goal of the research is to determine whether and to what extent the idea of sustainable development manifests itself in contemporary urban concepts. The analysis covered both publications, events and selected urban projects. As the beginning of the time frame, the 1960s were adopted, which together with the 1970s are the background to changes that led to the crystallization of the idea of sustainable development. This is a period of decline and criticism of the idea of modernism, the crisis of cities, as well as the beginnings of the trend of postmodernism. The following years - the 80s, 90s and the beginnings of the 21st century - is a gradual development of the concept: a compact city, a green city, an intelligent city, as well as searching for ways to implement sustainable development in cities. Analysis of contemporary concepts of shaping cities has shown a lack of consistent, uniform planning and urban planning criteria for sustainable development. However, this does not necessarily mean the faults of the idea itself, but the advantage of an individual approach to each city and the possibility of its flexible implementation. The conducted analysis also showed that particular contemporary concepts are based on similar assumptions, or even are opposed to each other. None of them offers the perfect city. Individual ideas of urban development can be implemented separately or creatively combined with each other. Although none of the ideas of shaping cities is fully complete and universal, it is important to treat the city as one organism, and seeking for its sustainability, consistently use selected planning tools, adapting ideas to the context and scale of the city. Further search for the right direction of urban development is a task that in a given time perspective may lead to an improvement in the spatial, social, economic and environmental situation, and consequently to a higher quality of life for residents.

UAV TECHNOLOGY SUPPORTS FOR 3D MODELING OF STERILE DUMPS

Adrian Șmuleac [1], Iacob Nemeș [1], Floarea Maria Brebu [1], Alina Corina Bălă [1], Laura Șmuleac[2]

[1] Polytechnic University Timisoara, Victoriei Square no. 2, Romania
[2] Banat's University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania" from Timisoara, Path of Arad no 119, Romania

ABSTRACT

The last decade has known a spectacular development in using the unmanned aerial vehicles (UAVs) in order to obtain spatial information on the Earth's surface. The use of UAV equipment is ideal for acquiring research data at resolutions ranging from 0.5 to 2 cm. Although UAVs have their complex origins in military contexts, they have become of real use in scientific applications at this time. Compared with analyzes taken from satellites or with photogrammetric ones with traditional equipment, UAV flight plans offer a high operational variety in terms of costs, time and repeatability. UAV platforms are today a valuable source of data for inspections, surveying, mapping, 3D modeling, manipulation and classification of cloud points, and the development of daily orthophotomaps with the representation of the studied area. The present paper has as purpose processing the aerial images obtained from the UAV and processing them in order to determine the amount of volume based on the resulted 3D model. The acquisition of air data was made with the Phantom4 Pro device, with a Sonny camera, with a resolution of 12 megapixels, with an average flight speed of approx. 20m/s, with a battery life of approx. 20 minutes. For collecting aerial data and to determine volume based on cloud points an oblique and vertical image were used. Nadir imaging was performed at a height of 120 m above sea level (AGL - Above Ground Level). In order to accomplish this scientific work, the imaging data was processed with the AgiSoft PhotoScan program using a total of 677 images from the total of 678 for processing. In order to achieve georeferencing with a high precision we used 25 GCP Ground Control Points, control points that were marked on the ground using 1m x 1m targets and which were determined directly on the field with GPS equipment through RTK method, using Leica GS08 equipment, obtaining the coordinates in the system Stereographic Projection 1970. In order to verify the correctness of the results, the cloud points were overlapping on the orthophotoplan from 2014 and over the orthophotoplan made in 2018 by UAV technology. The resolution differences and the visibility of the details are breathtaking. The final data obtained from aerial photography were used to perform volumetric calculations where this was done with the TopoLT program and in order to perform another verification we used and compared these data with the volume obtained with another program - Surfer 13. In this scientific paper have been made3D data comparisons, namely the cloud points obtained from the UAV aerial photographs with those determined with the GPS equipment.

Corresponding Author: Iacob Nemeș

GREEN BUILDING IN THE FRAMEWORK OF ORGANIZATIONAL AND TECHNOLOGICAL DESIGN

Elena Korol [1], Natalia Shushunova[1] and Stepan Rerikh[2]

[1] National Research Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia
[2]Brno University of Technology, Techicka 2851/15, 61600, Brno, Czech Republic

ABSTRACT

This research of improving technology of installation green roof systems is aimed to study the use of green technologies in construction, a special role is given to the application of innovative technologies and green building in the framework of organizational and technological design. At present, the Goverments of most developed countries to a policy of restoring disturbed ecosystems of urban space has been planned. According to the United Nations Environment Program (UNEP), the construction sector accounts for 40% of total energy consumption: buildings account for 36% of all greenhouse gas emissions. In this regard, green roofs are considered one of the most appropriate sustainable solutions to solve the problems associated with the "heat island" effect, with roofs making up almost 30-40% of the total urban areas. The aim of the study is to analyse the technological processes of the device coatings of roofs and walls with greening systems and the search for optimal structural and technological solutions. The study used a method of comparative analysis of various options for the device of roofing with landscaping systems. The study of integrated systems for building roofing and walls with landscaping systems based on the BIM-model makes it possible to evaluate energy-efficient projects using "green building" technologies.

Corresponding Author: Natalia Shushunova

GREEN WALL AS A KEY FEATURE OF SUSTAINABLE URBAN DEVELOPMENT

Elena Korol[1], Natalia Shushunova[1], Stepan Rerikh[2]

[1] National Research Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia
[2]Brno University of Technology, Techicka 2851/15, 61600, Brno, Czech Republic

ABSTRACT

This research is aimed to study the main features of the device of green coverings and find the optimal solutions of the device of green wall system. The architecture of the modern urban space presupposes the presence of elements of a green public space, which ensures the development of the ecological concept of the urban environment. Green architecture allows the city to "breathe." These elements of the urban environment include the use of green spaces on the walls of buildings of various institutions, as well as in the adjacent areas. In this study, we consider various options for the installation of coatings with greening systems. On the basis of the study, an analysis of existing green coverings was performed. The optimal variant of the device of the exploited coverings was determined with the help of the hierarchical structuring of indicators of labor intensity for various variants of the device of green coverings.

Corresponding Author: Natalia Shushunova

ENERGY SENSITIVE CITY - ENVISIONING THE MIĘDZYODRZE ISLAND IN SZCZECIN: THE NEW APPROACH TO THE URBAN DESIGN

Krystyna Januszkiewicz, Jakub Golebiewski

Faculty of Civil Engineering and Architecture, West Pomeranian University of Technology in Szczecin, 50 Piastów Ave., 70-311 Szczecin, Poland

ABSTRACT

This paper deal with the possibilities of architectural design in the process of creating a zoro-energy city, which encompasses environmental quality of life in highly-urbanized areas. Nowadays, the urban pollution is rising on a global scale. This problem is particularly noticeable in Poland. According to the latest WHO report, 36 of the 50 most polluted cities in the European Union are located in Poland. The paper is focused on a new possibility to resolve the problem of air pollution in developing polish cities by advanced architectural design. One of the examples of cities implementing the zero-energy strategy may be Szczecin. In the process of designing new urban districts in the post-industrial area of the Międzyodrze Islands new opportunities to implement energy self-sufficiency can be given. The first part of the paper depicts possible usage of Solar systems and Titanium dioxide (TiO_2) technology - nanoparticles of TiO_2, as a building materials component. These components eliminate various atmospheric pollutants and clean the atmosphere from nitrogen oxides. The use of both technologies may stop the emission of new pollutants into the atmosphere as well as limit the existing ones The second part presents the results of the research program Climate Change Adapted Architecture and Building Structures which has been conducted by Krystyna Januszkiewicz (the Faculty of Civil Engineering and Architecture for a few years at West Pomeranian University of Technology (WPUT) in Szczecin. The presented designs were developed with co-operation of WPUT M.sc. eng. student's applications samples of titanium dioxide technology connected with photovoltaic technology. In conclusion, the paper emphasizes the usage of titanium technology and photovoltaic technology as a components of building structures or special independent structures in the urban space. This is indispensable to improve citizens' health and to clear the atmosphere as well as to stop the emission of new pollution resulting from the dynamic development of polish cities.

Corresponding Author: Jakub Golebiewski

MODELLING OF CAPACITY AND PUBLIC TRANSPORT MODAL SPLIT FOR NEW CITY CENTRE IN BRATISLAVA

Tibor Schlosser [1], Peter Schlosser [2], Dominika Hodáková [1], Andrea Zuzulová[1], Silvia Cápayová[1]

[1] Faculty of Civil Engineering, STU Bratislava, Radlinského 11, 810 05 Bratislava, Slovakia
[2] DOTIS Consult, Budatínska 1, 851 01 Bratislava, Slovakia

ABSTRACT

The article is following the detailed traffic modelling in new city centre, which is under a huge expert discussion. The core of the problem is lying on the municipality to put on the table a final decision which have to change the modal split for public transport development. On the north part of new city centre is under construction the suburb bus station. The solution of new tram routes are taken into account. Results of traffic studies show, that how could be this change re-define the current traffic behaviour and create for the new area new functional interest and certainly the new quality of relationships of the territory. The system solution is the new public transport service for this area with which will be created by a capacitive new tramway network. The transport model has the importance of these empirical experiences for practice and final decision making. The city of Bratislava had a very detailed and defined layout of the Master Transport Plan and is a big impact to change on the side of developers. The question is why they have not complied with it and the answer would be found, because exact scenarios can show the disproportion for each details of organization of traffic flows, public transport lines with results of measurable sustainable mobility together with accessibility.

Corresponding Author: Tibor Schlosser

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

Upeka Kuruppu, Ataur Rahman, Arumugam sathasivan

School of Computing Engineering and Mathematics, Western Sydney University, Kingswood 4747, Australia

ABSTRACT

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

Corresponding Author: Upeka Kuruppu

KEY SUCCESS FACTORS FOR THE PUBLIC PARTICIPATION EFFECT OF OLD CITY RECONSTRUCTION PROJECTS

Jingjing Xiao

College of Management and Economics, Tianjin University, Weijin Road Campus: No. 92 Weijin Road, Nankai District, Tianjin, China

ABSTRACT

Public participation has been receiving more and more attention in the urban redevelopment. However, the implementation effect of the public participation is less than satisfactory. It seems that little literature has studied how to implement public participation and how to enhance its value in this field. This article aims to make up for this gap by exploring key success factors of public participation processes to improve the effect of public participation in urban redevelopment projects. This study proposes specific factors responsible for effective public participation in urban redevelopment projects by combing the impact factors of different stakeholders proposed by the existing literature and the specific characteristics of urban redevelopment projects, and finally hope to improve the implementation effect of public participation. The index system for the factors is identified from the three main factors of the government, the public, and the developer and the external environmental factors based on the literature review and expert interviews in the effect of the public participation in urban redevelopment. Government administrators, the public and developers in China were surveyed to gather data to test the index system. And we develop some hypotheses to explore the relationships between the critical factors with the empirical data. The results show that the characteristics of government have remarkable significant effect on the effect of the public participation, the characteristics of public come second, the external environment conditions come third. External environmental conditions can indirectly affect the public participation effect through government behaviour, public characteristics and developer characteristics. Surprisingly, the characteristics of developer have no significant effect on the effect of the public participation, which is quietly different from the abroad situation. Finally, combining with the results, we proposed corresponding measures and recommendations to further enhance the public participation in the old city reconstruction.

REVIEW ON THE SOCIAL CONFLICTS OF LAND ACQUISITION AND DEMOLITION AND ITS CAUSES IN CHINA: FROM THE PERSPECTIVES OF STAKEHODERS AND INSTITUTIONS

Yu Zhai

Tianjin University, No.92 of Weijin Road, Nankai District, Tianjin 300072, China

ABSTRACT

It has always been a hot spot when it comes to urban planning, the conversion of agricultural land, etc. China's urbanization process has been continuously promoted since the founding of the People's Republic of China, and it has developed more rapidly year by year after the implementation of the reform and opening-up. By the end of 2017, China's urbanization rate has reached 58.5%. Although it cannot be as high as 80% or 90% in developed countries in Europe and America, it has made great progress. The vigorous promotion of urbanization also means the development and construction of infrastructure and real estate projects, and a large amount of agricultural land is requisitioned to meet social needs. However, land acquisition and demolition has also brought about many social problems and even caused conflicts. In the meanwhile, the characteristic of China's large population has also intensified disputes over land to a certain extent. Once the land acquisition conflict occurs, it will bring about a large negative social impact, threaten the stability of the community, hinder the urban planning process, and cause invisible losses to the government's prestige. Therefore, it is meaningful to review and analyze the performance and causes of social conflicts in land acquisition and demolition in order to alleviate contradictions and promote the friendly development of both urban and rural areas. By reviewing the relevant literatures on the study of land acquisition and demolition conflicts, this paper summarizes the social conflicts in the process of land acquisition and demolition. On the other hand, it deeply analyses the reasons causing conflicts in the land acquisition and demolition from the four perspectives of landless public, government, developers and institutional environment and further provides some suggestions. The study contends that there are three main manifestations of social conflicts in land acquisition and demolition: (1) violent enforcement of demolition; (2) gaps in compensation demand; and (3) problems of landless people's disorderly struggle. At the same time, in order to solve these problems, the government should establish a sense of "service-oriented governance", distinguish the relationship between public interests and personal interests, enrich the public feedback channels to enhance the public's right to speak. For developers, the government should strengthen control and avoid corruption caused by the combination of officials and businessmen. Finally, the government should improve the compensation and supervision mechanism for land acquisition and demolition, fundamentally solving the chaotic state that no great laws to follow.

Session Title:

Urban Sociology, Economics & Politics

IMBALANCE IN LOCAL REVENUES FROM PROPERTY TAXES IN POLAND VERSUS LOCAL INFRASTRUCTURE EXPENDITURES

Iwona Foryś [1], Joanna Cymerman [2]

[1] University of Szczecin, 71-245 Szczecin, Mickiewicza 64, Poland
[2] Koszalin University of Technology, 75-453 Koszalin, Śniadeckich 2, Poland

ABSTRACT

The imbalance in the public finance sphere is equated with the budget deficit, when the inflows to local budgets do not cover expenses. In the article, the imbalance is understood in two ways: as the deficit of property tax revenues in relation to public expenditures for purposes directly related to the infrastructure increasing the value of a property or changing its use and as spatial imbalance in the amount of revenues in individual territorial self-government units. The second approach will examine the disproportion of tax and per capita spending broken down into urban, rural and urban-rural communes as well as the search for the causes of disproportions in the level of tax revenues. The aim of the study is to indicate a permanent budget deficit within the meaning of earmarked expenditure (income from property tax - expenses on real estate infrastructure) in the surveyed units and a strong differentiation of this deficit in the three groups of local government units examined. The study will use data from public statistics and methods of multidimensional analysis. The obtained results may be another argument in favor of introducing ad valore tax in Poland as well as implementing the concept of task budgets and prescribing generic inflows to expenditures on related purposes.

Corresponding Author: Joanna Cymerman

EFFECTIVENESS OF REAL ESTATE MANAGEMENT IN LOCAL GOVERNMENT – AN EXAMPLE OF VOIVODSHIPCAPITALS IN POLAND

Joanna Cymerman [1], Wojciech Cymerman [2]

[1] Koszalin University of Technology, 75-453 Koszalin, Śniadeckich 2, Poland
[2] University of Live Sciences in Lublin, 20-069 Lublin, Leszczynskiego 7, Poland

ABSTRACT

The paper discusses the effectiveness of real estate management in voivodship capitals in Poland.Time frame of analyses: 2005-2016. The main research hypothesis was made that voivodship cities located in voivodships with a higher level of economic development conduct more effective real estate management. The analysis was carried out in four stages: I - identification and measurement of the effectiveness of real estate management (12 indicators / diagnostic variables were selected), II - assessment of cities / ordering in terms of the degree of property management efficiency (a ranking was made- the standardized sums method), III – evaluation of similarity of voivodship capitals in terms of the effectiveness of their property management (voivodship classifications were carried out - Ward's method), IV – identification of the direction and strength of relations between the level of property management effectiveness in capitals and the level of economic development of voivodships (two rankings were prepared: (1) according to the effectiveness of property management, (2) according to GDP per capita in voivodships (the Spearman rank correlation coefficient was used).The data came from the Local Data Bank of the Polish Central Statistical Office.

Corresponding Author: Joanna Cymerman

HOUSING POLICY IN SLOVAKIA

Katarína Rentková [1], Pavol Gejdoš [2]

[1] Comenius University in Bratislava, Faculty of Management, Odbojárov 10, P. O. Box 95, 82005 Bratislava, Slovakia
[2] Technical University in Zvolen, Faculty of Wood Science and Technology, T. G. Masaryka 2117/24, 960 53 Zvolen, Slovakia

ABSTRACT

The need for housing is the basic physiological need of a person. The level of satisfaction of housing needs corresponds to the degree of socio-economic development of the given society. The basic criteria are the quality of housing, the availability of housing, the type of ownership, the possibility of purchasing own housing, the financial support and the financial possibilities of the individual / household. A suitable market environment created by the state is also a prerequisite for satisfying the need for housing. The mission of the state is to create an appropriate market environment that combines economic, social and environmental factors. This is the concept of sustainable housing. The analysis focuses on Slovakia and deals in more detail with responsibility and the position of self-government/municipalities in the context of Slovak housing policy. The paper is processed by using a wide scale of the scientific methods and procedures. The first part is based on preparation and explanation of key terms, such as the housing policy, concept of sustainable housing and state housing policy in Slovakia. The paper was elaborated on the basis of a study of related legislation, in particular the Act on the State Fund for Housing Development and the Concept of State Housing Policy - the State Documentary Document for the Housing Area. Methodology contains of identification of research assumptions, as well as methods and sources used in the paper. Results part consists of the main findings and is prepared by using a comparative and causal analysis. Statistical data was used to analyze the current state of housing in Slovakia. Prospects housing development in Slovakia are developed by the resulting trends and processing the statistics and are presented at the end of paper.

Corresponding Author: Katarína Rentková

ANALYSIS OF MARKET AND REPLACEMENT VALUE OF REPAIR WORKS IN BUILDINGS IN AREAS WITH MINING IMPACT

Monika Gwozdz - Lason

University of Bielsko-Biala ATH, Faculty of Materials, Civil and Environmental Engineering, Institute of Civil Engineering, 43-309 Bielsko-Biala, 2 Willowa St., Poland

ABSTRACT

This publication is a summary of all tasks carried out in recent years of research, calculations, simulations and analyzes related to the performed research on parameter analysis that affect the form, scope and cost of removing damage in buildings and structures in areas with mining impact. The analyzed problem is interdisciplinary and contains legal, geotechnical, engineering - mining, construction, material and economic analysis. The ground reaction forces were analyzed for buildings and structures in the mining area. Coordinating activities of the land model, foundations and construction of buildings and structures in the mining area were adopted and the distribution rights and changes in additional reaction forces of the structure in the mining area were analyzed and various factors which affect the construction damage were indicated. Problems were also identified in the mining impact forecasts that affect the design scope of new engineering structures and the impact of existing buildings and structures. The influence of various factors was analyzed and additional dependency formulas were proposed, which are needed for current calculations and analyzes of the scope and costs of strengthening the structure or its modernization. Based on the output data and the analysis of the results of the empirical examination of selected buildings, the determination of all factors affecting the technical condition of the building erected in the areas with the impact of mining operations. Classification according to currently used guidelines and clarification of new attributes affecting the technical condition of buildings and structures (typical and modern geometry of the building's structure, type of foundation, type of construction protection, type and stiffness of the structure). Backward analysis of damages (their temporary changes) identified as factor affecting the current state of engineering objects.

THE CITY AS A SOCIAL SPACE OF INTERACTION BETWEEN GENERATIONS

Lyudmila G. Lebedeva [1], Ludmila V. Orlova [2]

[1] Samara State University of Economics, Russia
[2] Medical University "Reaviz», Russia

ABSTRACT

Intergenerational mobility is intertwined with territorial migration (mainly from the village to the city, as well as from small towns to larger cities). The authorities should take into account various economic and socio-demographic factors in their attempts to plan and effectively manage the solution of urban problems, first of all, taking into account the peculiarities of social stratification and mobility of the population. Municipal structures and authorities seek to cover many aspects of the lives of citizens, organizations and enterprises with planning. This applies to the creation of favorable conditions for business (investment), housing, recreation areas (parks, squares), road construction, development of social infrastructure, solving environmental problems etc. The conclusion of Robert Park (in the work "The City") about the socio-cultural heterogeneity of the city (especially large) retains its significance. It should be borne in mind that each urban group has its own culture, social composition and behaviour. It is important to ensure the harmonious interaction of all groups in the common interest. One of the aspects of the life of the city, which remains without sufficient attention, is the interaction of generations (generational groups) in the socio - cultural space of the city. Sociological facts show high importance for certain generational groups of both the same type and different problems that require attention from municipal (and state) management structures (as well as from business and public organizations). For example, the same type of problems for representatives of different generations are material (financial and economic) - job security and income. To varying degrees, the problems of health and treatment, leisure and communication (and loneliness), provision of own housing and others are relevant. Urban lifestyle, in contrast to rural, contributes to the weakening of blood ties, weakening of intergenerational relations in the family version. However, at the level of interpersonal and intercultural relations, the city does not cancel, but modifies intergenerational socio-cultural ties and exchanges. Within the framework of educational, labor and public organizations, the processes of intergenerational socio-cultural relations and exchanges manifest themselves and develop in the form of subcultures. Still H.W. Zorbaugh, analyzing the problem of "cities and communities" in the monograph "Golden coast and slums", warned against excessive idealism in an effort to subordinate all any programs, management and stressed that the life of the local area has a natural organization that must be taken into account. It should be borne in mind that each city has its own history and certain unique features. Therefore, there are no universal urban planning and management solutions for the planning and development of all cities. In the work on the new appearance and structure of cities, an important place belongs not only to specialists in the field of architecture and urbanism, Economics and management, but also to the collective creativity of residents of different generational groups. Naturally, municipal (and state) bodies (as well as business and public organizations) can influence the solution of most problems, but only indirectly. These opportunities need to be used purposefully and fully. One of the goals in this process is to harmonize the interaction of generations (generational groups) in the socio-cultural space of the city.

Corresponding Author: Lyudmila G. Lebedeva

Session Title:

Risk Management & Mitigation Planning

IMPACT OF BIOCHAR REAPPLICATION ON PHYSICAL SOIL PROPERTIES

Andrej Tárník

Department of Biometeorology and Hydrology, Faculty of Horticulture and Landscape Engineering, Slovak University of Agriculture in Nitra, Slovakia

ABSTRACT

The Biochar is getting attention of agronomist worldwide due to its positive effect on physical soil properties in last years. The influence of biochar on physical soil properties has been studied, but only few results was obtained from the field experiments. The main objective of this paper was to study the effect of repeated dose of the biochar on physical soil properties (water content, temperature). The biochar used for the field experiment was produced from paper fiber sludge and grain husks (1:1 w/w) by pyrolysis at 550 degrees C for 30 minutes. In this study, the soil water content (SWC) and temperature was measured in 5-10 cm depth at experimental plots which received dose 20 t/ha (in 2014); repeated dose 20 t/ha (in 2018) and 0 t/ha (control) of biochar amendment at the Malanta area, Slovakia (48°19'23"N 18°09'01"E) in the year 2018. Our field measurements show the positive effect of biochar on SWC. SWC was higher (statistically significant difference) at plots with older dose of the biochar compared to plots with repeated dose and control plots. No statistically significant difference was between plots after reapplication of the biochar and control plots. It could be caused by short time period between biochar reapplication and SWC measurements which means that biochar incorporation to soil was limited. There was no significant difference between average daily temperatures on plots with variant dose of the biochar. Soil warming up offset could be observed during sunrise. It could be caused by darker colour of biochar.

Corresponding Author: Andrej Tárník

A NEW APPROACH TO DEBRIS FLOW STUDY

Silvia Bosa, Marco Petti, Sara Pascolo, Cristiano Reolon

Università degli Studi di Udine, via del Cotonificio 114, 33100 Udine, Italy

ABSTRACT

In northern Italy, debris flow is a very important topic in the risk assessment related to territorial issue because in the Alpine environment the numerous buildings, infrastructures and the population living in the mountain area are continually exposed to the risk of debris flow, which often manifests themselves with great destructive power due to the intensity, the high speed with which they can travel great distances and the difficult predictability with which they occur. One of the areas most affected by this type of issue is that of the Dolomites where the presence of loose debris in the rocky walls and the type of rainfall that occur especially during the summer period, represent the ideal conditions for the triggering of these phenomena. The Dolomites area, as well as being a UNESCO heritage, is particularly important for economic activities linked to tourism, especially in the summer and winter seasons, tens of thousands of tourists populate small mountain villages. The risk induced by a debris flow can be reduced with a correct modeling of the phenomenon and a consequent territorial management. To be able to achieve effective protection against these issues it is necessary to know the causes that originate them and be able to make a prediction of the consequences that they produce. For example, the forecast of the characteristics of a debris flow such as the propagation speed and the distances traveled is of great importance for the planning of the protective structures. In this perspective it is necessary to adequately represent the dynamics of a debris flow, through a numerical modeling that allows to correctly interpret the physical phenomenon. Generally, the study of a debris flow is carried out following an eulerian approach, i.e. in which the solid-liquid mixture is treated as a continuous. The presence of large boulders with a diameter of more than 5 meters is typical in the debris flows that are of interest to the Dolomites. To be able to characterize these boulders through modeling, it's not possible to characterize the casting as a homogeneous mixture and therefore it's necessary to choose a lagrangian approach to be able to follow the movement of the boulders within a fluid matrix. For this reason, in this work we want to study the phenomenon through the SPH method, a model based on the lagrangian description of the movement of a set of particles, that can represent the fluid and the boulders. In the present paper, the SPH method has been applied to represent the phenomenon that affects Cortina d'Ampezzo (BL) known as the "debris flow of Alverà". As a first approach, the debris flow was modeled through water and boulders, identifying important characteristics such as propagation speed and distances traveled, in order to adequately assess the risk to be able to propose actions to mitigate it. The results are presented and discussed and give promising results for future developments in the study of the dynamics of a debris flow.

Corresponding Author: Silvia Bosa

NUMERICAL SIMULATION OF SEDIMENTS TRANSPORT ON A RIVER SECTOR AS DISTORTED BY A CROSSING STRUCTURE

Alina-Ioana Popescu-Buşan, Gheorghe I. Lazăr, Albert Titus Constantin, Şerban-Vlad Nicoară

Polytechnic University Timisoara, Faculty of Civil Engineering, Department Hydrotechnical Engineering, George Enescu No.1A, 300022, Timisoara ROMANIA

ABSTRACT

The paper presents a 1D numerical modelling of sediments transit on Someș River downstream of its confluence with Agrij tributary, specifically for a 352 m sector affected by a driveway crossing bridge right outside of Jibou Town building area, about 25 km from Zalău Municipality in the North-West of Romania. There was considered a quasi-transitory flow regime as assimilated from a three years data available period of time, i.e. from August 1st, 1985, to July 31st, 1988. As considering the on-site findings and concluding general riverbed restoration suggestions of a technical expertise ordered by the rivers national administration, the performed numerical model comes in support of the technical solutions stipulated by a feasibility study conducted by the authors with respect to streambed balance achievement in the range of the mentioned bridge. Specifically, the following main interventions were implied: the accomplishment of a downstream bottom step to break the general scouring phenomenon in the structure vicinity and to produce the re-siltation of the central gaps, and the execution of two upstream river groins designated to lead the flow and carried alluvia towards the bridge central area. Thus, the numerical simulation performed by the help of HEC-RAS 5.0.6 specialized software package looks to establish the optimum location and geometry for the bottom step as correlated with bridge area re-siltation and general scouring on the modelled river sector. Specific structural results and flow parameters outcome – water surface level and velocity development – together with important general sediments transport information (e.g. flexible streambed configuration evolution) was concluded from the reached graphical output.

Corresponding Author: Alina-Ioana Popescu-Buşan

INTERNATIONAL ADAPTATION OF HAZUS MODEL FOR FLOOD LOSS ESTIMATION IN CURITIBA-PR

Edilberto Nunes de Moura[1], Jesse Ryan Rozelle[2]

[1] 1155, Imaculada Conceição, St - Prado Velho - ZIP CODE 80215-903 - Curitiba/Parana-Brazil
[2] W 20th Ave. Lakewood, Colorado 80215, United States of America

ABSTRACT

Flooding is the most common natural disaster in Brazil, causing more than half of the registered damage cases and inflicting high economic damage to the country, according to data published in The International Disaster Database (2015). However, the rating of flood losses in Brazil are still made through disaster information forms, which is a time-consuming and subjective method. In this paper, procedures will be presented to adapt the Hazus loss estimation system to Brazilian conditions, based on the creation of a data inventory and flood scenarios in the city of Curitiba, Paraná. Hazus is a standardized and applicable methodology for the United States of America, which uses models of loss estimation from major disaster typologies. The model adapted for Curitiba was created to work with the available version of Hazus 3.1, supported by a Geographic Information System. The work started with the creation of a Data Inventory and the incorporation of local terrain data. The adapted model was able to perform an analysis of flood losses to each building. The building inventory developed from local parcel data accurately represents 51% of the affected structures as Commercial and 35% Residential. The results also showed that about 22% of buildings directly affected by the flood had a level of damage greater than 75%. Despite the ability to estimate building damage states, the study did not yet allow quantification of losses in monetary values. However, it is considered that the adapted Hazus model has significant potential for improving our quantification of flood risk.

Corresponding Author: Edilberto Nunes de Moura

ENVIRONMENTAL LAND USE CONFLICTS FROM THE POINT OF VIEW OF SOIL COMPONENTS AND FLOODS IN THE METROPOLITAN AREA OF TIMISOARA

Moscovici Anca-Maria[1], Grecea Carmen[1], Grozav Adia[2], Banescu Oana –Andreea[3]

[1] Polytechnic University Timisoara, Department of Overland Communication Ways, Foundation and Cadastral Survey, Ioan Curea Street No. 1, Timisoara, Romania
[2] Polytechnic University Timisoara, Hydrotechnical Engineering Department, Spiru Haret Street No. 1A, Timisoara, Romania
[3].Politehnica University Timisoara, Faculty of Architecture and City Planning, Traian Lalescu Street , NO 2/A, Timisoara, Romania

ABSTRACT

In the context of the development of metropolitan areas, the strategic spatial planning tool that correlates spatial development of the localities and their periurban / metropolitan area is essential. Therefore, a special attention should be taken into account to the urban planning policies and to the local development and it must take into account European directives, national legislation and in this case the works masterplan development of Timisoara. Timisoara is the most dynamic city in western Romania, both economically and demographically. The study for this work was carried out in the metropolitan area of Timisoara, studying the way of using the lands in the environment according to the urbanism policies, the soil component and the areas that may be subject to possible floods Data obtained for this study has been processed in a GIS, so spatial analysis can lead to urbanistic recommendations. The use and occupation of land for the develop of a locality is essentially conditioned by soil characteristics, combined with soil conservation strategies, to which we have added another component, that of floods. Floods are considered as a severe natural hazard and the coverage of their damage is not measurable. Using GIS, it is possible to collect, store, analyze, manipulate and model a large amount of data, and GIS-generated maps combining the three areas: urbanism, soils and floods can help local authorities to make the right decisions and actions for the convenience of the citizens.

Corresponding Author: Moscovici Anca-Maria

UTILIZING BIG DATA FOR ENHANCING PASSENGER SAFETY IN RAILWAY STATIONS

Hamad Alawad[1], Sakdirat Kaewunruen[2], Min An[3]

[1] Department of Civil Engineering, the University of Birmingham, Birmingham B15 2TT, UK
[2] Birmingham Centre for Railway Research and Education, The University of Birmingham, Birmingham B15 2TT, UK
[3] School of Built Environment, University of Salford, Manchester, M5 4WT, UK

ABSTRACT

In light of the increasing demand and capacity in the railway industry, it is imperative to maintain safety in relation to the complexities of the substantial railway stations. Thus, it is important to take note of the time where investments in new technologies directed at the safety of the railway enable safety and protection in this area. Novel technological techniques such as big data analysis, data mining or machine learning have been developed and applied in many areas such as sales, banking and healthcare. The development of such methods has important benefits within the context of railway safety, however, these new methods need to be implemented and developed with consideration of whether these operational models can help to solve the various difficulties that currently exist in the risk analysis of railway stations. Moreover, as the adoption of the Internet of thing (IoT) grows, it is expected that analytical needs for handling data will also increase. Finally, it has been shown that the progression towards automation and applying such innovative new technologies such as big data may be a powerful tool for integration in the future of transportation in general and the railway industry in particular, whereby analytical predictions can aid in the development of safer railway stations which have greater potential for ensuring the safety of passengers. In this paper Bow Tie, evaluation methodology has been created to combine Big Data into the risk assessment process. Moreover, a suggested framework and based on the Bow-Tie analysis has been enhanced through associating related Industry data Taxonomy sources to each of the factors of the Bow Tie. These data sources can include many aspects, for instance, monitoring, social media, and safety management and so on. BIG data analysis can be beneficial to the risk assessment, support the decision makers in real time, and reduce human errors. This method can be fully integrated into passenger data and the business model for the railway station. Employing the existing safety records utilizing big data is expected to mitigate risks, predict hazards, raise safety and security efficiency and reduce the cost. Here, the safety records are vital information and need to be a part of an automated process.

Corresponding Author: Hamad Alawad

RISK MANAGEMENT PREDICTION FOR OVERCROWDING IN RAILWAY STATIONS UTILISING ADAPTIVE NERO FUZZY INFERENCE SYSTEM (ANFIS)

Hamad Alawad[1], Sakdirat Kaewunruen[2], Min An[3]

[1] Department of Civil Engineering, the University of Birmingham, Birmingham B15 2TT, UK
[2] Birmingham Centre for Railway Research and Education, The University of Birmingham, Birmingham B15 2TT, UK
[3] School of Built Environment, University of Salford, Manchester, M5 4WT, UK

ABSTRACT

In this research, it has been suggested and developing an intelligent system for managing risks with a framework to aid in managing the risks in the railway stations. Actually, a method to advance risk management in the railway stations requires to be developed that minimizes risk by the automated process taking into deliberation all the factors in the system and how they work mutually to provide an acceptable level of safety and security. The Adaptive Nero Fuzzy Inference System (ANFIS) is proposed to improve risk management as an intelligently selected model which has powerful dealing with uncertainties in risk variables. The methods of neural network (NN) and Fuzzy have been proved as tools for risks in many fields. In this work case study from railway is selected for manage risk of overcrowding in the railway stations (MRO) taking two parameters as input for risk value output using a hybrid model, which has the potency to deal with risk uncertainties and to learn by neural network training processes. The results show that the ANFIS method is more promising in the management of station risks. The framework can be applied for other risks in the station and more for a wide range of other systems. Also, ANFIS has the ability to learn from past risks records for future prediction. Clearly, the risk indexes are essential to reflect the actual condition of the station. Moreover, these indexes can indicate a high level of risks at the early stage such as overcrowding. The dynamic model of risk management can define risk level and aid the decision makers by convenient and reliable results based on recorded data. Finally, the model and the model can be generalised for other risks.

Corresponding Author: Hamad Alawad

GEOSPATIAL WEB MICROSERVICE FOR REAL-TIME EARTHQUAKE LOSS ESTIMATION: APPLICATION TO ALGERIA

Mário Marques [1,2], Ricardo Monteiro [3], José Miguel Castro [1]

[1] Faculty of Engineering of the University of Porto, Rua Dr. Roberto Frias, s/n. 4200-465 Porto, Portugal
[2] Lusófona University of Porto, R. de Augusto Rosa 24, 4000-098 Porto, Portugal
[3] Istituto Universitario di Studi Superiori di Pavia, Piazza della Vittoria, 15, 27100 Pavia PV, Italy

ABSTRACT

The estimation of the consequences resulting from a given earthquake event can provide useful information both for emergency rescue decisions as well as for the development of seismic risk mitigation measures. These measures can include post-disaster emergency planning, strengthening and retrofitting building types or strategic urban planning for the most affected regions, to minimize the earthquake death toll as much as possible. This type of assessment at a large scale can be complex and demanding in terms of computer resources, due to the amount of information that is involved. Most of the information required for hazard and risk calculations is composed of large sets of geospatial data, therefore there's a great need for tools that easily process numerical data in a geographic coordinate system. The expected outputs consist of a visual representation of the seismic consequences through a set of maps, plots and tables, with aggregated and disaggregated results. To this extent, a real-time web-based platform (WBP) was developed for seismic risk assessment in Algeria, under the EU funded project *Improved Tools for Disaster Risk Mitigation in Algeria* (ITERATE). This is an effective and viable tool for seismic risk reduction in cities, providing an overview of the safety level of the national design code. Therefore, a continuous connection between the organization that manages and monitors the seismic activity in North Africa (Centre de Recherche en Astronomie Astrophysique et Géophysique – CRAAG), and the WBP will be established so that information regarding the occurrence of seismic events, such as magnitude, epicentre location and depth, is transmitted and processed in real time. The WBP will automatically conduct a preliminary analysis to assess each event's severity. In this way, unnecessary calculations are avoided for events that might be too far or too weak to generate significant losses. When an event is classified as severe, a process is triggered to calculate the ground motion field and to estimate the associated losses, in terms of damage in structures, number of homeless people, human and economic losses. This estimation will enable the possibility to take the dynamic of the population into account. After the event estimation, there will be an automatic communication of the potential consequences to registered users, through email and SMS with the summary of the earthquake's severity. The WBP is a valuable tool for all public authorities committed to coordinate emergency activities.

Corresponding Author: Mário Marques

Session Title:

GIS-Based Modelling for Mitigation Planning

THE USE OF LiDAR DATA AND VHR IMAGERY TO ESTIMATE THE EFFECTS OF TREE ROOTS ON SHALLOW LANDSLIDES ASSESSMENT

Johnny Alexander Vega

School of Engineering, Civil Engineering Program at University of Medellin, Colombia

ABSTRACT

The study of geo-hazards is benefited from the technological advances in the field of Remote Sensing (RS) techniques as the ALS (Airborne Laser Scanners) Systems with Very High Resolution (VHR) cameras. LiDAR (Light Detection and Ranging) is an active sensor that has recently been used for a variety of geoscientific applications including slope monitoring to retrieve ground surface displacements at high spatial resolution, due to the shallow landslides are the most widespread natural hazards in the world, with an important economic impact and sometimes with tragic results in terms of fatalities. Additionally, LiDAR has been widely used in order to collect high resolution information on forests structure for the determination and characterization of vegetation cover due its ability to capture multiple returns and to reach the ground, even in forested areas, allowing the generation of Digital Terrain Models (DTMs) for the estimation of forest variables. In study, it was used a LiDAR dataset and VHR imagery from aerial survey, in the south-western zone of Medellin City-Colombia. Slopes with gradients up to 30% on residual soils characterize the study area, having about of 30% of forest cover, consisting predominantly of *Eucalyptus* and *Coniferous* forests. Although the most frequent landslides in the city are shallow and triggered by rainfall. For the estimation of the tree roots effects on the shallow landslide assessment on a natural slope, interpolation processes were developed from the LiDAR 3D point cloud, obtaining DTMs of 1 m-pixel. Additionally, orthophotos with the same spatial resolution were acquired in the aerial campaign. The proposed workflow was implemented on a GIS platform, and considers the extraction of the tree heights by generating a Canopy Height Model (CHM), while for the delineation of the tree crown a process of image segmentation was developed. Once the vegetation has been characterized using LiDAR products and dendrometric relationships, the Limit Equilibrium Method (LEM) was used to evaluate slope stability considering the effect of vegetation (trees). The results indicate that the proposed workflow allows obtaining adequate stability indicators for the estimation of tree roots contribution, and that this RS technique allows saving resources in this kind of analysis. It is important to highlight that the presence of vegetation reduces the likelihood of mass failure due to reinforcement of slope soils by tree roots.

Session Title:

Computer Aided Design

NUMERICAL SIMULATION OF WAVE LOADS ON PERFORATED BREAKWATERS

Sergey Buruchenko

South Ural State University, 76, Lenin Prospect, Chelyabinsk, Russia

ABSTRACT

Smoothed Particle Hydrodynamics (SPH) and Moving Particle Semi-implicit (MPS) are the meshfree Lagrangian particle methods that are widely used recently to solve engineering problems of hydrodynamics. Both methods are well suited for numerical modeling of fluid motion with large changes in its free surface shape. They use a set of lagrangian particles (points) to replace a real continuous medium that contains information about the state of a continuous medium such as pressure, density, velocity, etc. This approach avoids the use of a computational grid and makes it easy to describe large fluid deformations. In this work, a series of numerical experiments on the simulation of the impact of a liquid wave on a perforated breakwater has been carried out. The DualSPHysics SPH code was used as a tool for numerical simulation. The results obtained in the approximation of a weakly compressible fluid are compared with the previously obtained results on the MPS method. The maximum values of the integral forces acting on the protective device obtained by different methods have a good quantitative match.

Corresponding Author: Sergey Buruchenko

NUMERICAL SIMULATIONS OF SLOSHING PHENOMENA WITH SPH METHOD IN RECTANGULAR TANKS

Sergey Buruchenko

Ural State University, 76, Lenin Prospect, Chelyabinsk, Russia, 454080

ABSTRACT

The main aims of this paper are to identify, verify, and validate a smoothed particle hydrodynamics (SPH) method for simulating long duration transient and steady-state fluid sloshing in simple geometries with a various filling ratio. The numerical examples are modeled using open source DualSPHysics SPH code, and the obtained numerical results agree well with experimental results. Two cases of the tank motions are considered sway and roll. The accuracy of the numerical model is validated against available experimental data. The numerical results of the impact pressure and the free surface elevation are compared with the published experimental results and show good agreement.

FENCES APPLICATION OF THE CATIA PROGRAMME IN ARCHITECTURE AND CONSTRUCTION

Malwina Tubielewicz-Michalczuk

The Technical University of Częstochowa, 69 Dąbrowskiego Street, 42-200 Częstochowa, Poland

ABSTRACT

Nowadays, modern computer programmes are widely used in the design process. Information technology provides designers with the tools for extending and facilitating creative practices. The computer programmes offer a modern approach to the architectural design process, help maintain control over it and ensure the accuracy of documents. The use and application of CATIA, increasingly chosen as support for design activities, has been discussed in the paper. Both key features to create the surface geometry of the model and the analyses of extremely complex shapes have also been demonstrated. CATIA was released in 1977 by French aircraft manufacturer Dassault. The range of this software allows it to be applied in a wide variety of industries, such as aviation, automotive, architecture and construction. Moreover, CATIA is the perfect ideal tool for designing home appliances, injection molds, press-forming dies, blanking dies, elements made of metal sheet, plastics, composite materials. The software allows designers to virtually analyse the ergonomics of designed products. Furthermore, CATIA offers a tool to easily create Class A surfaces (called stylistic surfaces). The paper also shows the examples of the use of CATIA software which has been applied in the following outstanding architectural projects: the Walt Disney Concert Hall in Los Angeles, the Guggenheim in Bilbao, Spain, the Dancing House in Prague, the Heydar Aliyev Centre in Baku, Azerbaijan, the Messner Mountain Museum in Italy, the Dominion Office Building in Moscow, the Dongdaemum Design Plaza in South Korea. The software enables users to perform virtual design experiments with architectural objects, creating curvilinear shapes, as well as aerodynamic and curved surfaces at different angles. In addition, CATIA promotes innovative technologies and materials employed in the creative design processes. In particular, it should be noted that the software facilitates the modelling process, ensuring that the modifications made during the construction process are easy and effective as well as enabling designers to define contours, determine the surface parameters and perform an analysis of the quality of a plane.

FREEHAND COMPATIBILITY ANALYSIS OF BUILDING STRUCTURES

Agustin Gregorio Lacort

Higher Technical School of Architecture, University of the Basque Country, Plaza de Oñati, 2, 20018, Donostia-San Sebastián, Spain

ABSTRACT

This paper proposes a sufficiently precise graphic method of obtaining the stresses in certain models with low static hyperstaticity widely found in building, so as to facilitate manual analysis at the early phases of design. The models considered are continuous beams and certain types formed by flat, one-level porticoes that could serve to cover large surface areas. Their stresses are obtained graphically using the consistent deformation method, considering manual field hypotheses and disregarding torsional stresses. The procedure is a modification of an earlier method (Lacort, 2016) which are obtained the deformation graphically based on a graph representing the stiffness matrix. In both cases, when sketches are made freehand the application time is greatly reduced but the operations continue to be highly precise, given that the sketches made on a mesh formed by squares with sides measuring one unit in length, which prevents any major errors from being committed. Moreover, the size of the mesh does not seem to have any great influence on the precision of the results. Stresses are obtained in three phases. In the first, a graph representing the flexibility matrix is determined numerically, considering the dimensions of the model and the inertias of the bars. In the second, redundant stresses are obtained by graphically solving the compatibility equation system using the Gauss method, as in the earlier procedure, choosing the order of elimination of unknown is suitably so as to simplify the sketch. In the third phase, the bending diagrams are obtained, drawn on a sketch of the structure, and mnemonic rules are suggested for visually determining the remaining stresses. Based on this work, possible lines of research are suggested for developing further graphic methods that can be used to analyse other types of structure accurately.

Corresponding Author: Agustin Gregorio Lacort

ON INNOVATIVE CONCRETE-RUBBER COMPOSITE BLOCKS REDUCING EFFECTS OF DYNAMIC MECHANICAL IMPACT. THE REVIEW OF STRUCTURAL SOLUTIONS

Krzysztof Kuliński

Częstochowa University of Technology, Akademicka 3 street, 42-200 Częstochowa, Poland

ABSTRACT

In this paper structural solutions concerning innovative precast concrete hollow blocks with rubber injects are discussed. Knowing that the concrete material has relatively low damping factor, injecting in blocks additional rubber layers improves the overall damping coefficient against propagation of mechanical waves. In order to prepare required hollows under the rubber injects in the concrete block, special form made of plastic or steel is required. Discussed solution is very cheap to achieve. Prepared form could be placed into the cuboid form where has already been poured concrete mix. After the congeal process both forms could be removed and in the premade hollows rubber material could be injected. According to that, process of production is changed in only small manner comparing to the original process, where concrete blocks are produced. Moreover, as an inject, recycled rubber material may be used. Due to very small number of research concerning the connection of concrete and rubber in civil engineering structures, dynamic and thermal numerical analyses of precast hollow blocks with rubber injects has been performed. One of the main aims of performed study is to estimate the damping factor against propagation of mechanical wave in blocks. On the other hand, thermal resistance of proposed blocks is also very important from the economical point of view. Many analyses have been performed, showing the influence of different rubber injects shape on mechanical wave damping. Moreover, utilization of discussed precast concrete-rubber hollow blocs in three-layered wall has been taken into considerations. All analyses have been performed with the ADINA code, which is fully based on finite element method. For the concrete material describing blocks C16/20 and C20/25 concrete strength classes have been adopted, which are the most popular classes utilized in Poland. Rubber has been represented via Mooney-Rivlin and/or Zahorski material model. In order to use Zahorski model, special modification of ADINA material library has been introduced. Through the analyses, it has been shown that shape of rubber injects have significant influence on mechanical waves refraction and their dissipation. Moreover, due to relatively small volume of rubber injects in comparison to the whole concrete block, the reduction of block compressive strength would be insignificant. Presented in this paper prototype solutions may be treated as innovative because of rarely met combination of concrete with rubber as well as relatively easy and cheap implementation in the production process.

VERTICAL LOAD GENERATED BY WALKING PERSON: COMPARATIVE ANALYSIS OF SELECTED LOAD MODELS

Kinga Marecik, Marek Pańtak

Cracow University of Technology, Faculty of Civil Engineering, Institute of Building Materials and Structures, Warszawska 24, 31-155 Cracow, Poland

ABSTRACT

The natural vibration frequencies of footbridges with span length greater than 30 m very often are in a range of 1.50 – 4.00 Hz. The steel footbridges (characterised by low dead weight and low damping), in the event of their natural vertical vibration frequency are in the range of 1.70 – 2.10 Hz, are particularly exposed to excitation of resonant vibrations by walking users. This affects the need to perform the dynamic analyses of the footbridges using appropriate models of dynamic loads generated by pedestrians. The accuracy of estimation of the value of dynamic loads acting on the structure is one of the important issues from the point of view of accuracy of dynamic analyses. In the paper the results of comparative analyses of five selected models of vertical ground reaction forces (*VGRF*) were presented. The modelled forces were compared with the *VGRF* acquired during the laboratory measurements of the forces generated by walking people. Performed analyses showed a good agreement between the estimated and measured *VGRF*. Nevertheless, it should be noted that some models allow to predict the lower limit of the *VGRF* and other upper limit. All models represent the harmonic fluctuation of the force around the *G* value. For this reason, predefined equations had to be supplemented with the *G* value which roughly represent the average level of the *VGRF*.

Corresponding Author: Kinga Marecik

Session Title:

Mathematical & Statistical Methods

CONTACT PROBLEM FOR LAYERED MEDIUM SUPPORTED BY A WEDGE

Mehmet Bakioglu, Arcan Yanik

Istanbul Technical University, Faculty of Civil Engineering, Division of Mechanics, 34469 Maslak, Istanbul, Turkey

ABSTRACT

In this paper the plane contact problem for a layered medium supported by an elastic wedge is considered. A compressive load is applied to the top of the layered medium through a frictionless rigid punch. It is assumed that all contact areas are frictionless and only compressive normal tractions can be transmitted through the interfaces. Hence, the length of the contact region along the layers and layer-wedge interface is finite and are also unknown. The problem is formulated in terms of a system of singular integral equations in which the unknown functions are the pressure between layers in layered medium and between layered medium and the wedge. The analytical formulation of layered medium supported by wedge is given. As a numerical example, contact length and stress intensity factor at the tip of rails are calculated and the result are given by diagrams.

Corresponding Author: Arcan Yanik

NON-GRAPHICAL DATA STRUCTURE FOR THE PURPOSE OF BIM-BASED LIFE CYCLE ASSESSMENT: A REVIEW FOR CZECH ENVIRONMENT

Michal Brandtner, Václav Venkrbec

Brno University of Technology, Faculty of Civil Engineering, Veveří 331/95, 602 00 Brno, Czech Republic

ABSTRACT

Construction industry produces a significant amount of waste and on the other hand the capacities of landfills are almost filled. It is necessary to deal with the effective use of materials that have already been used and have potential to be reused again. Life Cycle Assessment (LCA) is a method of assessing the life cycle of a product or service in terms of its environmental impact. The Building Information Model (BIM) includes, in addition to geometry, the information part. This data can be used for life cycle inventory (LCI) and then for the assessment itself. The aim of the article is to analyse previous approaches and define which data structure is necessary to be obtained from the BIM model for the LCI purpose of an specific material. The proposed methodology of the data recognition and selection is based on data structure of non-graphical database called SNIM, which was developed for the Czech construction environment. Results are demonstrated on case study, based on proposed methodology for specific selected materials.

Corresponding Author: Václav Venkrbec

SOLUTION OF INTEGRAL EQUATIONS ARISING IN MATHEMATICAL PROBLEMS OF CONSTRUCTION SCIENCE BY BOGOLYUBOV – KRYLOV METHOD

Alexander Koshev, Valentina Kuzina

Penza State University of Architecture and Construction, 440028, Penza, 28, German Titov St., Russia

ABSTRACT

The possibility of a numerical solution of construction problems leading to Fredholm integral equations of the first and second kinds is considered. The following problems of building sciences, for example, lead to such equations: in the theory of elasticity – elastoplastic torsion of bodies, stress concentration in a body during its bending; in the theory of vibrations, in the mechanics of structural failure – in the formation of cracks; when studying non-stationary phenomena in solids – non-stationary heat transfer, quasistatic viscoelasticity, propagation of longitudinal and transverse waves and other processes. According to the formulas of numerical integration, the problem can be reduced to a system of linear algebraic equations with a matrix of coefficients, which can be ill-conditioned, and the task is classically incorrect. This circumstance complicates its decision by traditional methods. To solve ill-posed problems similar to the problem in question, there are classical regularization methods. However, the numerical implementation of regularizing algorithms is not always easy to implement. In this regard, the goal of our study was to develop a numerical method for solving the Fredholm integral equations of the first and second kinds, which allow solving such problems without using regularization methods. The authors propose to solve problems of this type on the basis of the Bogolyubov – Krylov formula for representing certain integrals, in the form of finite-dimensional sums. At the same time, it becomes possible to use a non-uniform grid of nodes for splitting the integration interval. To efficiently define the set of nodes for splitting the integration interval, it is proposed to use a priori information about the properties of the solution of the problem. For example, the number of split points of the integration interval increases where the intended solution undergoes the most rapid changes, and decreases in areas where the intended solution is close to linear. The optimal arrangement of the splitting nodes of the integration interval makes it possible to increase the conditionality of the system of linear equations corresponding to the difference analogue of the problem and, thereby, to prevent the divergence of the iterative process. The article provides an example of calculating the optimal arrangement of the nodes splitting the integration interval when solving a test problem.

Corresponding Author: Valentina Kuzina

MATHEMATICAL MODELING OF THE PROCESS OF HUMID ABSORPTION IN A POROUS MEDIUM ON THE EXAMPLE OF MOISTURE OF LIME COMPOSITES

Valentina Kuzina, Alexander Koshev, Ivan Sukhov

Penza State University of Architecture and Construction, 440028, Penza, 28, German Titov St., Russia

ABSTRACT

A mathematical description of the dependence of the equilibrium moisture content of the porous material of the lime composite on the relative humidity of the air - curves of moisture adsorption in the material under study is considered. Mathematical modeling of the moisture absorption process was performed on the basis of the representation of a certain elementary volume of a lime composite in the form of a volume-porous medium with averaged physicochemical parameters. Mathematical modeling is used for theoretical study of the laws of the process of wetting dry construction mixes. Comparison of calculated and experimental data is carried out, their good consistency is shown. The moistened material is a material with a developed surface throughout the volume and can be considered as a porous medium with effective characteristics distributed throughout the volume, such as porosity, thermal conductivity, mass diffusivity, adsorption characteristics, etc. In the process of moistening the material of the medium at each point of the porous space, an adsorption reaction occurs moisture, which has its macro and microkinetic patterns. Moist air is supplied to the internal, hard-to-reach areas of the porous material due to diffusion and air flow caused by various reasons. The speed of the microscopic reaction of wetting the surface of the composite granules should be taken into account in accordance with the theory of the dependence of the moisture content of the material on the relative humidity of the air. Analysis of the type of sorption curves makes it possible to notice that for a mathematical description of experimental dependence, it is advisable to distinguish two sections on each curve: a section with a bulge up and a segment with a bulge down. The basic equation of moisture transfer in a porous medium is a three-dimensional parabolic differential equation. Under certain conditions, the process of moistening a porous material has the same regularities on any straight line perpendicular to the air-medium interface, which makes it possible to reduce the equation to one-dimensional in spatial variables. The presented calculation results show that the value of the diffusion coefficient significantly affects the process of moistening a porous material and can be used as a measure of the possible moisture content of the composite.

Corresponding Author: Valentina Kuzina

REQUIRED MODEL CONTENT AND INFORMATION WORKFLOWS ENABLING PROFICIENT BIM USAGE

Jure Česnik, Marko Žibert, Martin Lah, Matic Skalja

Elea iC, Dunajska cesta 21, 1000 Ljubljana, Slovenia

ABSTRACT

The modern issue within the construction industry is its conservative approach to innovation and poor data management. In a world where information means everything and efficient workflows are becoming the norm for advanced businesses, not using the attainable data pool is a recipe for stagnation and even regression. Different ways to mitigate the risks involved in building projects have been developed at the design company Elea iC to become more flexible and efficient. Through several large-scale high-rise and tunnelling BIM projects in the past four years engineers at Elea iC have identified two crucial development barriers for advanced proficient BIM usage. The first is organizing the BIM models: internal model structure, information required in models, and how this information is written into models. The second barrier is establishing crucial information workflows to achieve valuable practical results. Exploration of the required model content and its organization together with data workflows are thus the main purposes of this article. Incremental improvement from project to project was needed to provide a much-needed baseline for crucial project data which makes 4D, 5D and 6D BIM modelling possible. A database structure for model properties was developed, from which consistent properties can be inserted into all project BIM models. This provides a unified internal standard ensuring the correct level of information modelling. At the same time essential workflows for BIM implementation, modelling, data sharing, and information management were also developed. Standard BIM software was used to create the base models, but collaboration with other software developers and adapting their solutions was needed in order to attain the desired outcomes of advanced BIM analyses. As more and more clients require advanced BIM solutions for their projects, neglecting to develop and implement new ways of using BIM will diminish companies' potential in the market in the long run. This paper demonstrates that BIM, coupled with databases including standard model content requirements and information workflows, can provide a credible solution for proficient project data management in the construction industry. Therefore, BIM must not be seen as an impractical tool only requiring additional expenses, but as a system that needs internal company development to be adequately utilized and profited from.

Corresponding Author: Jure Česnik

PRICE INDICES DOR RESIDENTAL PREMISES IN SMALL AREAS ON THE EXAMPLE OF A SELECTED MARKET IN POLAND

Iwona Foryś

Faculty of Economics and Management of the University of Szczecin, Institute of Econometrics and Statistics, Department of Operations Research and Applied Mathematics in Economics, Mickiewicza Street 64 Szczecin 71-101, Poland

ABSTRACT

The discussion about real estate price indices in Poland, dates back to the beginning of the transformation period. Despite statutory regulations, the creation of these indices continues to face formal, organizational as well as methodological obstacles. The methodology for building these indices, despite the rich foreign experience in this area, is also not established. The proposed article refers to the Nobel Prize winner from 2013 prof. Robert Shiller, who pointed to the need to build house price indices in homogeneous areas, for example due to the level of urbanization, population size and based on them, the construction of aggregated price indices for larger areas. The foundation of the construction of property price indices in this concept is the definition of a typical home, which is a permanent reference point in subsequent periods of the study. In the proposed article discusses the problem of constructing price indices of housing in small areas, indicating a typical dwelling in trading on the secondary market. On this basis, an attempt was made to determine the price index for a small area, i.e. a homogeneous area due to price-setting factors important for the residential real estate market. Each transaction is described by a set of several quantitative and qualitative features. Price indices will be determined taking into account the methodology used to determine them in the literature. The research hypothesis concerning the discrepancy of the indices values will be verified using various criteria for selecting the spatial extent of the studied area. The obtained results are a contribution to further research on other local markets and for other types of real estate.

Corresponding Author: Iwona Foryś

ANALYSIS OF DATA EXCHANGE RELIABILITY BETWEEN VARIOUS BIM SOFTWARE USING OPEN FORMAT IFC

Tomáš Funtík, Pavol Mayer

Faculty of Civil Engineering, Department of Building Technology, Slovak Technical University in Bratislava, Slovakia

ABSTRACT

Individual software applications store information primarily in their native formats, which is a major challenge in the digital world of the construction industry. In order to make information available to all project participants throughout the life cycle, software applications must enable and secure and reliable data exchange. Interoperability refers to the property of a product or system communicating and working with other products or systems without any limitations. A reliable and effective data exchange of information is a key task for every project. It is important to admit that users cannot fully rely on exchange format IFC. In most cases, however, the user's approach to the develop model is incorrect, resulting in poor interpretation and display in other programs. Therefore, analyse and evaluate the reliability of data exchange between various BIM software using IFC format.

Corresponding Author: Tomáš Funtík

Session Title:

City & Regional Planning Education

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

Magdalena Sulima

Bialystok University of Technology, Faculty of Architecture, Unit of Urban and Spatial Planning, Oskara Sosnowskiego 11, 15-893 Białystok, Poland

ABSTRACT

Nowadays, in which more and more often we are witness of the chaos, lack of aesthetics, respect for historical buildings both in cities and rural settings – the social awareness of space in which we are living and the responsibility for it are extremely important for the preservation of its quality. The discussions in scientific circles from around the world: architects, urban planners and cultural anthropologists, which have been going on for years, postulate that education from an early age is one of the most important ways of protecting the cultural landscape and maintaining sustainable development. This issue is very broad and includes aesthetic aspects (sensitivity to the environment: beauty, ugliness), cultural aspects (knowledge and respect for architectural heritage), creative aspects, but also civil – a shared responsibility and a critical attitude towards the environment. The formation of emotional relations with a place is quite a complex process, which includes concepts such as assimilation, valuation or assessment. Only when man understands the meaning of these words, he identifies himself with the place in which he lives and becomes less indifferent to the processes and transformations taking place in it. From an early age, children are active participants of the space and experience it as an area in which they reside. Movements, visual and tactile perception, even sound, draw images of separate objects [Yi-Fu Tuan, 1987], and the nearest neighborhood: house, school, village/city begin to affect their functioning and reception indirectly or directly. As a result, it leads to attachment and rooting to a place that becomes close and understandable for them. In the process of experiencing space, consciousness is therefore extremely important. It affects the feeling of difference between what is inside and outside and strengthens social relations based on identity, cultural connotations or history. It is the responsibility of adults to foster sensitivity in children to the laws governing the urbanized environment, learning to share responsibility for it, or making decisions aimed at respecting and protecting their surroundings, which is necessary for the harmonious functioning of the whole in the future. The aim of the article is to bring attention to the need for architectural education for children, in order to prepare them to actively and consciously function in the surrounding world and participate in activities connected to the environment in which they are living. Based on examples from different countries, where learning architecture is the core curriculum of schools and countries in which the topic of integration teaching architecture with educational programs from kindergarten to high school is very popular, the author evokes the situation in Poland, where in recent years more and more is happening to raise architectural awareness among the youngest. Joint actions of parents, teachers and architects can help children better understand their neighborhood and its function, help stimulate their creativity, spatial imagination, the sense of observation, as well as to spread regional education and a sense of local identity.

Corresponding Author: Magdalena Sulima

ACADEMIC BUILDINGS AS A SUBSTANTIAL PART OF THE TEACHING SYSTEM. THE CASE OF THE NEW BUILDING DESIGN AT THE SCHOOL OF ENGINEERING, NATIONAL UNIVERSITY OF ROSARIO, ARGENTINA

Rubén Piacentini[1,2], Marcelo Vega[1], Julieta Morabito[3] and Mara Estevez [3]

[1]Laboratorio Eficiencia Energética, Sustentabilidad y Cambio Climático (LESYC), Instituto de Mecánica Aplicada y Estructuras (IMAE), Facultad de Ciencias Exactas, Ingeniería y Agrimensura (FCEIA), Universidad Nacional de Rosario (UNR), Rosario, Argentina
[2] Grupo Física Atmosférica, Radiación Solar y Astropartículas, Instituto Física Rosario (CONICET – UNR), Rosario, Argentina
[3] Student at Escuela de Ingeniería Civil, FCEIA, UNR, Rosario, Argentina

ABSTRACT

With the steady increase in human population observed in the past decades, it is predictable that within the next half a century the world's population will have risen by 2 billion inhabitants. This population growth demands that buildings to be built from now on will have to include energy-efficiency measures as well as their own clean energy production plant, in order to be of very low or, if possible, positive net energy. This last term means that said buildings will produce, on an annual basis, more energy than they will consume. We propose that buildings designed for academic (university education and research) purposes will be monitored with sensors/dataloggers and actuators in real time by students, professors and researchers in order to: a) verify if the design criteria are fulfilled, b) compare the behaviour, efficiency and life cycle of different systems and c) suggest modifications to the monitoring system and even to the building itself through their own ideas or through new developments. As an example, we present the case of the new building design for the School of Engineering, Faculty of Exact Sciences, Engineering and Surveying, National University of Rosario, Rosario, Argentina. It was designed with a surface of 1151m^2**,** for an estimated number of occupants of 132, with a building technique that includes autoclaved aerated concrete in walls and insulation thermal roof panels, high energy and water use efficiency, photovoltaic power supply and sensors/dataloggers and actuators placed in the main equipments and sites. With respect to energy and water efficiency, a reduction of 69% and 67% is obtained, respectively, in comparison with conventional buildings. The energy intensity is 25.7 KWh/(m^2.year), about 30% that of a similar building without efficiency measures. A solar photovoltaic power plant is placed in the roof of the building, covering a surface of 132m^2 with a total installed power of 22KWpeak and an annual energy production of 33320 kWh/year. Since the annual consumption of the building is estimated to be 29620 KWh/year, the building is *energy positive* in *+11.1%*, exporting the rest to the National Electrical Interconnected System. Investigations were also made on the possibility to increase this percentage of energy export (since the roof surface is not completely occupied) and on the possible extension of these results to other buildings in Rosario city, in order to reduce energy consumption and emission of greenhouse gases. Outdoor and indoor temperature, humidity and natural and artificial illumination will be measured, to monitor the bioclimatic comfort. Air sensors/dataloggers will also be installed in strategic areas around the building. In conclusion, all buildings even more those devoted to education, need to be designed and built considering energy efficiency, renewable energy and monitoring in real time. In this way, students and researchers will have the possibility to test ideas and acquire knowledge based on experimental evidence, thereby contributing to the world effort to reduce the global contamination due to greenhouse (and other types of) gases and atmospheric particulate matter and, consequently, to mitigate global warming.

Corresponding Author: Marcelo Vega

EDUCATION IN THE LANDSCAPE OF HISTORIC URBAN SYSTEMS FROM UNESCO WORLD HERITAGE LISTS

Mariusz Antolak

[1]Department of Landscape Architecture, Faculty of Environmental Management and Agriculture, University of Warmia and Mazury in Olsztyn, Poland

ABSTRACT

Education in space is usually associated with nature and takes place on educational paths, in botanical and zoological gardens and other similar spaces. However, education takes place in the open landscape also in other fields. One of them is architecture and urban planning. The aim of the work is to present the results of research on the issue of education in the landscape of historic urban systems and discussion on the phenomenon of open space education. 10 objects from Bulgaria, Cyprus, Ireland, Chile, Kenya, Seychelles and Cape Verde inscribed or proposed for inclusion on the UNESCO World Heritage List were selected for the analysis. The article presents a case study of representative facilities - historic urban systems of towns, villages, concentration camps and mission settlements. The content of information boards located in these places was analyzed and basic information about these objects was summarized in a tabular form. A catalog of examples of design, exhibition and educational solutions was prepared. Despite the fact that these places have not been inhabited for a long time, in most cases they are still lively and are visited by tourists from all over the world. The way of spatial development of the analyzed objects is diverse and usually consistent with the surrounding space. The content presented on the information boards is, however, clichéd and boring, and tourists are not willing to acquaint with them. The research shows that the old urban layouts have great tourist potential. The greater number of tourists poses a threat to the historic systems, but it is also an opportunity for more effective society education in the field of architecture and urban planning. Tourists expect modern forms of content presentation, and knowledge is most easily absorbed in practice - in the open space. Presentation of too much information is not recommended, and the selection of information materials should be consulted with potential users of these facilities.

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Warsaw University of Technology, Poland

WARSAW MODERNISM – BOGDAN LACHERT

Anita Orchowska

Faculty of Architecture Warsaw University of Technology, Department of Architecture, Interior Design and Industrial Forms, 55 Koszykowa Street, 00-659 Warsaw, Poland

ABSTRACT

Bogdan Lachert's work is a significant contribution to the development of modern architectural thought in Poland and his creative personality is connected witch the activities of the Faculty of Architecture of the Warsaw University of Technology. He was one of the first students, later Dean and lecturer, but also a theoretician of architecture. Creative activity, although torn apart during World War II, is invariable associated with the trend of modern avant-garde and leads a dialogue with architecture of modernism. The dialogue is the subject of this article, the dialogue of the new residential architecture of Warsaw, in which Lachert presented his own interpretation of the five principles of Le Corbusier's modern architecture. The two stages of his work, pre-war with Józef Szanajca and post-war with the reality of socialistic realism are intertwined because in fact he remained faithful to the ideas of modernism. More importantly, however, he never changed his opinion about the role of architecture as useful and practical, speaking about its utilitarian and artistic character at the same time, but he saw its significance in the constant pursuit of modernity. According to Lachert the understanding of modernity is the direction of eliminating discrepancies between the requirements of art and technology. Such a view of the role of architecture will be served by examples of buildings as "prototypes of the works of future generations" of individual houses, Muranów housing estate – one of the flagship works of post – war architecture and other residential buildings in Warsaw. Lachert was an extraordinary, predictable creator, but at the same time difficult to define. He searched for a separate expression of modern architecture, which cannot be overlooked. He armed his works with modernistic patterns and expressive style, which in time became clear and legible in a clash with the spatial reality of his times.

Corresponding Author: Anita Orchowska

INTERPENETRATION OF THE ARCHITECTURAL AND URBAN REALMS IN THE WORK OF ARCHITECT MAREK BUDZYŃSKI

Krystyna Ilmurzyńska

Faculty of Architecture, Warsaw University of Technology, Ul.Koszykowa 55, 00-659 Warszawa, Poland

ABSTRACT

Marek Budzyński is one of the best renowned contemporary polish architects. His work is characterized by the wide variety of design themes: a large housing estate, residential buildings, a library, a court, an opera, university campus, spatial management plans as well as theoretical contributions in the field of urban planning. Still Budzyński' distinctive design approach is recognizable in each one of above mentioned creations. As an architect, Marek Budzyński is well established among the polish architectural critic as "postmodern" and "green". The main purpose of the article is to examine the interpenetration of architectural and urban design approaches in Marek Budzyński' work as its essential element, independent of the aesthetical features reflected in the described general view. The research method involved analysis of Marek Budzyński' creations against the background of the ideas expressed in his theoretical contributions. The results of the research indicate that the architectural design of analyzed objects follows the form of adjacent urban space that is essential part of every design idea. In addition, the internal structure of the analyzed buildings is shaped analogically to the urban fabric. At the same time shaping the landscape seems to be as important as shaping the urban space in creating the forms of architecture. The references to traditional architecture and urban fabric are also substantial part of the researched design method. The observed features reflect the theoretical contributions formulated by Marek Budzyński. In the conclusion it can be stated that the fundamental concepts of arch. Marek Budzyński' design ideas are: seeing an architectural creation as the medium of reshaping the timeless continuum of space, and understanding both a city and a building as an organism in which every part should be reconcilable with another as well as with the whole. The use of the citations from the architectural tradition and incorporation of the nature into the built environment are the means of achieving the ideological goals formulated by the architect.

OSKAR HANSEN - AN ARCHITECT LOOKING INTO THE FUTURE

Anna Maria Wierzbicka

Faculty of Architecture, Warsaw University of Technology, Workshop of Sacral and Monumental Architecture, ul. Koszykowa 55, 00-659 Warszawa, Poland,

ABSTRACT

In 2015, the Architecture Department of Warsaw University of Technology as celebrating a century of existence. Although the Warsaw College was created during the occupation, it was characterised by the autonomy of its creators. Even in the hostile post-war years, when leading professors were under the influence of socrealism, the teachers kept elaborating independent ideas about design. Many started creating according to the new ideology, but some were still developing concepts that were not influenced by the oppressive communist system. Many creators and theoreticians of the Architecture Department influenced the academic, didactic and creative activity of the following generations of architects. Oskar Hansen was one of the many outstanding alumni of the Faculty of Architecture Warsaw University of Technology. He was a teacher at the Visual Structures Studio at the Fine Arts Academy, from 1954 to 1983. His unconventional creativity influenced heavily the research led in the experimental laboratory of the Department of Sculpture at the Fine Arts Academy. Hansen's character has been widely described, both in academic and popularised literature, in Polish and in English. The most notable are *About Zofia and Oskar Hansen* by Springer and Zaczyn, *Zobaczyć świat (*Looking at the world*)* written by Hansen himself, where he describes his open form theory, and his publications in the weekly *Przegląd Kulturalny* (The Cultural Review) and the magazine *Architektura* (Architecture). In this research paper, we will question the available literature about the subject - the artist's own publications, articles and monographies describing his work, and more specifically, the architectural practice using the theory of design called "open form". The "open form" theory will be analysed under the perspective of the applicability of the semantic narrative of the architecture of meaning. The research will be led through a case study method. We have chosen to analyse ten major semantic subjects: the Memorial to the Murdered Jews of Europe in Berlin, the POLIN Museum of the History of Polish Jews in Warsaw, the Franciscan monastery in Tychy, the Ronchamp chapel in France, the ecumenical chapel in Switzerland, Bruder Klaus chapel in Germany, St. Jacob's chapel in Germany, the Chapel of Reconciliation in UNESCO, the Cymbalista synagogue in Tel Aviv, and the Bełżec memorial for the murdered in Poland. The chosen subjects have been carefully selected, in order to show the multi-layered quality of the open form theory. The influence of the open form theory when designing modern object related to a symbolic narrative, remembrance sites, and sacral space will be a significant element of our study. An innovative element of this work will be the attempt to fully analyse the "open form" theory exposed in Hansen's writings called *Zobaczyć świat.* The study of these specific elements and characteristics of contemporary commemorative monuments and sacral objects belonging to the open architecture school raises the question of the place of semantics in the globalisation era. In the open form theory, the author builds the opportunity for contextualisation, and challenges the user. Does it stand in opposition or does it balance the Kantian theory of sacral spaces? The open form issue can also be connected to the didactics of the Faculty of Architecture Warsaw University of Technology, Workshop of Sacral and Monumental Architecture The long-standing didactic practice of the university shows the importance of the "hansenian open form".

STEFAN KURYŁOWICZ. ARCHITECTURE OF CHANGE 1989 - 2011

Marcin Goncikowski

Laboratory of Industrial and Large Space Architecture, Department of Design and Architecture Theory
The Faculty of Architecture of the Warsaw University of Technology, Koszykowa 55 str., 00-659 Warsaw, Poland

ABSTRACT

The work of prof. eng. arch. Stefan Kuryłowicz (1949-2011) marked a new chapter in the history of Polish architecture. His activity coincided with a profound socio-economic change that took place after the overthrow of the communist regime. For Polish architecture, this situation was deeply pioneering due to the need to develop new types of buildings and a new way to define the services of the architect. Design activities of prof. Stefan Kuryłowicz was being combined with didactic and scientific work within the Faculty of Architecture at the Warsaw University of Technology. The result of his academic involvement were publications containing texts referring to the theory of architecture, principles of practicing the profession and analysis of the change of public spaces. The analysis shows architectural works of prof. Kuryłowicz and the theoretical description of the discipline on the background of the time in which both: building design and theory were respectively created and formulated by him. The main subject of his theoretical achievements is the relationship of an architectural work with an idea, expression and message of the realized work. The idea is understood as principles formulated at the concept stage. Expression of the work as the sum of materially built means that may realize the idea. The message - as a result of the activity of all parties involved in the team's creation of the architectural object, which may be a part of the possible meaning of the work. The analysed objects are competition works from which a set of buildings of the Baltic Opera in Gdańsk (1973) was selected, a set of buildings of Operetta Dolnośląska in Wrocław (1975), sacral buildings from which the church was chosen in Nowy Dwór Mazowiecki (1979-1984), commercial buildings of public utility - Fuji Film (1993), Zielna Point (1998), Nautilius (1996), Focus (1997), PLL LOT (1999), housing - Eko-Park estate (2002) and the National Forum of Music (2008). Buildings - awarded regularly - have become the determinant of the typology for Polish architecture in the environment of freedom after the turn of 1989. Prof. Stefan Kuryłowicz died in a plane crash in Spain in 2011.

URBAN COMPOSITION THEORY BY KAZIMIERZ WEJCHERT AS A SPATIAL MORPHOLOGY MODEL

Artur Jerzy Filip

Warsaw University of Technology, Faculty of Architecture, 55 Koszykowa Street, 00-659 Warsaw, Poland

ABSTRACT

Among many other aspects of cities, spatial morphology of urban space (i.e. physical measurements, shapes, distances, proportions, scales) is one of the indefeasible ones. Thus, the need to give it great attention in urban studies and planning practice has been considered crucial. Throughout the years, urban spatial morphology has been theorized in a variety of ways by influential researchers and planners: starting with analysis of historical cities by Camillo Sitte, through the “image of the city” approach by Kevin Lynch or Gordon Cullen, up to modern parametric trends outlined by Christopher Alexander and developed by the subsequent researchers using advanced computing tools. By referring to all of these trends and models, the paper aims to present an outstanding work by Kazimierz Wejchert, whose “urban composition elements” theory (1974) was conceived almost concurrently to many of the globally known urban morphology theories. By contrast to them, however, although a foundation of urban-planning education in Warsaw (Poland), Wejchert’s work has remained largely unknown. By juxtaposing Wejchert’s theory with other spatial morphology models, the paper presents its unique components and indicates its shortcomings. And since a morphological approach is currently being discussed to be employed as a key concept to the new comprehensive plan for Warsaw, possible usefulness in regard to temporary planning issues has been taken for a major criterion of such assessment.

AFFORDABLE SINGLE-FAMILY HOUSING: FROM THE TRADITIONS OF THE WARSAW SCHOOL OF ARCHITECTURE

Piotr Trębacz

Faculty of Architecture, Warsaw University of Technology, ul. Koszykowa 55, 00-659 Warszawa, Poland

ABSTRACT

The hundredth anniversary of Poland regaining its independence (as well as the 100th anniversary of the Faculty of Architecture of the Warsaw University of Technology) is an opportunity to reflect on the achievements of Warsaw's architects. The ideas and the creative designs that matched the current needs of the citizens of Warsaw, including the initiatives guaranteeing the availability of cheap, proprietary houses, are worth a closer look. In different periods of the 20th century, the idea of an affordable home found support in urban planning: either in the form of a house in a garden city or a garden district, or by the support of economic, and at the same time ecological, construction (eg. In the suburban individual and cooperative housing). The architectural ideas were accompanied by the desire to ensure contemporary living standards, current aesthetic trends or the more popular stylistic trends (eg. "the manor house style" of the Staszic colony in Warsaw). The modernist avant-garde of the "Warsaw school", its eminent theorists, practicing academics and students had a huge impact on the architecture of the capital as well as Poland. The architecture and urban planning of Żoliborz – a Warsaw district which was designed between 1920-25 and built mainly in the 1930s - is an excellent example. The works of young enthusiasts of the European modernism (S. and H. Syrkus, S. and B. Burkalski, J. Szanajca and B. Lachert) were preceded by the "Blok" magazine and the Praesens group (1926) connected with the CIAM. In the postwar period, practically the only choice for residents of Warsaw was a flat in a prefabricated residential block. The cooperative and private middle-class houses began to appear at the end of the 20th century. The single-family houses, representing the modest means of their investors, were represented and popularized by the Warsaw magazine "Murator" and its nationwide competitions "Domy Dostępne" ["Affordable Houses"]. The suburban landscape of today's Warsaw is dominated by catalogue projects of different quality while the outskirts of the city comprise mostly very intensive residential developments commissioned by developers. They are mostly based on "wild" urban planning, without any social program. The Warsaw's 1930s modernist style is continued today and is associated with good, logical and safe architecture, especially when compared with the hard to define mass of the contemporary single-family houses. We long for the prestige and position of the avant-garde architecture which prevailed in the pre-war Warsaw. As in the interwar period, in some contemporary single-family houses we can observe a parallel trend in the form of neovernacularism. Neomodernism returns in the contemporary projects of the governmental program "Apartment Plus" and "Home Plus" (2018) which aims to create up to a thousand cheap, small, prefabricated houses. From hundreds of the competition submissions the houses designed by architects and students from our Faculty were selected to be built.

A GOOD FLAT ACCORDING TO HALINA SKIBNIEWSKA

Iwona Szustakiewicz

Department of Architectural Heritage and Art, Faculty of Architecture, Warsaw University of Technology, Poland

ABSTRACT

The search for the best solutions in residential architecture has been one of the major areas of interest of architects connected with Warsaw University of Technology's Faculty of Architecture ever since it was founded in 1915. Great achievements in the field were made by Halina Skibniewska (1921-2011), who designed many housing developments Warsaw: Sady Żoliborskie (1958-1963), Sadyba (1972-1974), Szwoleżerów (1974), the Winogrady estate in Poznań (1963-1964) and the Białołęka district of Warsaw (1975-1986). Her contribution to residential construction led to her receiving numerous awards, including the Mister Warsaw title given for the best building in the city, although the true measure of her success was the fact that all of her contemporaries wanted to "live at Skibniewska's". The article describes the most important objectives assumed by Halina Skibniewska when designing residential buildings and estates, illustrated with examples of her œuvre. It was her conviction that designing is the culmination of a long process and should be preceded by analysis, taking into account the local landscape conditions, and sociological, demographic, psychological and economic aspects. She valued direct social consultation just as much as she did scientific research, even carrying out discussions with children. She paid a great deal of attention to the structure of the family as the main users of residential buildings, and to the effects of this structure on the spatial and functional arrangement of the home, which was reflected in the doctoral dissertation. These studies resulted in the creation of the so-called open home model method, which is a concept of a flexible flat which can be modified in response to the changing needs of its users. Halina Skibniewska's social sensitivity meant that she was the first person in Poland to analyse the problems of elderly and disabled people, and to design flats in response to the conditions shaped by the state of their health and how able-bodied they are. An extremely important question for Halina Skibniewska were the surroundings of buildings, which she considered a kind of extension of the home. She became famous not only as a designer who was concerned with providing housing developments with the necessary services and facilities, but also as a zealous defender of existing nature, capable of changing the location of the stairs on a block of flats being designed in order to preserve two old mulberry trees for future residents. Not all the suggestions of this Warsaw architect proved possible to implement in the politicised economic conditions at that time, but many of her ideas were reflected in the architecture of housing developments and estates, which had and still has a positive influence on the residents' quality of life. There is no doubt that many of her views are still valid today, and can be an inspiration for contemporary architects in their quests

THE VISUAL PERCEPTION OF ARCHITECTURE ACCORDING TO THE THEORY OF JULIUSZ ŻÓRAWSKI

Paweł Trębacz

Warsaw University of Technology, The Faculty of Architecture, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

Visual perception is the most important psychological process which allows to perceive an architectural object. Drawing on the principles of human perception, Juliusz Żórawski - a graduate of the Faculty of Architecture at Warsaw University of Technology and a famous Polish architect of the interwar period - formed his theory during World War II. The purpose of this article is to introduce the main assumptions of his theory. According to Żórawski each person perceives the world in the individual and unique way. The transmission of the perceived images to another person requires working out a simplified perception code. This code is not based on the meaning of context but on the sequence of perceptual decoding, common for all people. The most important element in this code is the arrangement of characteristic points, called “communication points,” which hold the viewer’s attention. The decoding of the points as a sequence of glances, which move from a point to a point creates a set of straight lines. This set of straight lines is the code for reading the spatial structure of an architectural object. Therefore, an important element of any architectural design is to propose a set of highly explicit focal points. In conclusion, the characteristics of the human psyche like the search for straight lines, trying to understand what is being seen, the perception of the outside world as a set of arrangements against the surrounding background, are the essence of Juliusz Żórawski’s theory. It should be emphasized that the main elements of his theory are confirmed by contemporary neuropsychological findings. This shows how many disciplines of science the art of architecture comprises.

WORKS OF KAROL JANKOWSKI (1868-1928), CZESŁAW PRZYBYLSKI (1880-1936) AND RUDOLF ŚWIERCZYŃSKI (1883-1943) AS THE BACKGROUND FOR THE CHANGES IN ARCHITECTURAL DESIGN TEACHING AT THE FACULTY OF ARCHITECTURE OF WARSAW UNIVERSITY OF TECHNOLOGY IN THE 1920S

Anna Agata Wagner

Warsaw University of Technology, Faculty of Architecture, 55 Koszykowa St, 00-659 Warsaw, Poland

ABSTRACT

The 20th century Polish architecture reached its turning point in the middle of the 1920s, a decade after the creation of the Faculty of Architecture at Warsaw University of Technology and soon after Poland had regained its independence. National forms emphasizing the autonomy and distinctiveness of Polish architecture were sought for and enhanced, which is characteristic of the first years of the Warsaw school of architecture. New aesthetic trends of the artistic avant-garde hailing from the West changed the perception of architecture. New, modern architectural perspectives were particularly enthusiastically received by the youngest generation of architectural adepts. Striving for simplicity, for purist forms, was related to the construction and logic of the materials used. Changes in the didactics that emphasised the significance of technical subjects and design resulted in a much more rationalistic approach to the problems of architectural design. These changes are also visible in the works of the professors - practitioners who at that time ran the Architectural Design Departments at the Faculty of Architecture at WUT. Using the works of Karol Jankowski, Czesław Przybylski and Rudolf Świerczyński as the example, I would like to present changes not only in the artistic approaches of the leading creators of Polish architecture of that period, but also those affecting the teaching at the Warsaw school of architecture. As the body of the written texts left by these outstanding teachers is relatively scant, their work remained the most powerful form of expression while assimilating innovative currents of the 1920s - a synthesis of their views and ideas contained directly in their architectural works.

Corresponding Author: Anna Agata Wagner

HISTORY OF CITY PLANNING AT FACULTY OF ARCHITECTURE, WARSAW UNIVERSITY OF TECHNOLOGY: THEORY AND PRACTICE

Alicja Szmelter, Justyna Zdunek-Wielgołaska

Faculty of Architecture, Warsaw University of Technology, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

This article seeks to underline the role played in project work by history of city development. From the outset, the teaching on this subject at the Faculty of Architecture of Warsaw University of Technology combined theory and practice together closely, as is evidenced by both the curriculum as such and the ways in which it was taught. Moreover, it is attested to clearly in the CVs of those who taught the subject. This papaer therefore presents the roles played by various different urban planners and researchers into the history of urban planning, when it comes to the evolution of teaching on planning propaedeutics and urban-planning design. From the moment it came into being in 1915, the Faculty of Architecture had teaching on architectural planning and planning as such, as well as urban-planning design, with this also linking up with study of the history of architecture and the history of city planning. Only the second institution in Poland (after Lvov in 1913) to establish a Department of City Planning (hence one dealing with urban-planning design), lecturers here were both practising architects and urban planners, and researchers in the field of history. The co-founder of the Faculty of Architecture Tadeusz Tołwiński (1887-1951) began teaching in this field with a view to its serving as a basis for further work on design in cultural circles. And in his first handbook on urban-planning design (from 1934), that author devoted his first volume to a discussion of historical cities. The second then dealt with the design of the contemporary city, while the third volume dealt with the design of urban green space. T. Tołwiński's approach to design took account of the achievements in the new field thereof that urban planning represented, such as the zoning of cities and the development of communal transport; while also linking this up with the sensitivity of a designer seeking to create a beautiful and healthy environment for living in the city that is at the same time loaded with significance. Wacław Ostrowski (1907-1990) expanded the scope of teaching on urban-planning history in order to include the city in the times of the Industrial Revolution, as well as the start of the 20th century. Affording broad treatment to the matter of history of city planning, he at the same time drew attention to the ecological, social and cultural dimensions of the city creation process. Teresa Zarębska (1932-2003) continued with teaching of the basics of urban-planning design as first laid out by her predecessors. In her activity, she focused on research work, the results of which gained immediate implementation in the teaching programme for the subject officially known as History of City Planning. However, it was further her service to expand the teaching to include matters of the protection of urban structures. She then combined her research and teaching work with activity serving the protection of heritage towns and cities. And through to the present day, a key thrust to the teaching at WAPW has been for theory to link up with practice. For ultimately there is no way to design in European cities without having some knowledge of the way in which they developed.

Corresponding Author: Justyna Zdunek-Wielgołaska

STRUCTURAL DESIGN IN THE WARSAW SCHOOL OF ARCHITECTURE

Ewelina Gawell

Department of Structure Design, Construction and Technical Infrastructure, Faculty of Architecture, Warsaw University of Technology, Koszykowa 55 Street, 00-659 Warsaw, Poland

ABSTRACT

The architectural design process requires the collision between art and technology. Their clash leads to an interaction which shapes the building, whose interdisciplinary content is subjected to a multifaceted assessment. Structural design is the technical discipline, which has the greatest impact on the form of the object being designed. It is concerns itself not only with the important material and technological decisions, but above all the structural idea, which greatly affects the function, artistic expression, etc. In the history of architecture many of the iconic buildings are characterized by an unconventional structure with an impressive geometry, span or material technology. Regardless of whether their author was an architect with structural intuition, or a civil engineer with a high sensitivity to beauty, and whether the building was created as a result of cooperation between industries – the "emergence" of the structural form, is invariably a creative process requiring multi-criteria evaluation, compromise and a coherent vision. There are many examples of objects that have arisen through the synergy of architecture and structure - including the J.S. Dorton Arena sports and entertainment hall in Raleigh opened in 1952, which was designed by the architect Maciej Nowicki, or the impressive search for bio-morphic reinforced concrete forms by eminent architects and engineers such as Felix Candela, Pier Luigi Nervi, Otto Frei or Eduardo Torroja. The interactions between architecture and structure are very important part of the design process that should come at the beginning. The difficulty in running a creative and co-dependent process results from the original vision of the structural form, often arising from a momentary inspiration, while thinking about the technical side is still far in the future – unless it is an intuitive reflex dictated by a proper habit and previous positive experiences. From this perspective, the process of educating young architects and preparing them to search for innovative architecture through rational technical solutions seems to be interesting. Supporting the creation of such habits and experiences has been the aim of the Warsaw school of architecture since the beginning of its existence, ie from 1915. The Interdisciplinary, practical education based on knowledge and historical achievements was the underlying idea which guided the founders and later the lecturers of the university, including Józef Dziekoński, Oskar Sosnowski, Stefan Bryła and many other eminent professors. The care for the integration of art and technology continues even today and it motivates the development of new subjects as well as the vision for education. Particularly noteworthy in the context of the interdependence of architecture and civil engineering is the subject created by prof. Adam Pawłowski – structural design, which is carried out continuously since 1975. The paper deals with the selected curiculum topics and presents both the original teaching method as well as its effects on the structural design subject from the Warsaw school of architecture, pointing to the creative interdisciplinary aspect of the learning process.

MASTERS AND TEACHERS: HOUSING INNOVATIONS IN DESIGNS OF THE PROFESSORS OF FACULTY OF ARCHITECTURE WARSAW UNIVERSITY OF TECHNOLOGY AT THE BEGINNING OF THE 20TH CENTURY

Karolina Tulkowska

Faculty of Architecture, Warsaw University of Technology, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

The Faculty of Architecture Warsaw University of Technology (FA WUT) was established in the first quarter of the 20th century, when in European architecture and art traditional trends were intertwined with new ideas, which inspired building creativity. In 1915, the Society of Science Courses and the Association of Technicians attempted to create a Polish university and polytechnic in Warsaw. Finally, at the newly created technical university an intependent architectural faculty was established. The members of the Organizing Committee and future professors represented the diversity of the architectural environment, both thanks to education in various European schools (polytechnics, military schools and art academies), as well as different aesthetic interests. This diversity was fully reflected in the architectural creativity of that period. At the beginning of the 20th century the traditional craft thinking turned into the scientific interpretation of spatial activities, which stimulated interest in novelty. Innovation was understood as in humanistic disciplines - as the ability to discover and test solutions which deviate from the standard and which induce a rapid change in quality. Innovations of this period took the form of abstract and realistic ideas, methods based on alternative sets of criteria and technologies. They concerned the urban and architectural scale as well as the detail. In the particularly demanding living environment design, they manifested themselves in many objectively new values, such as functionalism, social housing, extensive typology of dwelling layouts, innovative reinforced concrete constructions of open plans, new standards of insolation, ventilation and many others. The paper is a summary of analyzes regarding modern thoughts about living, present in selected projects and realizations of FA WUT professors, 1918-1939. We discuss project of an extremely minimalist villa in Gdynia designed by Bohdan Lachert and Józef Szanajca (1926), Barbara and Stanisław Brukalski house at Niegolewski Street in Warsaw (1928), considered the first implementation of avant-garde architecture in Poland, the sanatorium house in Konstancin (Skolimów) by Helena and Szymon Syrkus (1930-1931) or the housing estate of the Warsaw Housing Cooperative. The aim of the analyzes is to define innovative solutions: more functional, efficient and human-friendly, spatial and technical innovations, in the scale of the building, housing estate and a wider urban and social environment.

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WARSAW MODERNISM – BOGDAN LACHERT

Anita Orchowska

Faculty of Architecture Warsaw University of Technology, Department of Architecture, Interior Design and Industrial Forms, 55 Koszykowa Street, 00-659 Warsaw, Poland

ABSTRACT

Bogdan Lachert's work is a significant contribution to the development of modern architectural thought in Poland and his creative personality is connected witch the activities of the Faculty of Architecture of the Warsaw University of Technology. He was one of the first students, later Dean and lecturer, but also a theoretician of architecture. Creative activity, although torn apart during World War II, is invariable associated with the trend of modern avant-garde and leads a dialogue with architecture of modernism. The dialogue is the subject of this article, the dialogue of the new residential architecture of Warsaw, in which Lachert presented his own interpretation of the five principles of Le Corbusier's modern architecture. The two stages of his work, pre-war with Józef Szanajca and post-war with the reality of socialistic realism are intertwined because in fact he remained faithful to the ideas of modernism. More importantly, however, he never changed his opinion about the role of architecture as useful and practical, speaking about its utilitarian and artistic character at the same time, but he saw its significance in the constant pursuit of modernity. According to Lachert the understanding of modernity is the direction of eliminating discrepancies between the requirements of art and technology. Such a view of the role of architecture will be served by examples of buildings as "prototypes of the works of future generations" of individual houses, Muranów housing estate – one of the flagship works of post – war architecture and other residential buildings in Warsaw. Lachert was an extraordinary, predictable creator, but at the same time difficult to define. He searched for a separate expression of modern architecture, which cannot be overlooked. He armed his works with modernistic patterns and expressive style, which in time became clear and legible in a clash with the spatial reality of his times.

Corresponding Author: Anita Orchowska

INTERPENETRATION OF THE ARCHITECTURAL AND URBAN REALMS IN THE WORK OF ARCHITECT MAREK BUDZYŃSKI

Krystyna Ilmurzyńska

Faculty of Architecture, Warsaw University of Technology, Ul.Koszykowa 55, 00-659 Warszawa, Poland

ABSTRACT

Marek Budzyński is one of the best renowned contemporary polish architects. His work is characterized by the wide variety of design themes: a large housing estate, residential buildings, a library, a court, an opera, university campus, spatial management plans as well as theoretical contributions in the field of urban planning. Still Budzyński' distinctive design approach is recognizable in each one of above mentioned creations. As an architect, Marek Budzyński is well established among the polish architectural critic as "postmodern" and "green". The main purpose of the article is to examine the interpenetration of architectural and urban design approaches in Marek Budzyński' work as its essential element, independent of the aesthetical features reflected in the described general view. The research method involved analysis of Marek Budzyński' creations against the background of the ideas expressed in his theoretical contributions. The results of the research indicate that the architectural design of analyzed objects follows the form of adjacent urban space that is essential part of every design idea. In addition, the internal structure of the analyzed buildings is shaped analogically to the urban fabric. At the same time shaping the landscape seems to be as important as shaping the urban space in creating the forms of architecture. The references to traditional architecture and urban fabric are also substantial part of the researched design method. The observed features reflect the theoretical contributions formulated by Marek Budzyński. In the conclusion it can be stated that the fundamental concepts of arch. Marek Budzyński' design ideas are: seeing an architectural creation as the medium of reshaping the timeless continuum of space, and understanding both a city and a building as an organism in which every part should be reconcilable with another as well as with the whole. The use of the citations from the architectural tradition and incorporation of the nature into the built environment are the means of achieving the ideological goals formulated by the architect.

OSKAR HANSEN - AN ARCHITECT LOOKING INTO THE FUTURE

Anna Maria Wierzbicka

Faculty of Architecture, Warsaw University of Technology, Workshop of Sacral and Monumental Architecture, ul. Koszykowa 55, 00-659 Warszawa, Poland,

ABSTRACT

In 2015, the Architecture Department of Warsaw University of Technology as celebrating a century of existence. Although the Warsaw College was created during the occupation, it was characterised by the autonomy of its creators. Even in the hostile post-war years, when leading professors were under the influence of socrealism, the teachers kept elaborating independent ideas about design. Many started creating according to the new ideology, but some were still developing concepts that were not influenced by the oppressive communist system. Many creators and theoreticians of the Architecture Department influenced the academic, didactic and creative activity of the following generations of architects. Oskar Hansen was one of the many outstanding alumni of the Faculty of Architecture Warsaw University of Technology. He was a teacher at the Visual Structures Studio at the Fine Arts Academy, from 1954 to 1983. His unconventional creativity influenced heavily the research led in the experimental laboratory of the Department of Sculpture at the Fine Arts Academy. Hansen's character has been widely described, both in academic and popularised literature, in Polish and in English. The most notable are *About Zofia and Oskar Hansen* by Springer and Zaczyn, *Zobaczyć świat (*Looking at the world*)* written by Hansen himself, where he describes his open form theory, and his publications in the weekly *Przegląd Kulturalny* (The Cultural Review) and the magazine *Architektura* (Architecture). In this research paper, we will question the available literature about the subject - the artist's own publications, articles and monographies describing his work, and more specifically, the architectural practice using the theory of design called "open form". The "open form" theory will be analysed under the perspective of the applicability of the semantic narrative of the architecture of meaning. The research will be led through a case study method. We have chosen to analyse ten major semantic subjects: the Memorial to the Murdered Jews of Europe in Berlin, the POLIN Museum of the History of Polish Jews in Warsaw, the Franciscan monastery in Tychy, the Ronchamp chapel in France, the ecumenical chapel in Switzerland, Bruder Klaus chapel in Germany, St. Jacob's chapel in Germany, the Chapel of Reconciliation in UNESCO, the Cymbalista synagogue in Tel Aviv, and the Bełżec memorial for the murdered in Poland. The chosen subjects have been carefully selected, in order to show the multi-layered quality of the open form theory. The influence of the open form theory when designing modern object related to a symbolic narrative, remembrance sites, and sacral space will be a significant element of our study. An innovative element of this work will be the attempt to fully analyse the "open form" theory exposed in Hansen's writings called *Zobaczyć świat.* The study of these specific elements and characteristics of contemporary commemorative monuments and sacral objects belonging to the open architecture school raises the question of the place of semantics in the globalisation era. In the open form theory, the author builds the opportunity for contextualisation, and challenges the user. Does it stand in opposition or does it balance the Kantian theory of sacral spaces? The open form issue can also be connected to the didactics of the Faculty of Architecture Warsaw University of Technology, Workshop of Sacral and Monumental Architecture The long-standing didactic practice of the university shows the importance of the "hansenian open form".

STEFAN KURYŁOWICZ. ARCHITECTURE OF CHANGE 1989 - 2011

Marcin Goncikowski

Laboratory of Industrial and Large Space Architecture, Department of Design and Architecture Theory
The Faculty of Architecture of the Warsaw University of Technology, Koszykowa 55 str., 00-659 Warsaw, Poland

ABSTRACT

The work of prof. eng. arch. Stefan Kuryłowicz (1949-2011) marked a new chapter in the history of Polish architecture. His activity coincided with a profound socio-economic change that took place after the overthrow of the communist regime. For Polish architecture, this situation was deeply pioneering due to the need to develop new types of buildings and a new way to define the services of the architect. Design activities of prof. Stefan Kuryłowicz was being combined with didactic and scientific work within the Faculty of Architecture at the Warsaw University of Technology. The result of his academic involvement were publications containing texts referring to the theory of architecture, principles of practicing the profession and analysis of the change of public spaces. The analysis shows architectural works of prof. Kuryłowicz and the theoretical description of the discipline on the background of the time in which both: building design and theory were respectively created and formulated by him. The main subject of his theoretical achievements is the relationship of an architectural work with an idea, expression and message of the realized work. The idea is understood as principles formulated at the concept stage. Expression of the work as the sum of materially built means that may realize the idea. The message - as a result of the activity of all parties involved in the team's creation of the architectural object, which may be a part of the possible meaning of the work. The analysed objects are competition works from which a set of buildings of the Baltic Opera in Gdańsk (1973) was selected, a set of buildings of Operetta Dolnośląska in Wrocław (1975), sacral buildings from which the church was chosen in Nowy Dwór Mazowiecki (1979-1984), commercial buildings of public utility - Fuji Film (1993), Zielna Point (1998), Nautilius (1996), Focus (1997), PLL LOT (1999), housing - Eko-Park estate (2002) and the National Forum of Music (2008). Buildings - awarded regularly - have become the determinant of the typology for Polish architecture in the environment of freedom after the turn of 1989. Prof. Stefan Kuryłowicz died in a plane crash in Spain in 2011.

URBAN COMPOSITION THEORY BY KAZIMIERZ WEJCHERT AS A SPATIAL MORPHOLOGY MODEL

Artur Jerzy Filip

Warsaw University of Technology, Faculty of Architecture, 55 Koszykowa Street, 00-659 Warsaw, Poland

ABSTRACT

Among many other aspects of cities, spatial morphology of urban space (i.e. physical measurements, shapes, distances, proportions, scales) is one of the indefeasible ones. Thus, the need to give it great attention in urban studies and planning practice has been considered crucial. Throughout the years, urban spatial morphology has been theorized in a variety of ways by influential researchers and planners: starting with analysis of historical cities by Camillo Sitte, through the “image of the city” approach by Kevin Lynch or Gordon Cullen, up to modern parametric trends outlined by Christopher Alexander and developed by the subsequent researchers using advanced computing tools. By referring to all of these trends and models, the paper aims to present an outstanding work by Kazimierz Wejchert, whose “urban composition elements” theory (1974) was conceived almost concurrently to many of the globally known urban morphology theories. By contrast to them, however, although a foundation of urban-planning education in Warsaw (Poland), Wejchert’s work has remained largely unknown. By juxtaposing Wejchert’s theory with other spatial morphology models, the paper presents its unique components and indicates its shortcomings. And since a morphological approach is currently being discussed to be employed as a key concept to the new comprehensive plan for Warsaw, possible usefulness in regard to temporary planning issues has been taken for a major criterion of such assessment.

AFFORDABLE SINGLE-FAMILY HOUSING: FROM THE TRADITIONS OF THE WARSAW SCHOOL OF ARCHITECTURE

Piotr Trębacz

Faculty of Architecture, Warsaw University of Technology, ul. Koszykowa 55, 00-659 Warszawa, Poland

ABSTRACT

The hundredth anniversary of Poland regaining its independence (as well as the 100th anniversary of the Faculty of Architecture of the Warsaw University of Technology) is an opportunity to reflect on the achievements of Warsaw's architects. The ideas and the creative designs that matched the current needs of the citizens of Warsaw, including the initiatives guaranteeing the availability of cheap, proprietary houses, are worth a closer look. In different periods of the 20th century, the idea of an affordable home found support in urban planning: either in the form of a house in a garden city or a garden district, or by the support of economic, and at the same time ecological, construction (eg. In the suburban individual and cooperative housing). The architectural ideas were accompanied by the desire to ensure contemporary living standards, current aesthetic trends or the more popular stylistic trends (eg. "the manor house style" of the Staszic colony in Warsaw). The modernist avant-garde of the "Warsaw school", its eminent theorists, practicing academics and students had a huge impact on the architecture of the capital as well as Poland. The architecture and urban planning of Żoliborz – a Warsaw district which was designed between 1920-25 and built mainly in the 1930s - is an excellent example. The works of young enthusiasts of the European modernism (S. and H. Syrkus, S. and B. Burkalski, J. Szanajca and B. Lachert) were preceded by the "Blok" magazine and the Praesens group (1926) connected with the CIAM. In the postwar period, practically the only choice for residents of Warsaw was a flat in a prefabricated residential block. The cooperative and private middle-class houses began to appear at the end of the 20th century. The single-family houses, representing the modest means of their investors, were represented and popularized by the Warsaw magazine "Murator" and its nationwide competitions "Domy Dostępne" ["Affordable Houses"]. The suburban landscape of today's Warsaw is dominated by catalogue projects of different quality while the outskirts of the city comprise mostly very intensive residential developments commissioned by developers. They are mostly based on "wild" urban planning, without any social program. The Warsaw's 1930s modernist style is continued today and is associated with good, logical and safe architecture, especially when compared with the hard to define mass of the contemporary single-family houses. We long for the prestige and position of the avant-garde architecture which prevailed in the pre-war Warsaw. As in the interwar period, in some contemporary single-family houses we can observe a parallel trend in the form of neovernacularism. Neomodernism returns in the contemporary projects of the governmental program "Apartment Plus" and "Home Plus" (2018) which aims to create up to a thousand cheap, small, prefabricated houses. From hundreds of the competition submissions the houses designed by architects and students from our Faculty were selected to be built.

A GOOD FLAT ACCORDING TO HALINA SKIBNIEWSKA

Iwona Szustakiewicz

Department of Architectural Heritage and Art, Faculty of Architecture, Warsaw University of Technology, Poland

ABSTRACT

The search for the best solutions in residential architecture has been one of the major areas of interest of architects connected with Warsaw University of Technology's Faculty of Architecture ever since it was founded in 1915. Great achievements in the field were made by Halina Skibniewska (1921-2011), who designed many housing developments Warsaw: Sady Żoliborskie (1958-1963), Sadyba (1972-1974), Szwoleżerów (1974), the Winogrady estate in Poznań (1963-1964) and the Białołęka district of Warsaw (1975-1986). Her contribution to residential construction led to her receiving numerous awards, including the Mister Warsaw title given for the best building in the city, although the true measure of her success was the fact that all of her contemporaries wanted to "live at Skibniewska's". The article describes the most important objectives assumed by Halina Skibniewska when designing residential buildings and estates, illustrated with examples of her œuvre. It was her conviction that designing is the culmination of a long process and should be preceded by analysis, taking into account the local landscape conditions, and sociological, demographic, psychological and economic aspects. She valued direct social consultation just as much as she did scientific research, even carrying out discussions with children. She paid a great deal of attention to the structure of the family as the main users of residential buildings, and to the effects of this structure on the spatial and functional arrangement of the home, which was reflected in the doctoral dissertation. These studies resulted in the creation of the so-called open home model method, which is a concept of a flexible flat which can be modified in response to the changing needs of its users. Halina Skibniewska's social sensitivity meant that she was the first person in Poland to analyse the problems of elderly and disabled people, and to design flats in response to the conditions shaped by the state of their health and how able-bodied they are. An extremely important question for Halina Skibniewska were the surroundings of buildings, which she considered a kind of extension of the home. She became famous not only as a designer who was concerned with providing housing developments with the necessary services and facilities, but also as a zealous defender of existing nature, capable of changing the location of the stairs on a block of flats being designed in order to preserve two old mulberry trees for future residents. Not all the suggestions of this Warsaw architect proved possible to implement in the politicised economic conditions at that time, but many of her ideas were reflected in the architecture of housing developments and estates, which had and still has a positive influence on the residents' quality of life. There is no doubt that many of her views are still valid today, and can be an inspiration for contemporary architects in their quests

THE VISUAL PERCEPTION OF ARCHITECTURE ACCORDING TO THE THEORY OF JULIUSZ ŻÓRAWSKI

Paweł Trębacz

Warsaw University of Technology, The Faculty of Architecture, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

Visual perception is the most important psychological process which allows to perceive an architectural object. Drawing on the principles of human perception, Juliusz Żórawski - a graduate of the Faculty of Architecture at Warsaw University of Technology and a famous Polish architect of the interwar period - formed his theory during World War II. The purpose of this article is to introduce the main assumptions of his theory. According to Żórawski each person perceives the world in the individual and unique way. The transmission of the perceived images to another person requires working out a simplified perception code. This code is not based on the meaning of context but on the sequence of perceptual decoding, common for all people. The most important element in this code is the arrangement of characteristic points, called “communication points,” which hold the viewer’s attention. The decoding of the points as a sequence of glances, which move from a point to a point creates a set of straight lines. This set of straight lines is the code for reading the spatial structure of an architectural object. Therefore, an important element of any architectural design is to propose a set of highly explicit focal points. In conclusion, the characteristics of the human psyche like the search for straight lines, trying to understand what is being seen, the perception of the outside world as a set of arrangements against the surrounding background, are the essence of Juliusz Żórawski’s theory. It should be emphasized that the main elements of his theory are confirmed by contemporary neuropsychological findings. This shows how many disciplines of science the art of architecture comprises.

WORKS OF KAROL JANKOWSKI (1868-1928), CZESŁAW PRZYBYLSKI (1880-1936) AND RUDOLF ŚWIERCZYŃSKI (1883-1943) AS THE BACKGROUND FOR THE CHANGES IN ARCHITECTURAL DESIGN TEACHING AT THE FACULTY OF ARCHITECTURE OF WARSAW UNIVERSITY OF TECHNOLOGY IN THE 1920S

Anna Agata Wagner

Warsaw University of Technology, Faculty of Architecture, 55 Koszykowa St, 00-659 Warsaw, Poland

ABSTRACT

The 20th century Polish architecture reached its turning point in the middle of the 1920s, a decade after the creation of the Faculty of Architecture at Warsaw University of Technology and soon after Poland had regained its independence. National forms emphasizing the autonomy and distinctiveness of Polish architecture were sought for and enhanced, which is characteristic of the first years of the Warsaw school of architecture. New aesthetic trends of the artistic avant-garde hailing from the West changed the perception of architecture. New, modern architectural perspectives were particularly enthusiastically received by the youngest generation of architectural adepts. Striving for simplicity, for purist forms, was related to the construction and logic of the materials used. Changes in the didactics that emphasised the significance of technical subjects and design resulted in a much more rationalistic approach to the problems of architectural design. These changes are also visible in the works of the professors - practitioners who at that time ran the Architectural Design Departments at the Faculty of Architecture at WUT. Using the works of Karol Jankowski, Czesław Przybylski and Rudolf Świerczyński as the example, I would like to present changes not only in the artistic approaches of the leading creators of Polish architecture of that period, but also those affecting the teaching at the Warsaw school of architecture. As the body of the written texts left by these outstanding teachers is relatively scant, their work remained the most powerful form of expression while assimilating innovative currents of the 1920s - a synthesis of their views and ideas contained directly in their architectural works.

Corresponding Author: Anna Agata Wagner

HISTORY OF CITY PLANNING AT FACULTY OF ARCHITECTURE, WARSAW UNIVERSITY OF TECHNOLOGY: THEORY AND PRACTICE

Alicja Szmelter, Justyna Zdunek-Wielgołaska

Faculty of Architecture, Warsaw University of Technology, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

This article seeks to underline the role played in project work by history of city development. From the outset, the teaching on this subject at the Faculty of Architecture of Warsaw University of Technology combined theory and practice together closely, as is evidenced by both the curriculum as such and the ways in which it was taught. Moreover, it is attested to clearly in the CVs of those who taught the subject. This papaer therefore presents the roles played by various different urban planners and researchers into the history of urban planning, when it comes to the evolution of teaching on planning propaedeutics and urban-planning design. From the moment it came into being in 1915, the Faculty of Architecture had teaching on architectural planning and planning as such, as well as urban-planning design, with this also linking up with study of the history of architecture and the history of city planning. Only the second institution in Poland (after Lvov in 1913) to establish a Department of City Planning (hence one dealing with urban-planning design), lecturers here were both practising architects and urban planners, and researchers in the field of history. The co-founder of the Faculty of Architecture Tadeusz Tołwiński (1887-1951) began teaching in this field with a view to its serving as a basis for further work on design in cultural circles. And in his first handbook on urban-planning design (from 1934), that author devoted his first volume to a discussion of historical cities. The second then dealt with the design of the contemporary city, while the third volume dealt with the design of urban green space. T. Tołwiński's approach to design took account of the achievements in the new field thereof that urban planning represented, such as the zoning of cities and the development of communal transport; while also linking this up with the sensitivity of a designer seeking to create a beautiful and healthy environment for living in the city that is at the same time loaded with significance. Wacław Ostrowski (1907-1990) expanded the scope of teaching on urban-planning history in order to include the city in the times of the Industrial Revolution, as well as the start of the 20th century. Affording broad treatment to the matter of history of city planning, he at the same time drew attention to the ecological, social and cultural dimensions of the city creation process. Teresa Zarębska (1932-2003) continued with teaching of the basics of urban-planning design as first laid out by her predecessors. In her activity, she focused on research work, the results of which gained immediate implementation in the teaching programme for the subject officially known as History of City Planning. However, it was further her service to expand the teaching to include matters of the protection of urban structures. She then combined her research and teaching work with activity serving the protection of heritage towns and cities. And through to the present day, a key thrust to the teaching at WAPW has been for theory to link up with practice. For ultimately there is no way to design in European cities without having some knowledge of the way in which they developed.

Corresponding Author: Justyna Zdunek-Wielgołaska

STRUCTURAL DESIGN IN THE WARSAW SCHOOL OF ARCHITECTURE

Ewelina Gawell

Department of Structure Design, Construction and Technical Infrastructure, Faculty of Architecture, Warsaw University of Technology, Koszykowa 55 Street, 00-659 Warsaw, Poland

ABSTRACT

The architectural design process requires the collision between art and technology. Their clash leads to an interaction which shapes the building, whose interdisciplinary content is subjected to a multifaceted assessment. Structural design is the technical discipline, which has the greatest impact on the form of the object being designed. It is concerns itself not only with the important material and technological decisions, but above all the structural idea, which greatly affects the function, artistic expression, etc. In the history of architecture many of the iconic buildings are characterized by an unconventional structure with an impressive geometry, span or material technology. Regardless of whether their author was an architect with structural intuition, or a civil engineer with a high sensitivity to beauty, and whether the building was created as a result of cooperation between industries – the "emergence" of the structural form, is invariably a creative process requiring multi-criteria evaluation, compromise and a coherent vision. There are many examples of objects that have arisen through the synergy of architecture and structure - including the J.S. Dorton Arena sports and entertainment hall in Raleigh opened in 1952, which was designed by the architect Maciej Nowicki, or the impressive search for bio-morphic reinforced concrete forms by eminent architects and engineers such as Felix Candela, Pier Luigi Nervi, Otto Frei or Eduardo Torroja. The interactions between architecture and structure are very important part of the design process that should come at the beginning. The difficulty in running a creative and co-dependent process results from the original vision of the structural form, often arising from a momentary inspiration, while thinking about the technical side is still far in the future – unless it is an intuitive reflex dictated by a proper habit and previous positive experiences. From this perspective, the process of educating young architects and preparing them to search for innovative architecture through rational technical solutions seems to be interesting. Supporting the creation of such habits and experiences has been the aim of the Warsaw school of architecture since the beginning of its existence, ie from 1915. The Interdisciplinary, practical education based on knowledge and historical achievements was the underlying idea which guided the founders and later the lecturers of the university, including Józef Dziekoński, Oskar Sosnowski, Stefan Bryła and many other eminent professors. The care for the integration of art and technology continues even today and it motivates the development of new subjects as well as the vision for education. Particularly noteworthy in the context of the interdependence of architecture and civil engineering is the subject created by prof. Adam Pawłowski – structural design, which is carried out continuously since 1975. The paper deals with the selected curiculum topics and presents both the original teaching method as well as its effects on the structural design subject from the Warsaw school of architecture, pointing to the creative interdisciplinary aspect of the learning process.

MASTERS AND TEACHERS: HOUSING INNOVATIONS IN DESIGNS OF THE PROFESSORS OF FACULTY OF ARCHITECTURE WARSAW UNIVERSITY OF TECHNOLOGY AT THE BEGINNING OF THE 20TH CENTURY

Karolina Tulkowska

Faculty of Architecture, Warsaw University of Technology, Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

The Faculty of Architecture Warsaw University of Technology (FA WUT) was established in the first quarter of the 20th century, when in European architecture and art traditional trends were intertwined with new ideas, which inspired building creativity. In 1915, the Society of Science Courses and the Association of Technicians attempted to create a Polish university and polytechnic in Warsaw. Finally, at the newly created technical university an intependent architectural faculty was established. The members of the Organizing Committee and future professors represented the diversity of the architectural environment, both thanks to education in various European schools (polytechnics, military schools and art academies), as well as different aesthetic interests. This diversity was fully reflected in the architectural creativity of that period. At the beginning of the 20th century the traditional craft thinking turned into the scientific interpretation of spatial activities, which stimulated interest in novelty. Innovation was understood as in humanistic disciplines - as the ability to discover and test solutions which deviate from the standard and which induce a rapid change in quality. Innovations of this period took the form of abstract and realistic ideas, methods based on alternative sets of criteria and technologies. They concerned the urban and architectural scale as well as the detail. In the particularly demanding living environment design, they manifested themselves in many objectively new values, such as functionalism, social housing, extensive typology of dwelling layouts, innovative reinforced concrete constructions of open plans, new standards of insolation, ventilation and many others. The paper is a summary of analyzes regarding modern thoughts about living, present in selected projects and realizations of FA WUT professors, 1918-1939. We discuss project of an extremely minimalist villa in Gdynia designed by Bohdan Lachert and Józef Szanajca (1926), Barbara and Stanisław Brukalski house at Niegolewski Street in Warsaw (1928), considered the first implementation of avant-garde architecture in Poland, the sanatorium house in Konstancin (Skolimów) by Helena and Szymon Syrkus (1930-1931) or the housing estate of the Warsaw Housing Cooperative. The aim of the analyzes is to define innovative solutions: more functional, efficient and human-friendly, spatial and technical innovations, in the scale of the building, housing estate and a wider urban and social environment.

CZESŁAW PRZYBYSLKI – REMINISCENCE OF DIDACTIC AND CREATIVE ACTIVITY

Agnieszka Lewandowska

Faculty of Architecture, Warsaw University of Technology ul. Koszykowa 55, 00-659 Warsaw, Poland

ABSTRACT

The work aims to remind and familiarize the creative activity of the outstanding Polish architect Czesław Przybylski - professor and dean of Faculty of Architecture in Warsaw, whose personality and teaching methods influenced a generation of famous Polish architects such as Juliusz Żórawski, Józef Szanajca, Bohdan Pniewski and Stanisław Brukalski. Czesław Przybylski was born in 1880. He lived and designed at the turn of the century in an extremely significant period for Poland. It was the era of searching for the national style in architecture as well as the time of the Great War and regaining independence by Poland. In 1919 he was asked to take up the Chair of Monumental Architecture at the Faculty of Architecture which was developed four years earlier. He served as the head of the department and lecturer until his unexpected death in 1936. The significance of his passing is illustrated by the fact that afterwards the entire issue of 'Architektura i Budownictwo' - the most popular architectural magazine at that time - was dedicated to his work. Today, Czesław Przybylski is primarily known for his oeuvres that remained after the Second World War: the building of the Polish Theater and so-called House without Edges - the building of the Military Accommodation Fund in Warsaw. The work of his life, the Main Railway Station in Warsaw was destroyed after the Warsaw Uprising. In turn, one of his last projects, the villa 'Julisin' located near Warsaw and completed in 1935, was illegally demolished in 2008. The article aims to remind the architect's figure and also attempts to analyze the reasons from which the memory of Czesław Przybylski described by his colleagues as a "great artist", "faded master", has become blurred in the minds of contemporary architects. The work was based on the statements of architects, students and his assistants of that time, as well as articles and lectures of Czesław Przybylski himself.

Session Title:

Specific Session:

Dimensions and principles of sustainability in architecture

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CREATIVE SUSTAINABILITY AND ITS APPLICATION IN THE DESIGN OF THE EXHIBITION IN SLOVAK NATIONAL MUSEUM

Ivan Siláči, Paulína Ebringerová

Slovak University of Technology in Bratislava, Faculty of Architecture, Námestie slobody 19, 812 45 Bratislava, Slovak Republic

ABSTRACT

The Museum of History located in the Bratislava Castle is an important part of the complex of specialised museums of the Slovak National Museum. Its basic mission is to purposefully acquire, preserve, scientifically and professionally process, use and make available the museum collections, documenting the development of society in Slovakia from the Middle Ages until the present. In this context of the museum´s specialisation, it has a nationwide scope. The current character of the exhibition spaces in the Bratislava Castle is based on the context of the building. At the last reconstruction was castle returned to the Baroque period. This reconstruction recognizes the historicity not only of the building but also of the architectural design of the interior. The individual exhibitions, made in the castle´s premises, are adapted to the specifics architectural space. The paper presents a case study of the presentation of selected specific piece of artwork in the traditional interior of the Slovak National Museum in the Bratislava Castle. The proposed presentation strategy of the artwork provides a comprehensive use of information and communication technologies. These modern presentation possibilities increase the visibility and attendance this type of exhibitions. The use of new technologies and the minimalist installation of the artwork is in sharp contrast to the essence of the exhibition – The St. Mary vax statue. In addition to the physical presentation of the piece of artwork, emphasis is placed on the presentation of the process of restoration of the statue through the itself story. The applied research, that is presented in this paper is realized through the setup of exhibition. Its aim is to present a piece of art for the general public and professional researcher. Emphasis is focusing on the use of intellectual perception of reality through vision and hearing in conjunction with the presentation of the restoration of the piece of art. By combining the spoken word, story, music, and visual background in relation to the architectural space, we verify the possibilities of presenting this statue. The presentation of the work through the experience, we verify the possibilities of the exhibition system itself in the context of the sustainability of creative activities in the Slovak National Museum. Thanks to the non-traditional form of exhibitions in the architectural space of the museum, this type of presentation is innovative and unconventional.

Corresponding Author: Ivan Siláči

EXTERNAL IMAGE OF VITICULTURAL TOWNS LOCATED AT THE FOOT OF LITTLE CARPATHIAN

Livia Šišláková, Andrea Šeligová

Fakulta architektúry STU, Námestie slobody 19, 812 45 Bratislava, Slovakia

ABSTRACT

One of the main development axes of city Bratislava, the capital of Slovakia, is set through the viticultural region of Little Carpathians. The "*Wine Road"* leads through the settlements that include the Old Rača, now part of the Bratislava city, and adjacent small towns of Sv. Jur, Pezinok and Modra. Throughout centuries, these have developed naturally in the characteristic landscape dominated by the wine growing activities and therefore have strong cultural values for the region, as well as for the whole country. The proposed article deals with the problem of finding the right planning tools, helping in establishing the balance of sustainable development of this microregion - the balance between protecting specific cultural and landscape values of the area and the increasing pressures on the rapid expansion of the new suburban zones into the characteristic landscape. The article initially looks at the transformation of the external image of these viticultural towns through three stages: a. The period of the first Industrial Revolution, when the construction of factories and chimneys changed the panorama, b. The period of the second half of the 20th century, which is the most significant period of changing the external image. The original vineyards were transformed into building plots and the "Old Rača" was absorbed in the development of a modernist panel housing neighborhoods. Sv. Jur was in the era of socialism at the edge of interest due to its sacral history. Modra also stands outside of the main development zone, due to the diversion of the railway towards Trnava and is struggling with individual construction of family houses. Pezinok has served the role of a district town as an administrative and territorial centre and underwent the greatest transformation of its original character, c. The period of modern history that continues to this day, it is characteristic with suburbanization, urban sprawl and the destruction of the natural landscape. As one of the possible solutions, the article proposes the use of the "first line" concept - a new method of regulating and planning the city - that reflects also on the ecological and economical size of the town. This line represents the external boundary of the town which should not be crossed in order to maintain the contrast between natural and cultural environment. Furthermore, proposed contribution deals with the changes in the external image of the viticultural towns in general, especially in the context of Slovakia, which are nowadays under the pressure of suburbanization and transformation of their natural environment and their characteristic landscape. This process is in the long run unsustainable, as the contrast between the natural and cultural environment diminishes, together with all their values.

Corresponding Author: Lívia Šišláková

SOCIAL AND CULTURAL ROLE OF GREENERY IN DEVELOPMENT OF CITTASLOW TOWNS

Agnieszka Jaszczak[1], Katarina Kristianova [2]

[1] Department of Landscape Architecture, University of Warmia and Mazury in Olsztyn, Prawochenskiego St.177, 10-719 Olsztyn, Poland

[2] Centre of Landscape Architecture, Faculty of Architecture, Slovak University of Technology in Bratislava, Namestie slobody 19, 812 45 Bratislava, Slovakia

ABSTRACT

The beginnings of the Cittaslow movement date back to 1998. Italian towns became a model for other European towns, and subsequently for others, around the world. This is how an international movement came into being, founded on the idea of improvement of the quality of life of residents, savouring “slow”, healthy lifestyle, drawing on the tradition and history and respecting the natural and cultural environment of small towns. Green areas play a huge role in creating the image of Cittaslow towns. They constitute the so-called "Green urban corridors" or "green spots" and have cultural, educational and social significance, including recreation and spa functions. They are not only a complement to architecture, but can play a superior role in the structure of cities. The aim of the work is to analyze the state of parks, squares and green areas management in the Cittaslow towns in region of Warmia and Mazury (Poland). There are 20 environmentally, spatially, economically and demographically diverse towns in the region of Warmia and Mazury that acceded to the association. The international network includes towns with a population under 50 thousand. An analysis of the source materials involved gathering and interpretation of information obtained from monographic and cartographic documentation, both current and archival, from websites of Cittaslow towns and mentions in the media. Apart from a monographic study, the authors carried out a landscape and spatial analysis, pre-project studies and made original designs for selected urban parks and greens in Cittaslow towns. All the Cittaslow towns in the Province of Warmia and Mazury under analysis have high potential in terms of using greenery areas with the social and cultural function. Parks and squares are perfect places for integration of communities and for conducting educational and cultural activities. However, diversity regarding land development and programme offer is observed (utility programme). In some towns, greenery areas cover only space with planned (not always in accordance with the art of gardening) plant compositions. However, parks and squares should be planned not only with their visual aspect in mind, but emphasis should be placed on their utility side (active use). Therefore, the article points to the directions of development of new places, as well the possibility of adding socio-cultural functions to existing greenery areas.

Corresponding Author: Katarina Kristianova

COMMUNITY ENGAGEMENT AS A SUSTAINABLE TOOL IN TRANSFORMING MASS HOUSING URBAN STRUCTURES: CASE STUDY OF PETRŽALKA ESTATE, BRATISLAVA, SLOVAKIA

Viktor Kasala, Katarína Smatanová

Slovak University of Technology, Námestie Slobody2911/19, 812 45, Bratislava, Slovakia

ABSTRACT

Engagement of public in the planning and design of our cities is one of the most basic foundations of the democratic society, and is directly reflected on the quality of life of each individual. The public participation is necessary at least from two reasons - firstly, in order to define the real needs of local residents, and secondly, to gather feedback on the top-down of proposed regulations and planning documents. This trend is supported also in the praxis as well as in academia. As defined by New Urban Agenda, there is still a great need of public participation in order to achieve more rigorous method of public scrutiny and ensuring a sustainable way of developing our cities. Especially in the countries after transition, a particular environment of panel mass housing estates presents a specific challenge to meet these trends. These areas can be characterised as of lack of identity and individual attachment of local resident to their everyday spaces, the lack of demarcated public/private spaces - or, in other words - the plethora or "shared" no-one space. his leads to serious problems for city officials. The lack of organised communities means very difficult position in addressing the inhabitants with development of the district, for example the area of central axis which was planned as main transport and facilities corridor but which was never built and so today is huge abandoned space. In Slovakia, at the same time, the areas of mass housing areas represent at least 70% of the whole housing stock, and the methods of their sustainable transformation are therefore an urgent topic for many urban planners and municipality offices. The proposed article deals with the case of redevelopment of area in mass housing estate in Petržalka, part of the capital of Bratislava in Slovakia, based on the piloting various different methods of community involvement and community building. The proposed article analyses the un/successfulness this developed methodology and attempts to outline its further applicability in other contexts. Furthermore, the article contributes to the general topic of finding the balanced tools of planning and regulating the sustainable city development and applicability of proposed methods as a standard urban design and planning tool from the municipal level.

Corresponding Author: Viktor Kasala

STAKEHOLDERS - AN IMPORTANT PART OF A SUSTAINABLE CITY CONCEPT

Ľubica Vitková, Ján Urban

Slovak University of Technology in Bratislava, Faculty of Architecture, Námestie slobody 19, 812 45 Bratislava, Slovak Republic

ABSTRACT

Cities and their representatives need to respond adequately to societal, economic, cultural, climatic and demographic changes that are reflected in new concepts of transformation and the development of spatial urban structures. These changes and new approaches that are linked to responsibility towards the environment and the sustainability of cities require a larger number of professionals from different fields and disciplines to be involved in planning processes. Due to the fact that the behaviour of its inhabitants (their habits and their lifestyles) has a major influence on the character of the present city, it cannot be limited to rational and technical approaches. Which planning methods should be applied in the concepts of sustainable, gradual and vital transformation of space, city and landscape? Which entities should be involved in the planning process? How to communicate with stakeholders? What tools should be applied when designing with the long-term perspective of gradual transformation of space, city and landscape? The submitted contribution deals with these questions and examines them on the implemented project - DANUrB. It aims to evaluate the cultural and landscape heritage in selected small and medium-sized towns along the Danube, through the involvement of stakeholders. The contribution presents the research and the applied methodology connected with stakeholder engagement in the process of seeking a vision aimed at making their city more attractive through cultural tourism. As part of the project's research, a methodology for data collection, common to all participating partners (university institutions, municipal and regional authorities) was established. The methodology was aimed at gaining a wide range of stakeholder information, including their requirements and expectations for the future development of their respective territory, including the identification of interest in active participation. The methodology was applied to selected small and medium towns along the Danube. Our partners in the project in Slovakia are the towns of Komárno and Štúrovo. We have therefore researched the stakeholders with links to these cities and their surroundings. Part of the research is also a comparison of the stakeholders' approach in individual cities, depending on the nature of the city and its cultural background.

Corresponding Author: Ľubica Vitková

POTENTIAL OF CULTURE FOR SUSTAINABLE URBAN DEVELOPMENT

Ivan Siláči, Ľubica Vitková

Slovak University of Technology in Bratislava, Faculty of Architecture, Námestie slobody 19, 812 45 Bratislava, Slovak Republic

ABSTRACT

Urban development, implemented on the principle of a creative city, is one of the principles of the transformation of urban structures, which is based on a thorough evaluation of its potential. It is one of the principles of the development of cities that are responsible for their environment (Sustainable City). A creative city is based on the city's dignities and the communities in which it lives. It builds on the specificities and creative potential of institutions, schools, the social composition of the population, but also on the particularities of the urban structure, the traditions of the city and its cultural climate. Many cities draw on this exception and use it for their own benefit and for the benefit of their citizens (Sain Etienne, Copenhagen, Lisbon, Graz, Glasgow, Košice ...). In order for the prosperity of the city to be based on the principle of the development of culture and the creative industry, its potential for this type of transformation needs to be assessed. The key factors that make the success of a "creative city" conditional are specific economic, social and political conditions. Favorable economic factors include: a labor market with a rich offer of a wide range of job opportunities, with existing creative industries, incubators, the IT sector, and intensive tourism. Relevant social factors include: open social climate, characteristic tolerance, living city atmosphere, rich social life, informal social activities. Appropriate policy factors include: Urban policy and public administration applying the creative form of city management and working with local authorities and citizens. The character of the urban structure is also significant: its image, the quality of the urban environment, a rich array of cultural facilities, education based on the promotion of creative thinking. Just like the tradition of active social and cultural life. The paper aims to evaluate the potential of selected locations in Slovakia - Bratislava and Lučenec. These cities represent two poles of the settlement structure in terms of their hierarchy, size, economic strength, localization. Both have a strong cultural background. Their potential for applying the "smart city" principles, with an emphasis on the use of cultural potential, is analyzed and subsequently evaluated through a range of economic, political and social criteria that correspond to the principles of a cultural city. In view of the authors' focus on urban planning, the assessment of the potential of the urban structure of the selected cities is an essential consideration as one of the factors determining the development of their creative base. The contribution will also present cultural activities that promote the transformation of the urban structure in favor of the viable and sustainable development of the city.

Corresponding Author: Ľubica Vitková

THE QUALITY OF INDOOR ENVIRONMENT OF INTELLIGENT BUILDING – GLOBAL PHENOMENA OF SUSTAINABLE ARCHITECTURE

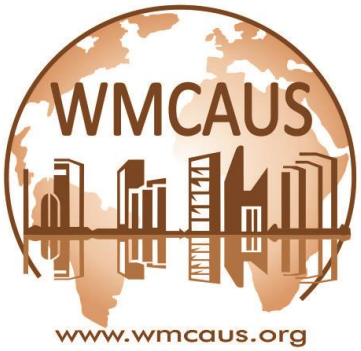
Branislav Puškár, Edita Vráblová, Dušan Kočlík

Faculty of Architecture, Slovak University of Technology, Námestie slobody 19, 812 45 Bratislava, Slovakia

ABSTRACT

The issue of intelligent buildings can be perceived in the context of creating an architectonic concept that accepts the requirement of sustainable development. The architect defines a development scenario for building intelligent buildings and a methodology for its implementation so as to support the user of the intelligent building and to fully accept his requirements for intelligent buildings. The term “intelligent building” represents a well-designed, implemented and functional building that meets the requirements of operators and users and, above all, is able to satisfy the users and residents of the building. The intelligent building is built with state-of-the-art technologies and is equipped with progressive devices and systems. Despite the intelligent building concept’s focus on technology, a sustainable architectonic concept would play an important role in its creation. In the interests of architecture, the intelligent building is not just an exact reflection of the user’s needs. The architectonic concept provides the intelligent building with both sustainability and a high social and aesthetic value.

Corresponding Author: Edita Vráblová



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